



**Asunto 2: Informe sobre el cumplimiento del programa de actividades a la fecha desde la última reunión de coordinación del proyecto regional RLA/06/901**

## **RENOVACIÓN DEL SERVICIO SATDIS**

(Presentada por la Secretaría)

### **RESUMEN**

En esta nota se presenta informaciones sobre la renovación del servicio SATDIS que está siendo llevada a cabo por la Oficina de Cooperación Técnica (Technical Cooperation Bureau).

#### **1. Introducción**

1.1 En el marco del Grupo de Implantación de la Región SAM (SAM/IG), los Estados participantes del Proyecto Regional RLA/06/901 (Argentina, Bolivia, Brasil, Chile, Colombia, Ecuador, Panamá, Paraguay, Perú, Uruguay y Venezuela) han desarrollado un intenso trabajo para la implantación de la navegación basada en performance - PBN, conforme a la orientación del Doc. 9613 - Manual de Navegación Basada en la Performance.

1.2 Cumpliendo con los requerimientos de seguridad operacional para la utilización de las rutas ATS, llegadas y salidas normalizadas, y procedimientos de aproximación basados en PBN, compete al Estado proveer a los usuarios y operadores de aeronaves la predicción de la disponibilidad y geometría óptima de la constelación GNSS (sistema GPS de satélites NAVSTAR) que permita al equipo de a bordo contar con la función RAIM (*Receiver Autonomous Integrity Monitoring*).

1.3 El RAIM representa un medio de seguridad para que el sistema de aviónica detecte y alerte a la tripulación sobre una probable degradación en la precisión de la navegación aérea guiada por el GNSS. De ser el caso, el piloto decide de retomar la navegación de modo seguro por medio de otras ayudas a la navegación.

1.4 Para atender este requerimiento de seguridad, los Estados participantes del Proyecto Regional RLA/06/901 han contratado un servicio de una aplicación web desde el año 2014, para proveer las informaciones de predicción de la disponibilidad RAIM, que fue denominada SATDIS. El contrato fue con la compañía DW International Limited, que luego paso a llamarse NAVBLUE Wales Limited, con una vigencia hasta diciembre del año 2018 a un monto total de USD 328,789.00 el cual sería distribuido equitativamente entre los Estados miembros y significaba el pago anual por Estado de USD 7,943.00.

1.5 Al haberse finalizado el primer contrato, la Oficina de Cooperación Técnica de la OACI ha orientado que, para poder hacer una renovación o una nueva contratación, es necesario pasar por un proceso de licitación internacional para proveer el servicio de acuerdo al procedimiento de compras de la OACI. Para poder completar el procedimiento de licitación internacional y no suspender el servicio se hizo una prórroga del contrato por 8 meses mientras se realiza dicho procedimiento.

## 2. Análisis

2.1 Considerando lo anterior, se informó a los Estados de esta situación con la carta SA5002 de fecha 3 de enero de 2019, y se solicitó la realización de teleconferencias con los puntos focales asignados de los Estados para revisión de las especificaciones técnicas para la nueva contratación del SATDIS. Los resultados de este trabajo posteriormente, fue puesto en consulta a los Estados con la carta SA5195 de fecha 18 de marzo de 2019, donde se indicó que el costo para continuar con este servicio en total debía ser como máximo el mismo costo anual que actualmente se está pagando, es decir USD 87,373.00 anual, lo que significa que se mantendrá la cuota para el servicio por Estado de USD 7,943.00. El resumen de las respuestas de los Estados se encuentra en el **Apéndice A** de esta nota de estudio.

2.2 Con las especificaciones técnicas trabajadas, se solicitó a TCB el 2 de mayo de 2019 iniciar el proceso de licitación. El **Apéndice B** de esta nota de estudio presenta la versión final del documento de especificación técnica del SATDIS.

2.3 En estas especificaciones técnicas, se realizaron algunos cambios para lograr un mayor uso de la aplicación SATDIS y mitigar de mejor forma los riesgos en las operaciones PBN; los Estados SAM decidieron ofrecer mayores facilidades de acceso a los potenciales usuarios eliminándose los requerimientos de registro y claves (*passwords*).

2.4 Como referencia, se puede encontrar las herramientas web de la FAA (EEUU) y Eurocontrol que están abiertas al público y usuarios de las regiones del hemisferio norte.

<https://sapt.faa.gov/default.php>  
<https://augur.eurocontrol.int/ec/terminal-approach>

2.5 En esta nueva forma de acceder al servicio SATDIS, un usuario, en cualquier parte del mundo, puede obtener la información necesaria para el planeamiento de su vuelo hacia un aeropuerto de la Región SAM donde planea ejecutar, por ejemplo, una llegada normalizada RNP-1 y un procedimiento de aproximación RNP APCH publicados en la AIP del Estado.

2.6 Sin embargo, se prevé que la aplicación SATDIS proveerá solamente las informaciones de aeropuertos de los Estados participantes del Proyecto RLA/06/901, no estando disponible informaciones de otras regiones o de Estados que no participen del proyecto.

2.7 De acuerdo a lo informado por Montreal, la licitación internacional estará publicándose la primera semana de junio y se espera concluir con los trámites en agosto, pero estos tiempos dependen de los tiempos de revisión de las propuestas y el proceso de selección y contratación. En ese sentido, la Oficina Regional estará informando a los Estados.

3. **Acción sugerida**

3.1 Se invita al Comité de Coordinación a:

- a) analizar la información proporcionada en esta nota de estudio y su apéndice; y
- b) otras consideraciones al respecto que la reunión considere necesaria.

**RESUMEN DE LAS RESPUESTAS DE LOS ESTADOS  
A CARTAS SA5002 y SA5195 DE LA OACI**

**Carta SA5002 – Designación de expertos para actuar como puntos focales sobre el tema**

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**Carta SA5195 – Solicitud para aprobación a la propuesta de extensión del servicio RAIM (SATDIS)**

<b>Estado</b>	<b>Fecha de Respuesta</b>	<b>Respuesta</b>	<b>Comentarios</b>
Argentina			
Bolivia	25/marzo/2019	Aprueba	Solicita que una vez concluido el proceso correspondiente, se informe el monto a ser destinado para ese proyecto.
Brasil			
Chile	3/abril/2019	Aprueba	DGAC Chile continuará formando parte de este sistema
Colombia			
Ecuador			
Panama			
Paraguay			
Perú			
Uruguay	25/marzo/2019	Aprueba	
Venezuela	14/mayo/2019	Aprueba	Considera viable dicho proceso.

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PROCUREMENT OF SAM REGIONAL RAIM PREDICTION AVAILABILITY SERVICE VIA WEB  
Attachment II to ST-22502019

# INTERNATIONAL CIVIL AVIATION ORGANIZATION

## TECHNICAL COOPERATION BUREAU

### TECHNICAL SPECIFICATIONS



## PROCUREMENT OF SAM REGIONAL RAIM PREDICTION AVAILABILITY SERVICE VIA WEB

<b>ICAO COMMODITY CODE</b>	94-02-080		
<b>REFERENCE</b>	RLA/06/901	PR 21101691	Reg. Project
<b>DATE</b>	May 2019		

<b>SUPPLIER NAME</b>

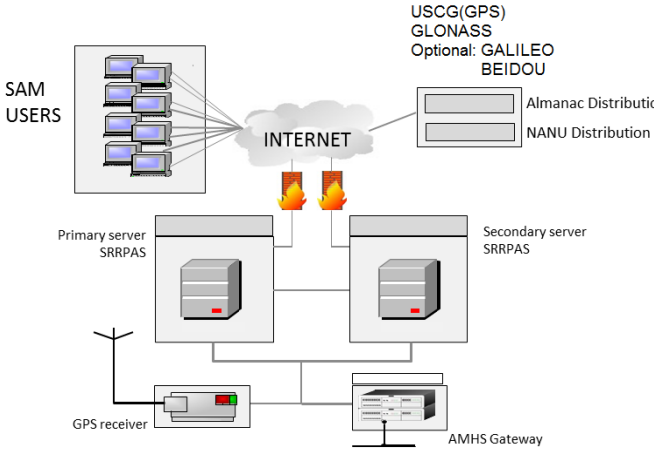
It is strictly prohibited for tenderers to alter this document. Only the originator of the specification may provide amendments. tenderers must state against every item of the document, Compliance or Non Compliance. Failure to complete and return this form or alter this form shall invalidate the bid

The tenderer shall reference the compliance statement to the appropriate sections of the supporting documentation in order to provide substantiation of said compliance. Notwithstanding this, if compliance is indicated, any further references, statements, comments or notes will not waive the liability of the tenderer on the stated compliance.

Note that ICAO does NOT charge any fees from suppliers in order to download the tender documents for ICAO projects

SECTION A – INTENT AND STANDARDS	COMPLIANCE STATEMENT
<p><b>1. OBJECTIVE</b></p> <p>1.1 The International Civil Aviation Organization (ICAO), on behalf of the Governments of Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Panama, Uruguay and Venezuela intends to procure, on a turnkey basis, the implementation of a SAM Regional RAIM (Receiver Autonomous Integrity Monitoring) prediction availability service for a period of up to 4 years through a public WEB page functioning the 24 hour per seven day a week (24/7) to support the PBN procedures en route, terminal and approach area.</p> <p><b>2. OBJECTIVE OF THE SAM REGIONAL RAIM PREDICTION AVAILABILITY SERVICE (SATDIS)</b></p> <p>2.1 In order to achieve this objective, the aeronautical authorities of the Region have agreed that the SATDIS shall ensure:</p> <p>2.1.1 To provide users of an on-line status of the prediction availability of GNSS 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, participating in the Regional Project RLA/06/901.</p> <p>Note 1: From now on, when GNSS is mentioned in this document, it refers to both GPS and GLONASS constellation.</p> <p>2.1.2 To develop a web site for the SATDIS.</p> <p>2.1.3 To be easily expandable to cover the availability of the RAIM prediction service in other constellations of satellite navigation systems (GALILEO and BeiDou).</p> <p>2.1.4 To cover all regional airspace for RNAV/RNP operations for both Fault Detection (FD) and Fault Detection and Exclusion (FDE) capable receivers.</p> <p><b>3. SCOPE</b></p> <p>3.1 The Project contemplates that the contractor shall provide:</p> <p>a) SAM Regional RAIM Prediction Availability Service (FD and FDE capable receivers) for the following PBN/RNAV /RNP operations:</p> <p><b>En route</b>                      Oceanic and remote continental area: RNP 10, RNP 4, RNP 2, Advanced RNP                      Continental area: RNAV 5, RNAV 2, RNAV 1, RNP 2, Advanced RNP, RNP 0.3</p>	

SECTION A – INTENT AND STANDARDS	COMPLIANCE STATEMENT
<p><b>Terminal</b> RNAV 5, RNAV 2, RNAV 1, RNP 1, Advanced RNP, RNP 0.3</p> <p><b>Approach</b> RNAV 1 (Initial, intermediate, missed approach segments) RNP 1 (Initial, intermediate, missed approach segments) RNP 0.3 (Initial, intermediate, missed approach segments) Advanced RNP (all segments) RNP APCH (all segments) RNP AR APCH Departure RNAV 2, RNAV 1, RNP 1, Advanced RNP, RNP 0.3</p> <p>b) Provision of database of waypoints within SAM airspace SATDIS website design.</p> <p>c) The development of a WEB page for he SATDIS</p> <p>d) To maintain and manage the WEB page for the SATDIS</p> <p>e) The SATDIS application shall be hosted on a dual application server with a database back-end providing highly available file storage facilities.</p> <p>Note 2: For RNP AR APCH analysis a disclaimer must be added as follows:  <i>“The RNP AR procedures in the SAM Region are usually executed in airspace surrounded by mountainous terrain or within valleys. Aircraft users and operators should consider that maneuvers and turns of the aircraft can limit the reception of the satellite signal in a given segment of an RNP AR approach”.</i></p> <p><b>4. BASIC TECHNICAL CHARACTERISTICS</b></p> <p>4.1 The hardware shall consist of at least two servers, one for the redundant primary and mirror. See Figure 1 for SATDIS architecture reference:</p> <p>Note 3: Please see Section A, 2.1.1 Note 1. The information source is not only USCG (GPS) but GLONASS too.</p>	

SECTION A – INTENT AND STANDARDS	COMPLIANCE STATEMENT
 <p>Figure 1 SATDIS Architecture</p> <p><b>5. GENERAL CONSIDERATIONS</b></p> <p>5.1 The contractor shall be responsible for the implementation of the SATDIS, a design of a WEB page, acquisition, installation, hosting and commissioning of the required equipment and services, with all the accessories and facilities and to maintain and manage the SATDIS.</p> <p>5.2 The system shall be installed, hosted and operated across two geographically dispersed servers, at two different Data Centres, offering 24/7 service with a 99.5% availability.</p> <p><b>6. RULES AND STANDARDS</b></p> <p>6.1 All designs, materials, manufacturing techniques and workmanship shall be in accordance with the highest accepted international standards.</p> <p>6.2 Where applicable, the system shall fully comply with or exceed the requirements of the following documents (latest edition plus any related amendments):</p> <ul style="list-style-type: none"> <li>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 contractor is responsible for complying also with the new standards, amendments and recommendations issued during the implementation of the project;</li> <li>b) those applied by public carriers in each State; and</li> </ul>	

<b>SECTION A – INTENT AND STANDARDS</b>	<b>COMPLIANCE STATEMENT</b>
<p>c) the ISO 9000 certification in terms of its methods and lines of production.</p> <p>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.</p> <p><b>7. ALTERNATIVES</b></p> <p>7.1 The tenderer is invited to offer any equipment which in his opinion is equal to or superior to the requirements of this specification. Any such alternatives or variations must be fully and clearly defined and supported so that equivalence or superiority can be readily determined.</p> <p>7.2 The tenderer shall also clearly indicate the extent to which the requirements of this specification are not met by the alternative design and shall state the performance he is prepared to guarantee where this differs from that which is defined herein.</p> <p><b>8. TENDERER’S EXPERIENCE</b></p> <p>8.1 The tenderer shall demonstrate broad experience in the RAIM Prediction Availability Service implementation. The tenderer shall include a list of customers to whom it has supplied the same service during the last five (5) years. The list shall contain the names, addresses and references of customers that can be contacted.</p> <p>8.2 The tenderer 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 of the services previously provided. ICAO or the AAA may contact such customers to check the accuracy of the information submitted.</p> <p><b>9. TENDER DOCUMENTATION</b></p> <p>9.1 Compliance Statement: All offers shall be accompanied by a correctly completed Compliance Statement in the form of a copy of this specification with the tenderer indicating in the right hand column, Compliance (C) or Non Compliance (NC). If compliance is indicated, any further references, statements, comments or notes, will not waive the liability of the tenderer on the stated Compliance. The tenderer shall reference the compliance statement to the appropriate sections of the supporting documentation. Lack of such definitive indication for any requirement may invalidate the offer.</p>	

<b>SECTION A – INTENT AND STANDARDS</b>	<b>COMPLIANCE STATEMENT</b>
<p>9.2 Supporting Documentation: Each tender shall be supported by adequate technical documentation including system and data sheets, performance sheets, drawings, illustrations, photographs, etc., in order to facilitate a complete and detailed evaluation of the tender.</p> <p>Note: While the attachment of brochures and supporting literature is strongly encouraged and may in some cases be necessary to illustrate certain features of the systems, it does not relieve the tenderer of the obligation to fully complete the compliance statement of this specification as indicated above.</p> <p>9.3 The financial offer shall provide, as a minimum, prices itemized to the level indicated in the table included in the Instructions to tenderers (Attachment I of the tender documentation).</p> <p>9.4 The proposal shall include documentation related to the User Manual (operational commands, procedures, etc) and any other information which the tenderer deems necessary.</p> <p>9.5 Project Implementation: The tenderer shall submit with the tender a proposed schedule setting out the anticipated program of major activities. (Please see Section E for more details).</p>	

SECTION B – GENERAL REQUIREMENTS	COMPLIANCE STATEMENT
<p><b>1. REQUIREMENTS</b></p> <p>1.1 General guidelines</p> <p>1.1.1 The tenderer shall provide the organizational chart of the company and resumes of its technical staff involved in the tasks provided for in the provision of the services (management and technical).</p> <p>1.1.2 The tenderer shall prepare a project timetable for the implementation of the SATDIS.</p> <p>1.1.3 The contractor 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.</p> <p>1.1.4 Within forty-five (45) days following the signing of the contract, the contractor shall submit for the approval of ICAO a detailed System Design Document (SDD) for the implementation of the SATDIS.</p> <p>1.1.5 The contractor shall appoint properly qualified personnel in sufficient number to perform the work within the proposed timeframes.</p> <p>1.1.6 The contractor shall prepare and submit Inspection tests for approval, and shall conduct the performance tests.</p> <p>1.1.7 The contractor shall prepare and submit the Final Acceptance Test (FAT) protocols for approval.</p> <p>1.1.8 The contractor shall be responsible for host maintain and manage the SATDIS.</p> <p>1.1.9 The contractor shall submit the operation manual.</p> <p>1.2 Tenderer’s responsibilities</p> <p>1.2.1 The tenderer shall assume full responsibility for the following issues:</p> <p>a) Project proposal, organization and distribution of all works.</p> <p>b) Any deviation from the specifications must be corrected at its own expense.</p>	

SECTION C – TECHNICAL REQUIREMENTS	COMPLIANCE STATEMENT
<p><b>1. INTRODUCTION</b></p> <p>1.1 SATDIS OVERVIEW</p> <p>General Features</p> <p>1.1.1 SATDIS will be developed such that Users can access up to date information about the GNSS Satellite constellation and calculated RAIM unavailability pertinent to their operations (Please see Section C, par. 2.2.1 Note 3).</p> <p>1.1.2 SATDIS shall make information available to Users over the Internet and shall ensure that the most up to date GNSS 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 GNSS constellation data. Information shall be made available both graphically and in a textual form.</p> <p>1.1.3 SATDIS 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 synchronized to ensure that continuity is preserved regardless of the server used by the User. The SATDIS 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 human input.</p> <p>1.1.4 SATDIS shall ensure that the User 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.</p> <p>1.1.5 The System shall maintain calculation audit logs, for at least 30-days period, that capture the following information:</p> <ul style="list-style-type: none"> <li>- Calculation parameters and results.</li> <li>- Data and time of the calculation.</li> </ul> <p>1.1.6 Such data shall never be modified and the information provided to the User can be recreated.</p> <p>1.1.7 The System shall be designed to enable it to be easily expanded to provide an integrity prediction capability for Galileo, Beidou and future navigation systems.</p>	

SECTION C – TECHNICAL REQUIREMENTS	COMPLIANCE STATEMENT
<p><b>2. GPS RAIM PREDICTION SERVICE TECHNICAL APPROACH</b></p> <p>2.1 SATDIS shall be a web-based tool with public access. The information in the web site must be presented in English, Spanish and Portuguese. The main URL and mirror URL shall be defined in conjunction with ICAO on behalf of the SAM States.</p> <p>2.2 The following sections define the proposed tools and functions within SATDIS.</p> <p>2.2.1 GNSS Status Tool</p> <p>Note 3: In order to get the GNSS RAIM prediction, objet of the present technical specification, the tool shall allow the User to select viewing either only GPS constellation or only GLONASS constellation or GPS and GLONASS jointly constellations.</p> <p>2.2.1.1 The GNSS Status Tool shall allow the view of the GNSS Satellite constellation based on the latest almanac and NANUs (Notice Advisory to Navigation Users) issued respectively by the constellations operators.</p> <p>2.2.1.2 The GNSS Status Tool shall present the number of operational satellites in the GNSS 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 PBN/RNAV/RNP operations shown in Section A, paragraph 3.1 a). Also the almanac used and NANUs that may affect the satellite availability during the period of time requested, shall be displayed.</p> <p>2.2.1.3 The GNSS Status Tool shall be configured to provide the status of the GNSS 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).</p> <p>2.2.1.4 The tool shall be have implemented in the menu functions, the generation of PDOP/ GDOP both graphical and numerical.</p> <p>2.2.2 Terminal/Approach Tool</p> <p>2.2.2.1 The Terminal/Approach Tool shall use algorithms to calculate the predicted RAIM availability for a 72-hour period for specific Aerodromes. The algorithms shall be used in Terminal mode addressing the RAIM requirements for GNSS receivers operating in Terminal operations (<math>\pm 1\text{NM}</math>) in Approach mode addressing the RAIM requirements for GNSS receivers operating in Approach operations (<math>\pm 0.3\text{NM}</math>), and RNP AR APCH. Both the Fault Detection (FD) and Fault Detection and Exclusion (FDE) algorithms should be provided, with FD set as the default.</p>	

SECTION C – TECHNICAL REQUIREMENTS	COMPLIANCE STATEMENT
<p>2.2.2.2 The Terminal/Approach Tool shall provide a graphical output and a tabular output each of which shall display the predicted RAIM outages over the scenario period for each of the selected aerodromes.</p> <p>2.2.2.3 The Terminal/Approach Tool shall be configured to return the status of the GNSS 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).</p> <p>2.2.2.4 The Terminal/Approach Tool should allow up to 20 aerodromes to be specified. Aerodromes are selected by entering their ICAO identifier.</p> <p>2.2.2.5 The Terminal/Approach Tool shall 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.</p> <p>2.2.3 Visibility Tool</p> <p>2.2.3.1 The SATDIS has to calculate the location of the GNSS satellites relative to a fixed receiver position for a given time duration.</p> <p>2.2.3.2 The Visibility Tool shall provide the following output options:</p> <p>a) Graphical sky plot representation of the visible satellites.</p> <p>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 shall be included regardless of visibility and “health”.</p> <p>c) Visibility Tool shall require user-configurable parameters as inputs, like:</p> <ul style="list-style-type: none"> <li>- Receiver Position</li> <li>- Mask angle</li> <li>- Scenario duration</li> <li>- Number of samples required to calculate the satellite visibility</li> <li>- UTC date and time</li> <li>- Etc.</li> </ul>	

SECTION C – TECHNICAL REQUIREMENTS	COMPLIANCE STATEMENT
<p>2.2.4 Route Tool</p> <p>2.2.4.1 The Route Tool shall calculate/show the predicted RAIM availability for airways, aerodromes, airspace along a defined chart using either the RAIM algorithm in En-Route mode or the Terminal mode. The information must be presented graphically with an image of the whole Region (SAM), with different colors to indicate areas with positive prediction and areas with negative prediction (interruption of service). The image must allow to apply a zoom-in to visualize the States FIR areas, in an appropriate resolution. See items 2.2.4.7 and 2.2.4.8 below.</p> <p>2.2.4.2 Optionally, a route shall be defined by a series of waypoints selected, or inputed, by the User. The tool shall maintain a list of current en-route waypoints and nav aids in the South American Region area which shall be selected by ICAO identifier.</p> <p>2.2.4.3 The defined route and the results of the RAIM check shall be able to be saved and to be reviewed for the session. And shall allow the download in order to consider as a proof that a prediction was run for that flight.</p> <p>2.2.4.4 The User shall have the capability to select other angles.</p> <p>2.2.4.5 Both the Fault Detection (FD) and Fault Detection and Exclusion (FDE) algorithms shall be provided.</p> <p>2.2.4.6 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).</p> <p>2.2.4.7 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.</p> <p>2.2.4.8 The system must show the User Map with a RAIM prediction for all South America Region.</p> <p>2.2.4.8.1 The map shall present the boundaries between the countries of South America and allow to present the visualization of the airspace configurations (FIR, TMA, etc.) and main airports.</p> <p>2.2.4.8.2 The RAIM information must be displayed in different colors to provide a friendly visualization for the user, amongst others:</p>	

<b>SECTION C – TECHNICAL REQUIREMENTS</b>	<b>COMPLIANCE STATEMENT</b>
<p>a) Predicted RAIM interruptions of service, so as to allow the User to proceed or not with a flight.</p> <p>b) Any other information that can be relevant to the user.</p> <p><b>3. SATDIS HOSTING AND OPERATIONAL FACTORS</b></p> <p>3.1 SATDIS shall be managed and operated by the contractor and shall be deployed across two geographically dispersed servers, at two different Data Centers, offering 24/7 service with a minimum availability of 99.5%. (See Figure 1 Sec. A for SATDIS architecture). This means that the location of the data center must be in a far enough that ensure that any service failure like electricity, communication or environment like severe storm, earthquake, etc. do not affect both systems at the same time</p> <p>3.2 The SATDIS application shall be hosted on an application server with a database back-end providing highly available file storage facilities.</p> <p>3.3 The server shall be fault-tolerant and shall include support for hot-swapping of essential hardware such as disks and power supplies.</p> <p>3.4 The hardware shall consist at least of two servers, one for the redundant primary and mirror. Please see Section A, 4.1.</p> <p>a) Redundant Pair of firewalling Devices.</p> <p>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.</p> <p>c) Multiple upstream internet providers shall be provided.</p> <p>d) Servers must provide the performance necessary to guarantee the specified availability (see Section A item 5.2) and service continuity.</p> <p>3.5 IP security</p> <p>3.5.1 SATDIS 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.</p> <p>3.5.2 SATDIS shall be patched with software security updates (OS, Database, etc.) as they become available.</p>	

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<p>3.5.3 Local physical security measures shall be implemented.</p> <p>3.6 Constellation Data Mediator.</p> <p>3.6.1 SATDIS shall maintain an up to date record of the GNSS 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.</p> <p>3.6.2 The System shall obtain constellation data and constellation updates from a number of sources, as follows:</p> <ul style="list-style-type: none"> <li>a) United States Coast Guard (for GPS) and GLONASS.</li> <li>b) Almanac.</li> <li>c) Unscheduled outages/changes (NANU).</li> <li>d) AFTN/AMHS (as a future option).</li> <li>e) Unscheduled outages/changes (NOTAM).</li> </ul> <p>3.6.3 The constellation data mediator subsystem will provide the system with the best available picture of the constellation for the calculation time periods supported by the Tools.</p> <p>3.6.4 The constellation data mediator subsystem shall also carry out the recalculation of static data in response to a constellation change to ensure that RAIM outage predictions are current and reliable.</p> <p>3.6.5 The Constellation Data Mediator subsystem will be written to be resilient to errors in the data feeds from the external data sources. SATDIS will not update reference constellation data until it is verified as good with respect to format validity, range checking.</p> <p>3.6.6 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. SATDIS will allow customization 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 behavior and investigation of the issue if necessary.</p> <p>3.6.7 The topographic data source of the application shall come from a sufficiently reliable source.</p> <p>3.7 SATDIS Helpdesk</p> <p>3.7.1 The contractor should respond to queries related to SATDIS and its operation via the SATDIS Helpdesk, contactable via an Email address to be specified.</p>	

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<p>3.7.2 The contractor shall assist in resolving issues at application level, specifically:</p> <ul style="list-style-type: none"><li>a) To support the quality of the GNSS RAIM predictions,</li><li>b) Monitoring and validation of the NANUs and NOTAMs.</li></ul>	

<b>SECTION D – SPARES, TOOLS, TEST EQUIPMENT AND TECHNICAL DOCUMENTATION</b>	<b>COMPLIANCE STATEMENT</b>
<p><b>1. TECHNICAL DOCUMENTATION</b></p> <p>1.1 The contractor will supply an operational manual with the description of all the function of the SATDIS in soft-copy, in the English, Portuguese and Spanish language.</p>	

SECTION E – SERVICES, TESTS AND ACCEPTANCE	COMPLIANCE STATEMENT
<p><b>1. DATA CENTRE INSPECTION</b></p> <p>1.1 The contractor undertakes to submit for AAA/ICAO’s approval at least forty-five (45) days prior to the scheduled commencement of the inspection, a Data-centre Inspection Plan and Procedures. ICAO shall notify the contractor of its decision within thirty (30) days thereafter, and after an agreement has been reached, the plan/procedures shall form part of the contract. Any changes in the plan/procedures initiated by the contractor will be without cost to AAA/ICAO and subject to AAA/ICAO’s approval.</p> <p>1.2 The Data Centre Inspection includes the inspection of the hardware and software of the system that provide the SATDIS. The software includes the functionality of the SATDIS, the WEB page of the service for the SAM Region and the SAM database.</p> <p>1.3 All results of the data centre inspection shall be duly recorded and shall be signed by the contractor’s representative and AAA/ICAO representatives.</p> <p>1.4 All observations agreed on and discrepancies noted during the Data Centre Inspection are to be corrected by the contractor.</p> <p>1.5 The contractor shall arrange for a maximum of (2) inspections, to run consecutively for the facilities.</p> <p>1.6 ICAO’s appointed representative(s) together with AAA’s representative(s) shall be entitled to enter the facilities of the contractor at reasonable times during the normal working hours to witness the work in progress.</p> <p>1.7 The Inspection shall be conducted in the presence of ICAO’s appointed representative and representatives from AAA whose names shall be advised to the contractor at least three weeks prior to the commencement of tests. Following the satisfactory completion of the tests, ICAO shall sign and issue an Inspection Certificate. It has been considered that three people will participate in the Inspection, one on behalf of ICAO and the remaining two on behalf of the AAA.</p> <p>1.8 The costs of stay and passages from the three persons will be included in the offer of the tenderer. It has been considered a minimum of three days (total) for the Inspections.</p>	

<b>SECTION E – SERVICES, TESTS AND ACCEPTANCE</b>	<b>COMPLIANCE STATEMENT</b>
<p>1.9 If ICAO’s appointed representative does not issue and sign the Inspection Certificate, he shall immediately notify the contractor in writing with proper reference to any tests in the approved 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 contractor at no extra cost, shall not be considered as items preventing Acceptance.</p> <p>1.10 With respect to ICAO’s reason for non-acceptance, the contractor shall give notice to ICAO stating how it intends to rectify in order that ICAO may repeat the tests that not initially comply and also the tests in respect of those parts affected by the rectification. The contractor 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).</p> <p>1.11 In the event of ICAO or AAA’s representatives failing to be present at the time and place appointed by the contractor for the Centre Inspection, the contractor may proceed with the tests which shall be deemed to have been made in the presence of ICAO and AAA’s representatives and the contractor shall sign the Inspection Certificate for corresponding purposes which shall have the same meaning and value as if it had been signed by ICAO.</p> <p><b>2. TRAINING</b></p> <p>2.1 General aspects</p> <p>2.1.1 The tenderer shall include in its proposal a two-day operational training on the SATDIS. The training will be carried out on-line.</p> <p><b>3. INSTALLATION</b></p> <p>N/A</p> <p><b>4. SITE ACCEPTANCE TESTS AND START-UP</b></p> <p>4.1 The SAT shall be conducted in three (3) phases as follows:</p> <p>a) Provisional Site Acceptance Test (PSAT)  b) Operational Readiness Demonstration (ORD) phase (30 days)  c) Final Site Acceptance Test (FSAT)</p>	

SECTION E – SERVICES, TESTS AND ACCEPTANCE	COMPLIANCE STATEMENT
<p>4.2 The contractor shall provide written test plans and procedures, in Spanish language (If the language normally used by the contractor is other than Spanish, a set of documents shall be delivered in English) for the PSAT and FSAT. Copies of the detailed test plan and procedures are to be provided to ICAO/AAAs for approval not less than 30 days prior to the conduct of the tests. The SAT shall be witnessed by AAA/ICAO representatives.</p> <p>4.2.1 Note that the contractor shall introduce the comments, and corrections suggested by ICAO/AAAs and shall re-submit such documents for approval, at no additional cost for ICAO/AAA.</p> <p>4.2.2 Any delays in the execution of the contract resulting from the non-approval of the aforementioned plans and procedures shall be attributable to the contractor and shall not give the right to extensions in the execution timeframes established in the contract.</p> <p>4.3 The test plans and procedures shall contain at least the following</p> <ul style="list-style-type: none"> <li>a) Detailed test timetable, by day</li> <li>b) Test sites and schedules</li> <li>c) List of participants on behalf of the contractor</li> <li>d) Purpose of the test</li> <li>e) General description of the SATDIS to be tested.</li> <li>f) Description of test procedures and steps</li> <li>g) Lists/tables with expected results</li> <li>h) Complete operational manuals of the equipment to be tested</li> </ul> <p>4.4 The contractor shall demonstrate at PSAT phase, using mutually agreed upon test procedures, that the system provided within this project is compliant to the technical specification and requirements. All deficiencies identified at the PSAT phase shall be corrected by the contractor prior to the FSAT phase.</p> <p>4.5 PSAT tests shall be conducted for the service operation, covering at least the following aspects:</p> <ul style="list-style-type: none"> <li>a) Connectivity to the WEB page</li> <li>b) Functionality of all the parts of the SARRPAS described in Section C</li> <li>c) Verify the content and quality of the data base of location and waypoint of the SAM Region</li> <li>d) Documentation</li> </ul> <p>4.6 There shall be a 30-day period between the PSAT and FSAT phases. During this period of 30 days, the AAA personnel shall be operating the system normally in order to identify any defects, adjustments, etc. which shall be corrected by the contractor prior to the FSAT</p>	

<b>SECTION E – SERVICES, TESTS AND ACCEPTANCE</b>	<b>COMPLIANCE STATEMENT</b>
<p>4.7 When all the deficiencies identified during the PSAT and all abnormal situations identified during the 30 days operational readiness test phase are corrected, then the FSAT can take place.</p> <p>4.8 The contractor shall provide the test equipment required for the SAT (if any).</p> <p>4.9 All results of the SAT shall be duly recorded and shall be signed by the contractor. These results shall form the basis for the acceptance and for station records.</p> <p>4.10 During acceptance (PSAT, ORD and SAT), ICAO/AAA may include additional testing, as necessary, in order to ensure the correct operation of the supply of the website. These tests shall be automatically included as a supplement to the official test programme.</p> <p><b>Start-up</b></p> <p>4.11 The start-up of the service will commence upon approval of PSAT. The contractor will start the provision of the SATDIS for the 24 hours a day, 7 days a week (24x7). The service will be in a preoperational phase for of 30-day period</p> <p><b>5. GUARANTEES / PERFORMANCE OF THE SERVICES</b></p> <p>5.1 The contractor shall maintain the quality of the service during the term of the contract, 24 hours per day, 7 days a week (24x7).</p> <p>5.2 The contractor shall provide access to a support centre to handle queries about the functionality of the service.</p> <p>5.2.1 In the event of unavailability of the service, a user may contact this centre via an email or phone call to report the event. In this act, the contractor must provide the relevant claim number for its use in the discount calculation referred in this section, as well as send an email to the user and to the ICAO SAM Regional Office.</p> <p>5.2.2 Once the claim has been solved, the contractor will send an email to the ICAO monitoring bureau, and to every user who made the complaint, informing the solution and indicating the time it was settled and the number of claim.</p> <p>5.2.3 The time between the start of the contingency registered in the number of claim and its end, registered in the e-mail sent by the contractor, is the corresponding to <math>T_i</math> = "total time of unavailability" mentioned below. In case that a month registers several contingencies, the <math>T_i</math> will account for the total unavailability time.</p>	

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<p>5.3 Preventive maintenance should be performed during the period of the services, without prejudice to the service operation, and must be communicated with a minimum of 10 (ten) business days via fax or e-mail.</p> <p>5.4 The contractor shall provide to ICAO at the time of the commencement of the contract, the list of the persons in charge for the service provision in hierarchical order.</p> <p><b>Discounts due to outage</b></p> <p>5.5 The contractor shall provide a discount for the disruption in the prediction services if the required availability in these specifications is not met (99.5%).</p> <p>5.6 If the responsible of the failure is the contractor, penalties will be applied consisting in the reduction in the payment of the cost of the service, according to the following scheme:</p> $I = \frac{T_i \times P}{T_o}$ <p>Where:</p> <p>I = monthly discount in USD, relative to the service n fault.                      To = operation period (01 month), in minutes.                      Ti = total time of unavailability of the service, occurred during the considered operation period (01 month), in minutes.                      P = monthly price of the Contract in USD.</p> <p>5.7 The tenderer shall also warrant that all services delivered under an eventual contract shall perform in accordance with and conform to all specifications, descriptions, and other requirements included in the offer and shall be without defects in materials, workmanship and design. Failing to accomplish these performance criteria, the contractor must modify/add and/or exchange the inadequate equipment and/or software, if necessary, to provide the specified functions.</p> <p>5.8 Approval or acceptance of the contractor’s designs or acceptance of the system shall not prejudice ICAO/AAA’s rights under this Article.</p> <p>5.9 The rights under this Article shall be enforceable by the AAAs and ICAO irrespectively.</p> <p>5.10 ICAO’s and AAA’s rights under this Article are not exclusive and any other rights provided in this Contract or by Law are reserved.</p>	

**LIST OF ABBREVIATIONS**

AAA	Aeronautic Administrations Authorities
AFTN	Aeronautical fixed telecommunication network
AMHS	Air Traffic Services Message Handling Services
Beidou	Global Navigation Satellite System (GNSS) developed in China
FD	Fault Detection
FDE	Fault Detection and Exclusion
FSAT	Final Site Acceptance Test
GALILEO	Global Navigation Satellite System developed the European Union (EU)
GDOP	<b>Geometric Dilution of Precision</b>
GLONASS	Global Navigation Satellite System of Russia
GNSS	Global Navigation Satellite System (For this technical specification: GLONASS and GPS)
GRPS	GNSS RAIM / RNP Prediction Service
GPS	Global Positioning System
IP	Internet Protocol
PBN	Performance-based Navigation
PDOP	Positional Dilution of Precision
PSAT	Provisional Site Acceptance Test
NANU	NAVSTAR Users Advertisement Service
RAIM	Receiver Autonomous Integrity Monitoring
RNAV	Area Navigation
RNP	Required Navigation Performance
RNP APCH	Required Navigation Performance in Approach
RNP AR APCH	RNP Authorization Required Approach
<b>SATDIS</b>	<b>SAM Regional RAIM Prediction Availability Service</b>
URL	Uniform Resource Locator

PROCUREMENT OF SAM REGIONAL RAIM PREDICTION AVAILABILITY SERVICE VIA WEB

USCG	United States Coast Guard
UTC	Universal Time Coordinated