Agenda Item 6:	Assessment of operational requirements in order to determine the implementation of communications and surveillance (CNS) capabilities improvement for en-route and terminal area operations

FOLLOW-UP TO THE IMPLEMENTATION OF A RAIM AVAILABILITY PREDICTION SERVICE IN THE SAM REGION

(Presented by the Secretariat)

SUMMARY
This working paper presents information on the activities conducted for the implementation of a RAIM availability prediction service in the SAM Region.

REFERENCES:
• Eighth workshop/meeting of the SAM Implementation Group (SAM/IG/8) (Lima, Peru, 10-14 October 2012); and   • Fifth meeting of the RLA/06/901 Coordination Committee (Lima, Peru, 28-30 November 2011).

ICAO strategic objectives:	*A – Safety* *C - Environmental Protection and Sustainable Development of Air Transport*

1. **Background**

1.1   The SAM/IG/8 meeting, in follow-up to Conclusion SAM/IG/5 – FDE availability prediction programme, analyzed the two solution proposals on RAIM availability predictions from the industry, and the initial studies made by Colombia to extend the RAIM availability application it has installed domestically to all the SAM Region.

1.2   The SAM/IG/8 meeting considered that from the proposals received from the industry, that of DWI was the most appropriate for the Regin and, in reference to Colombia, the Meeeting deemed it convenient that the Secrtariat request it completed the technincal-financial study for avilability predicion by 15 November 2011, with the aim that regional project RLA/06/901 RCC/5 meeting could define the better technical-financial solution, formulating Conclusion SAM/IG8-3 - *Implementation of a RAIM/FDE prediction system in the SAM Region*.

2.   **Analysis**

2.1   In follow-up to Conclusion SAM/IG/8-3, the Regional Office sent a letter to the Administration of Colombia with the aim it analyze the possibility of extending the reach of the RAIM prediction availability service to all of the SAM Region. In this respect, Colombia informed it did not count with the resources necessary to carry out this task.

2.2   Furthermore, the ICAO Regional Office sent a letter to the SAM States indicating its willingness in participating in the implementation of the RAIM availability prediction service, through RLA/06/901 project (letter SA686 of 14 November 2011) and to provide comments by 25 November 2011.

2.3   RLA706/901 project RCC/5 meeting deemed it convenient that the consultation period be extended until 21 December 2011, since very few States had replied (letter SA6277 of 5 December 2011). The results of the consultation are shown in **Appendix A** to this working paper.

2.4   From Appendix A, observation is made that all States of the Region, minus Guyana, informed of their agreement in participating in the purchasing of the RAIM availability prediction service through RLA/06/901 project, with the exception of France.

2.5   In view of the positive results on the survey, and following agreements reached at RLA/06/901 RCC/5 meeting, a technical specifications document has been prepared, using the format of the ICAO Technical Cooperation Bureau for biddings, shown in Appendix B to this working paper for its analysis and approval by the Meeting, with the aim of starting with the technical bidding process.

3.   **Action suggested**

3.1   The Meeting is invited to:

     a)   Take note of the information provided in this working paper;
     b)   Analyze and approve the technical specifications document in Appendix B to this working paper, in order to start with the bidding process through the ICAO Technical Cooperation Bureau; and
     c)   Analyze any other aspects related with this Agenda Item.

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APPENDIX A / APENDICE A

State / Estado	Cartas env. por OACI Lima	Reply Date/ Fecha Respuesta	Doc Received / Doc Recibido	In Agreement/ DeAcuerdo		Remarks / Comentarios
				YES/SI	**NO**	
						RAIM IMPLEMENTATION IN THE SAM REGION / IMPLANTACIÓN RAIM EN LA REGION SAM
ARG	LN 3/24.1-**SA686** 14/11/11	07-feb-12	ANAC N° 58/2012	X		The Adinistration agrees in particpating in the implementation of the service as per the option offered by DWI / La Administración está de acuerdo en participar en la implantación del servicio conforme a la opción ofrecida por DWI
BOL	LN 3/24.1-**SA6277** 5/12/11	20-dic-11	DNA-1092/11	X		Bolivia accepts the invitation to participate in the implementation of this service, in accordance with SAM/IG/8 conclusions / Bolivia acepta la invitación a participar en la implantación de este servicio de acuerdo a las conclusiones de SAM/IG/8
BRA	LN 3/24.1-**SA686** 14/11/11	23-nov-11	291/CERNAI/2011	X		Suggests that the service be managed by the ICAO Technical Cooperation Programme / Sugiere que el servicio sea administrado por el Programa de Cooperación Técnica de la OACI
CHI	LN 3/24.1-**SA686** 14/11/11	27-dic-11	DGAC N°4/3/820/8201	X		To conside that the process this matter will follow is that decidec by RLA/06/901 RCC/5 meeting, indicated in its Final Report, under Agenda Item 4, paragraph 4.16 / Considerar que el proceso que este asunto seguirá es el decidido por la reunión RCC/5 del RLA/06/901 y que consta en el Informe Final, cuestión 4 del orden del día, párrafo 4.16
COL		30-dic-11	20033130 2011039702	X		Invite other companies in addition to DWI, such as DSI/FIGURAZIONE / Invitar otras empresas a parte de DWI, tal como DSI/FIGURAZIONE
ECU	LN 3/24.1-**SA686** 14/11/11	17-feb-12	DGAC-YA-2012-0410-O	X		Colombia is developing its PBN, which considers airspace optimization, RNAV route design and GNSS based PBN approach and exit procedures, with the corresponding training of specialists as per ICAO guidelines and recommendations / Colombia está desarrollando su PBN que contempla la optimización del espacio aéreo, diseño de rutas RNAV y procedimiento PBN de aproximación y salida PBN basados en el GNSS, con la correspondiente capacitación de sus especialistas de la mano con las directrices y recomendaciones de la OACI
FRA	LN 3/24.1-**SA686** 14/11/11	23-nov-11	correo-e de Sr. Olivier Jouans		X	Francia uses the AUGUR system established by Eurocontrol. This system is available for pilots and has world coverage. consults whether Eurocontrol can be contacted in order to obtain benefits from this proven system, at a lesser cost / Francia usa el sistema "AUGUR" establecido por Eurocontrol. Este sistema está disponible para los pilotos y tiene una cobertura mundial. Consulta si podemos contactar Eurocontrol con el fin de beneficiarnos con este probado sistema a un menor costo

State / Estado	Cartas env. por OACI Lima	Reply Date/ Fecha Respuesta	Doc Received / Doc Recibido	In Agreement/ DeAcuerdo		Remarks / Comentarios
				YES/SI	NO	
GUY						
PAN	LN 3/24.1-**SA686** 14/11/11	13-dic-11	DNA-114-2011	X		Panama considers convenient that this service be implemented through RLA/06/901 project / Panamá considera conveniente que este servicio se implemente a través del proyecto RLA/06/901
PAR	LN 3/24.1-**SA686** 14/11/11	21-nov-11	P/DINAC N° 2810/2011	X		Paraguay agrees in participating through RLA/06/901 project / Paraguay está de acuerdo en participar a través del proyecto RLA/06/901
PER	LN 3/24.1-**SA686** 14/11/12	31-ene-11	159-2012-MTC/12.04	X		Peru agrees on the need to count with one RAIM system, taking into consideration the PBN procedures currently implemented and those to be implemented in the future / Perú concuerda con la necesidad de contar con un sistema único RAIM, considerando los procedimientos PBN actualmente implantados y los que se implantarán en el futuro
SUR	LN 3/24.1-**SA686** 14/11/11	20-dic-11	correo-e de Sr. Kennith Dors	X		Suriname's administration is willing to participate in the implementation of RAIM availability prediction service for the SAM Region. They are waiting to participate in the discussions to be followed / La Administración de Suriname se encuentra llana a participar en la implantación del servicio de predicción de la disponibilidad RAIM para la Región SAM. Están en la espera para participar en las discusiones a seguir
URU	LN 3/24.1-**SA686** 14/11/11	19-dic-11	correo-e por el Director Nacional de Aviación Civil	X		In principle, is in agreement with the provision of this service as it is important for the support en route, approach and terminal area PBN procedures. The Uruguayan delegation participating in SAM/IG/8 dealt with the topic and agrees that the manner of payment be proportional, be it as per the number of consultations, the number of RNAV routes, the number of RNAV route mileage, or any other parameter agreed among contracting States / En principio se estaría de acuerdo con la provisión de este servicio por considerarlo de suma importancia para soportar los procedimientos PBN en ruta, aproximación y área terminal. La delegación uruguaya que concurrió a la SAMIG/8 trató el tema y concuerda que debe encontrarse una forma de pago que sea proporcional, ya sea al número de consultas, al número de rutas RNAV, al número de millas de ruta RNAV, o a alguna otra paramétrica que se acuerde entre los Estados contratantes

State / Estado	Cartas env. por OACI Lima	Reply Date/ Fecha Respuesta	Doc Received / Doc Recibido	In Agreement/ DeAcuerdo		Remarks / Comentarios
				YES/SI	NO	
VEN	LN 3/24.1-**SA5234** 27/03/12	13-abr-12	PRE-ORI-GRO 3017/2012	X		Venezuela agrees with the regional implementation of the referred service of it its conduct through RLA/06/901 project, taking into account same would provide the information necessary to support GNSS based PBN procedures as regards route, approach and terminal area. In addition, Venezuela approves the proposas presented by DWI (letter LN 3/24.1-SA686 of 14/11/2011), as the interface proposed, access options, consult, maintenance and associated costs result advantageous /Venezuela está de acuerdo en la implantación regional del referido servicio y su ejecución a través del proyecto RLA/06/901, tomando en consideración que el mismo proporcionaría la informacion necesaria para soportar los procedimientos PBN basados en el GNSS en relación a ruta, aproximación y área terminal. Asimismo, el Estado venezolano aprueba la propuesta presentada par la empresa DWI (carta LN 3/24.1-SA686 del 14/11/11) en virtud que resulta ventajosa la interface propuesta, opciones de acceso, consulta, mantenimiento y costos asociados

APPENDIX B

	INTERNATIONAL CIVIL AVIATION ORGANIZATION	**COMPLIANCE STATEMENT**
ICAO SPECIFICATION CODE:		Tenderer **must** state below, against **every** item, *Compliance* or *Non Compliance*. Failure to complete and return this form may invalidate the bid.
TITLE:	**SAM REGIONAL RAIM PREDICTION AVAILABILITY SERVICE VIA WEB**	
	It is strictly prohibited for tenderers to alter this document. Only the originator of the specification may provide amendments.	**SUPPLIER NAME:**

SECTION A – INTENT AND STANDARDS	

1.   **OBJECTIVE**
 	
 1.1   The International Civil Aviation Organization (ICAO), on behalf of the Governments of Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, French Guiana (France), Guyana, Paraguay, Peru, Panama, Suriname, Uruguay and Venezuela *intends to procure, on a turnkey basis, the implementation of a SAM Regional RAIM prediction availability service through an own WEB page functioning the 24 hour per seven day a week (24/7) to support the PBN procedures en route, terminal and approach area.*
 	
 2.   **OBJECTIVE OF SAM REGIONAL RAIM PREDICTION AVAILIBILITY SERVICE (SRRPAS)**
 	
 2.1   In order to achieve this objective, the aeronautical authorities of the Region have agreed that the SRRPAS shall **ensure**:
 	
      To provide users of an on-line status of the prediction availability of GPS RAIM the 24 hours/7 days a week (24/7) to support the PBN RNAV/RNP operations at Regional level and to each State of the SAM Region.
 	
      To develop a web site for the SRRPAS
 	
      To be easily expandable to cover other Performance-Based Navigation (PBN) RNAV and RNP applications. Based on other constellation of navigation satellite system (GALILEO, GLONASS, Beidou).
 	
      To cover all regional airspace for RNAV/RNP operations for both Fault Detection (FD) and Fault Detection and Exclusion (FDE) capable receivers.	

SECTION A – INTENT AND STANDARDS

3.   **SCOPE**

3.1   The Project contemplates that the Successful Bidder shall **provide**:

a)   SAM Regional RAIM Prediction Availability Service (FD and FDE capable receivers) for the following PBN/RNAV /RNP operations
En route
Oceanic :and remote continental area RNP 10, RNP 4
Continental area RNAV 5, RNAV 2
Terminal RNAV 1, RNP 1
Approach RNP APCH, RNP AR APCH

b)   Provision of database of waypoints within SAM airspace GRPS website design.

c)   The develop of a WEB page for he SRRPAS

d)   To maintain and manage the WEB page for the SRRPAS

e)   The SRRPAS application shall be hosted on an dual application server with a database back- end providing highly available file storage facilities

4.   **BASIC TECHNICAL CHARACTERISTICS**

4.1   The hardware shall consist of two servers, one for the redundant primary and mirror (2 in total) See Figure 1 for SRRPAS architecture

Figure 1 SRRPAS Architecture

5.   **GENERAL CONSIDERATIONS**

5.1   The Successful Bidder shall be responsible for the implementation of a SRRPAS, a design of a WEB page,, acquisition, transport, installation, hosting and commissioning of the required equipment and services, with all the accessories and facilities and to maintain and manage the SRRPAS.

SECTION A – INTENT AND STANDARDS

5.2   The system shall be installed , hosted and operated on the place of the bid winner installation and deployed across two geographically dispersed servers, at two different Data Centres, offering 24/7 service with a better than 99.5% availability

6.   RULES AND STANDARDS

6.1   All designs, materials, manufacturing techniques and workmanship shall be in accordance with the highest accepted international standards.

6.2   Where applicable, the equipment shall fully comply with or exceed the requirements of the following documents (latest edition plus any related amendments):

    a)   the standards and recommended practices of the International Civil Aviation Organization (ICAO) contained in the Annexes, as well as the provisions of its manuals, documents and circulars concerning aeronautical telecommunications, the ATN, CNS/ATM systems, and air traffic services. The Successful Bidder is responsible for complying also with the new standards, amendments and recommendations issued during the implementation of the project;

    b)   those applied by public carriers in each State; and

    c)   the ISO 9000 certification in terms of its methods and lines of production. Compliance with ISO 14000 standards is desirable in terms of materials, installation process, maintenance and disposal of materials.

6.3   If at the time of the publication of this document the specific rules and standards mentioned in any of the other Sections have been revoked, superseded or updated, the new rules or standards shall be deemed as applicable.

6.4   The Bidders shall pay special attention to minimising manual operations and maintenance tasks, and to the expansion capacity of the system, for both electronic and electrical components.

6.5   In order to achieve these objectives, the use of standard and COTS (commercial off-the-shelf) materials and equipment from manufacturers engaged in their production shall be maximised.

7.   ALTERNATIVES

7.1   Bidders are invited to bid for any equipment that, in their opinion, meets, or exceeds the requirements of, this specification. Any such alternative or variation shall be fully and clearly defined and substantiated so as to easily determine such equivalence or superiority.

8.   BIDDER'S EXPERIENCE

8.1   The Bidder shall demonstrate broad experience in the RAIM Prediction Availability Service implementation The Bidder shall include a list of customers to whom it has supplied and installed, during the last five (5) years, similar to those offered in its technical proposal and that are currently in operation. The list shall contain the names, addresses and references of customers that can be contacted.

SECTION A – INTENT AND STANDARDS

8.2   The Bidder shall submit at least three (3) letters of reference with the contact names of different customers with similar projects in different locations to enable verification of the level of compliance and quality of the equipment and services previously provided. ICAO or the AAA may visit such customers to check the accuracy of the information submitted.

8.3   The Bidder shall demonstrate that the level of quality of its personnel is commensurate to the installation, commissioning and maintenance of the systems and services to be supplied and installed.

8.4   The system manufacturer shall be a leading company worldwide, with a technology proven and recognised in the international markets. In this sense, Bidders shall also indicate the country of manufacture of the proposed equipment.

9.   **BIDDER'S DOCUMENTATION**

9.1   *Statement of compliance: all bids shall be accompanied by a Statement of Compliance, in the form of a copy of the specifications, indicating in the right column whether it Complies (C) or Does not Comply (NC). If the bid states that it complies, any reference, indication, comment or subsequent note to the contrary shall not release the Bidder from the responsibility for the compliance stated.* The Bidder shall make reference to the statement of compliance, indicating what section of its documentation substantiates such statement. Failure to provide such definitive indication with respect to any requirement can invalidate its bid.

9.2   The Bidder shall submit its bid in Spanish and English, in two (2) hard copies and one (1) electronic copy. See Section D, Technical Documentation for further details. The official language of the tender will be English.

9.3   Each Bidder shall submit the appropriate technical documentation containing data sheets, performance data, drawings, illustrations, pictures, etc., of the system being offered to enable full and detailed assessment of the bidder as a whole, in accordance with that stated in Section C. The financial bid shall provide detailed costs of the equipment and services required in this technical specification.

9.4   The proposal shall include documentation on operational *commands, and other information that the Bidder may deem* appropriate.

9.5   The Bidder shall submit, together with its bid, a timetable of major activities to be carried out concerning the design, manufacturing, provision, FAT, installation, , site acceptance and commissioning (see other details in Section E).

9.6   Additionally, the Bidder shall submit the available operational manuals (as described in Section D) as part of the proposal.

ICAO SPECIFICATION CODE:	**Page 5 of 26**
TITLE: **SAM REGIONAL RAIM PREDICTION AVAILABILITY SERVICE VIA WEB**	**COMPLIANCE STATEMENT**

SECTION B – GENERAL REQUIREMENTS	

1. REQUIREMENTS)

1.1 General guidelines

1.1.1 The Bidder may be required to provide the organizational chart of the company and resumes of its technical staff.

1.1.2 The Bidder shall prepare a project and assembly timetable for the implementation of the SRRPA

1.1.3 The Successful Bidder shall be fully responsible for the design, selection of components and materials, and installation techniques, to ensure total integration and full compatibility between the main components and all auxiliary units.

1.1.4 Within forty-five (45) days following the signing of the contract, the Successful Bidder shall submit for the approval of ICAO a detailed System Design Document (SDD) for the implementation of the SRPP

1.1.5 The Successful Bidder shall appoint properly qualified personnel in sufficient number to perform the work within the proposed timeframes.

1.1.6 The Successful Bidder shall prepare and submit Factory Acceptance Test (FAT) procedures for approval, and shall conduct the performance tests.

1.1.7 The Successful Bidder shall prepare and submit the Final Acceptance Test (FAT) protocols for approval.

1.1.8 The Successful Bidder shall be responsible for host maintain and manage the SRRAPS

1.1.9 The Successful Bidder shall submit operating and maintenance manuals, as well as the final drawings showing how facilities were constructed.

1.2 Input power supply

1.2.1 Nil.

1.3 Environmental conditions

1.3.1 Nil.

1.4 General considerations

1.4.1 Nil.

1.5 Protection system

1.5.1 Nil.

1.6 Electric power system protection requirements

1.6.1 Nil.

SECTION B – GENERAL REQUIREMENTS

1.7   **Communication equipment protection requirements**

1.7.1   Nil.

1.8   **Protection against atmospheric discharges**

1.8.1   Nil.

1.9   **Mechanical and electrical requirements**

1.9.1   Nil.

1.10   **Equipment assembly and installation**

1.10.1   Nil.

1.11   **Bidder's responsibilities**

1.11.1   The Bidder shall assume full responsibility for the following issues:

     a)   Project proposal, organisation and distribution of all works.
     b)   Any deviation from the specifications must be corrected at its own expense.

SECTION C – TECHNICAL REQUIREMENTS

1.   **INTRODUCTION**

SRRPS OVERVIEW

General Features

1.1   SRRPAS will be developed such that Operators can access up to date information about the GPS Satellite constellation and calculated RAIM unavailability pertinent to their operations.

1.2   SRRPAS shall make information available to Operators over the Internet and shall ensure that the most up to date GPS Satellite constellation data available is used as the basis for RAIM calculations and constellation status reports. The System will use a variety of information sources to collate the best available GPS constellation data. Information shall be made available both graphically and in a textual form.

1.3   SRRPAS shall be configured such that it is resilient and will provide 99.5% availability. The System shall be deployed in a mirrored configuration with two independent and geographically distributed server installations. The two server installations shall be synchronised to ensure that continuity is preserved regardless of the server used by the Operator. The SRRPAS software will be designed such that the switch between the primary site and the mirror site in the event of a failure occurs automatically, without operator input.

1.4   SRRPAS shall ensure that the Operator is made aware of the provenance and source of the constellation data used by the tools. The System will ensure that the Tools use a consistent constellation data set by means of the Constellation Mediator system function.

1.5   The System shall maintain calculation audit logs that capture the following information:

Calculation parameters and results.
Data and time of the calculation.

1.6   In addition the System shall ensure that data provided to Operators is logged for audit purposes. At a minimum, the system will record sufficient information to allow the Operator to be identified and for the information provided to the Operator to be recreated.

1.7   The System shall be designed to enable it to be easily expanded to provide an integrity prediction capability for Galileo, GLONASS, Beidou and future navigation systems.

2.   **GPS RAIM PREDICTION SERVICE TECHNICAL APPROACH**

2.1   SRRPAS shall be a web-based tool with access for SAM regional customers. The main URL and mirror URL shall be defined in conjunction with ICAO in representative of the SAM Member States.

2.2   The following sections define the proposed tools and functions within SRRPAS.

SECTION C – TECHNICAL REQUIREMENTS

GPS status tool

2.2.1 The GPS Status Tool presents a view of the GPS Satellite constellation based on the latest almanac and NANUs (Notice Advisory to Navigation Users) issued by the US Coast Guard. Information disseminated by the US Coast Guard can be found at the USCG NAVCEN web site.

2.2.2 The GPS Status Tool presents the number of operational satellites in the GPS constellation based on the information current at the time of the request to inform users whether or not there are sufficient satellites to meet the minimum requirements for RNAV 5 and so determine the necessity of RAIM predictions for RNAV 5 operations. The almanac used and NANUs that affect the availability of satellites during the requested time period are also displayed.

2.2.3 The GPS Status Tool is configured to provide the status of the GPS constellation for a 72 hour period calculated from the midnight previous to the time at which the status request was made (times are in UTC).

Terminal/Approach tool

2.2.4 The Terminal/Approach Tool have to uses algorithms to calculate the predicted RAIM availability for a 72 hour period for specific Aerodromes. The algorithms can be used in Terminal mode addressing the RAIM requirements for GNSS receivers operating in Terminal operations (±1NM) or in Approach mode addressing the RAIM requirements for GNSS receivers operating in Approach operations (±0.3NM). Both the Fault Detection (FD) and Fault Detection and Exclusion (FDE) algorithms are provided, with FD set as the default.

2.2.5 The Terminal/Approach Tool has to provide a graphical output and a tabular output each of which display the predicted RAIM outages over the scenario period for each of the selected aerodromes.

2.2.6 The Terminal/Approach Tool has to be configured to return the status of the GPS constellation for a 72 hour period calculated from the midnight previous to the time at which the status request was made (times are in UTC).

2.2.7 The Terminal/Approach Tool has to be allows up to 10 aerodromes to be specified – aerodromes are selected by entering their ICAO identifier.

2.2.8 The Terminal/Approach Tool has to calculate the predicted RAIM availability at the Aerodrome Reference Point (ARP) for baro (pressure altitude) aided and non-baro aided GNSS user equipment at 1 minute intervals throughout the scenario time. The sample time is taken to be the mid-point of a 1 minute period. Therefore a RAIM outage detected at a single sample time will have a duration of 1 minute starting 30 seconds prior to the sample time and ending 30 seconds after the sample time.

Visibility tool

2.2.9 The SRRPAS has to calculates the location of the GPS satellites relative to a fixed receiver position for a given time duration.

SECTION C – TECHNICAL REQUIREMENTS

2.2.10   The Visibility Tool has to provide the following output options:

    a) Graphical sky plot representation of the visible satellites.

    b) Tabular representation of the visible satellites. (A table of azimuth and elevation values and the visibility status for each satellite at each sample time in the scenario is displayed, azimuth and elevation are displayed in decimal degrees, all satellites are included regardless of visibility and health.

    c) Visibility Tool has to require entries user-configurable parameters as:
-     - Receiver Position
-     - Mask angle
-     - Scenario duration
-     - Number of samples required to calculate the satellite visibility
-     - UTC date and time

Route tool

2.2.11   The Route Tool has to calculate the predicted RAIM availability for points along a defined route using either the RAIM algorithm in En-Route mode or the Terminal mode.

2.2.12   A route shall be defined by a series of waypoints selected, or input, by the user. The tool has to maintain a list of current en-route waypoints and navaids in the South American Region area which can be selected by ICAO identifier. The user can also has the possibility to define custom waypoints by entering an identifier, State, latitude and longitude

2.2.13   The system has to contain a database of waypoints inside South American Region airspace and easily configured by the User.

2.2.14   The defined route and the results of the RAIM check has be saved and reviewed for the session but will be discarded when the User leaves the GRPS website.

2.2.15   The User has the capability to select other angles.

2.2.16   Both the Fault Detection (FD) and Fault Detection and Exclusion (FDE) algorithms have to be provided.

2.2.17   The tool has to calculate the anticipated RAIM availability for points spaced at one minute intervals along the route, based upon the Time Offset values entered, and displays any anticipated RAIM outages that equal or exceed 5 minutes (User configurable).

2.2.18   The Route Tool has to provide a graphical output and a tabular output each displaying the predicted RAIM outages over the scenario period. Both displays have also to show the anticipated outages if the start time is delayed, or brought forward, by 5, 10 or 15 minutes.

SECTION C – TECHNICAL REQUIREMENTS

3   SRRPAS HOSTING AND OPERATIONAL FACTORS

3.1   SRRPAS shall be managed and operated by the winning bidder and shall be deployed across two geographically dispersed servers, at two different Data Centres, offering 24/7 service with a better than 99.5% availability. (See Figure 1 for SRRPAS architecture).

3.2   SRRPAS application shall be hosted on an application server with a database back- end providing highly available file storage facilities.

3.3   The server shall be fault-tolerant and shall include support for hot-swapping of essential hardware such as disks and power supplies.

3.4   The hardware shall consist of two servers, one for the redundant primary and mirror (2 in total) with the following minimum specification:

 a)   Redundant Pair o firewalling Devices w.
 b)   Redundant Pair of Hardware Load Balancers balancing traffic at layer 4, 100Mbit access switch ports with 1Gbps trunks between distribution, aggregation and core switching layers.
 c)   Multiple upstream internet providers shall be provided.
 d)   Servers provided with the following minimum configuration that will be update during the implementation planning phase of the project (Processor (Quad 2.0Ghz) – 4Gb Ram – 2x 72Gb SAS 10k Disks in Raid 1).

IP security

3.5   SRRPAS server infrastructure shall be protected by a dual firewall system.The internal network clusters shall be hosted on a private network segment with a private address range – not directly accessible from outside the firewall. Only web traffic, email traffic and management traffic shall be permitted through the firewall.

3.6   SRRPAS shall be patched with software security updates (OS, Database, etc) as they become available.

3.7   Local physical security measures shall be implemented.

Constellation data mediator

3.8   SRRPAS shall maintain an up to date record of the GPS satellite constellation as well as scheduled changes to the constellation in order to ensure that the System calculations are based on the best available data.

3.9   The System shall obtain constellation data and constellation updates from a number of sources, as follows:

 a)   United States Coast Guard (USCG).
 b)   Almanac.
 c)   Unscheduled outages/changes (NANU).
 d)   AFTN (as a future option).
 e)   Unscheduled outages/changes (NOTAM).

SECTION C – TECHNICAL REQUIREMENTS

3.10   The Constellation Data Mediator subsystem will mediate the constellation information to provide the system with the best available picture of the constellation for the calculation time periods supported by the Tools.

3.11   The Constellation Data Mediator subsystem will also orchestrate the recalculation of static data in response to a constellation change to ensure that RAIM outage predictions are current and reliable.

3.12   The Constellation Data Mediator subsystem will be written to be resilient to errors in the data feeds from the external data sources. SRRPA will not update reference constellation data until it is verified as good with respect to format validity, range checking.

3.13   By using multiple data sources, GRPS will be able to use the best data available if one or more of the data sources is not functioning correctly. SRRPA will allow customisation of audit logging and notifications to system administrators based on errors detected in the source data (availability or content) to allow timely manual override of default behaviour and investigation of the issue if necessary.

SRRPAS helpdesk

3.14   The bid winner has to respond to queries related to SRRPAS and its operation via the SRRPAS Helpdesk, contactable via an Email address to be specified.

3.15   The bid winner shall assist in resolving issues at application level, specifically:

   a) To support the quality of the GPS RAIM predictions,
   b) Monitoring and validation of the US Notice Advisory to NAVSTAR Users (NANU) Service and GPS NOTAMs.

SECTION D – SPARE PARTS, ACCESSORIES, TEST EQUIPMENT & TECHNICAL DOCUMENTATION	
1. **SPARE PARTS**	
1.1 Nil	
2. **MEASURING EQUIPMENT AND TOOLS**	
2.1 Nil.	
3. **TECHNICAL DOCUMENTATION**	
3.1 The bid winner will supply an operational manual with the description of all the function of the SRRAP.	

SECTION E – SERVICES, TESTS AND ACCEPTANCE

1.   **FACTORY ACCEPTANCE TEST**

1.1   The tenderer undertakes to submit for AAA/ICAO's approval at least forty-five (45) days prior to the scheduled commencement of the factory acceptance tests, a Factory Acceptance Test Plan and Procedures. ICAO shall notify the tenderer of its decision within thirty (30) days thereafter, and after an agreement has been reached, the plan/procedures shall form part of the eventual contract. Any changes in the plan/procedures initiated by the tenderer will be without cost to ICAO and subject to ICAO's approval.

1.2   All results of the Factory Acceptance Test shall be duly recorded and shall be signed by the tenderer's QA representative and AAA/ICAO representatives.

1.3   All observations agreed on and discrepancies noted during the Factory Acceptance Test are to be corrected by the tenderer prior to shipment of the equipment.

1.4   The tenderer shall arrange for one (1) FAT Session, to run consecutively for all equipment and not fragmented sessions.

1.5   ICAO's appointed representative(s) together with AAA's representative(s) shall be entitled to enter the works of the tenderer at reasonable times during the normal working hours to witness the test of the equipment and work in progress.

1.6   The Factory Acceptance Tests shall be performed at the tenderer's factory in accordance with the approved procedures, the intent of which shall be that those systems tests accepted at factory, as a minimum, shall be functionally duplicated on-site.

1.7   The Factory Acceptance Tests shall be conducted in the presence of ICAO's appointed representative and representatives from AAA whose names shall be advised to the tenderer at least three weeks prior to the commencement of tests. Following the satisfactory completion of the tests, ICAO shall sign and issue a Factory Acceptance Certificate.

1.8   If ICAO's appointed representative does not issue and sign the Factory Acceptance Certificate, he shall immediately notify the tenderer in writing with proper reference to any tests in the approved Acceptance Test schedule or to any part of the Specifications which the equipment has failed to meet. It is agreed between the parties that minor failures, which do not adversely affect the performance or operation of the equipment for the purpose intended and subsequently subject to modification by the tenderer at no extra cost, shall not be considered as items preventing ICAO Factory Acceptance.

1.9   With respect to ICAO's reason for non-acceptance, the tenderer shall give notice to ICAO stating how it intends to rectify the equipment in order that ICAO may repeat the tests with which the equipment did not initially comply and also the tests in respect of those parts of the equipment affected by the rectification. The tenderer shall bear all costs associated with the re-testing (i.e. travel, accommodation and subsistence costs for ICAO's/AAA's representative(s) re-participation).

SECTION E – SERVICES, TESTS AND ACCEPTANCE

1.10   If the equipment, or any part thereof, is not accepted by the anticipated final Factory Acceptance date for the systems, ICAO shall have the right to request that the accepted component equipment be shipped, provided that the use of the equipment, or any part thereof, for any purpose by AAA/ICAO under such conditions shall not imply Final Acceptance in any way and the tenderer shall be afforded the earliest possible opportunity of taking such steps as may be necessary to obtain Final Acceptance.

1.11   In the event of ICAO or AAA representatives failing to be present at the time and place appointed by the tenderer for the Factory Acceptance Tests, the tenderer may proceed with the tests which shall be deemed to have been made in the presence of ICAO and AAA representatives and the tenderer shall sign the Factory Acceptance Certificate for corresponding purposes which shall have the same meaning and value as if it had been signed by ICAO. A copy of the FAT test results must be submitted to ICAO for review prior to shipment.

1.12   The equipment shall be considered factory accepted by ICAO upon satisfactory completion of each acceptance test as certified by the relevant test records signed by the tenderer's appointed representative and counter-signed by ICAO's appointed representative(s). Three copies of the said records shall be sent to ICAO addressed to the Chief, Field Procurement Section.

1.13   The tenderer shall ensure that all the equipment included under the eventual Contract, as well as spare parts, tools, test equipment, accessories and documentation are present at the Factory Acceptance, for ICAO inspection, review and approval.

1.14   The tenderer shall include in his offer, the air travel, accommodation, and DSA costs for the participation at the Factory Acceptance Test by AAA personnel.

2.   **TRAINING**

2.1   General aspects

2.1.1   The Bidder shall include in its proposal a one day operational training of the SRRPAS

3.   **INSTALLATION**

3.1   Nil.

4.   **SITE ACCEPTANCE TESTS AND START-UP**

4.1   A PSAT tests shall be conducted for the service operation , covering the following aspects:

   a) Connectivity to the WEB page
   b) Functionality of all the parts of the SARRPS described in Section C part 2
   c) Verify the content and quality of the data base of location and waypoint of the SAM Region
   d) Documentation

4.1.1   The FSAT tests are intended to ensure that the Successful Bidder has resolved all pending issues, even those that might have been identified after the provisional acceptance certificate has been issued.

SECTION E – SERVICES, TESTS AND ACCEPTANCE

4.1.2   Supply tests (PS) shall be carried out by the Successful Bidder.These tests shall be conducted once the Project Office has approved the "Supply Test Protocols" (PPS) documentation.

4.1.3   Supply tests protocols (PPS) and their results may be used by the Project Office as a standard and reference for subsequent tests, and in the operation of the supply.

4.1.4   It is expressly established that supply test protocols (PPS) shall be performed in sufficient depth so as to ensure that the tests to be conducted will guarantee and demonstrate that the supply satisfactorily meets all the requirements of the technical specifications document.

4.1.5   The language used for coordination and supply test protocols (PPS) shall be Spanish. If the language normally used by the Successful Bidder is other than Spanish, a set of documents shall be delivered in English.

4.1.6   The following is established:

    a)   The "provisional acceptance certificate" corresponding to the "provisional acceptance tests" does not imply the definitive acceptance of the service.
    b)   Once the "provisional acceptance certificate" has been issued, the Project Office shall request the Successful Bidder to start up with the service operations.

Programmes and protocols

4.1.7   The supply test programmes (PROG-PS) are documents that establish in detail the timetables. of supply tests.

4.1.8   The documentation for the supply test programmes shall contain at least the following:

    a)   Detailed test timetable, by day
    b)   Test sites and schedules
    c)   List of participants on behalf of the Successful Bidder

4.1.9   The supply test protocols (PROT-PS) are documents that establish in detail the technical procedures for running the supply tests. The results of these tests must also be recorded in these documents.

4.1.10   The documentation of each of the tests established in the supply test protocol shall contain at least the following:

    a)   Purpose of the test
    b)   General description of the SRRAP to be tested.
    c)   Description of test procedures and steps
    d)   Lists with expected results
    e)   Complete operational manuals of the equipment to be tested;

4.1.11   The Successful Bidder shall draft and submit to the Project Office the proposed supply test schedules and protocols for the PSATs, NATs, and FSATs.

SECTION E – SERVICES, TESTS AND ACCEPTANCE

4.1.12   The Successful Bidder shall make available to the Project Office, 30 calendar days in advance, the proposed supply test schedules and protocols for the PSATs, NATs, and FSATs. The Successful Bidder shall take into account the following:

    a)   After receiving the proposed supply test schedules and protocols, the Project Office shall have up to 7 calendar days for assessing them and issuing its approval or disapproval.

    b)   If the Project Office considers that the aforementioned proposals do not meet the technical specifications, the proposals of the Successful Bidder shall not be approved. In such case, the Successful Bidder shall correct them by making the additions and/or modifications required by the Project Office and shall submit such documents for approval.

    c)   Any delays in the execution of the contract resulting from the non-approval of the aforementioned proposals shall be attributable to the Successful Bidder and shall not give the right to extensions in the execution timeframes established in the document and in the contract.

    d)   "Supply tests" shall not start until the Contract Office has approved the corresponding testing schedule and protocol.

4.1.13   Once the Project Office has approved the supply test schedule and protocols, they shall become official documents.

4.1.14   During test implementation, the Project Office may include additional testing, as necessary, in order to ensure the correct operation of the supply. These tests shall be automatically included as a supplement to the official test programme.

Start-up

4.1.15   The start up of the service will start once PSAT will be approved The Successful Bidder will start the provision of the SRRPAS for the 24 hours a day, 7 days a week (24x7). The service will be in a preoperational phase for of 30 day period

4.1.16 After this period a FAT (Final Acceptance Test) will be made FAT tests are intended to ensure that the Successful Bidder has resolved all pending issues, even those that might have been identified after the provisional acceptance certificate has been issued

5.   **GUARANTEES**

GLOSSARY OF ACRONYMS

For purposes of this document, the following acronyms will apply: