



International Civil Aviation Organization

**SIXTH MEETING OF THE SOUTHEAST ASIA
SUB-REGIONAL ADS-B IMPLEMENTATION
WORKING GROUP (SEA ADS-B WG/6)**



Singapore, 24 - 25 February 2011

Agenda Item 5: Review of sub-regional implementation plan

UPDATING OF SAMPLE AGREEMENT

(Presented by Indonesia and Singapore)

SUMMARY

This paper updates the sample agreement for ADS-B data sharing, based on the agreement signed between Indonesia and Singapore.

1. BACKGROUND

1.1 APANPIRG19 has adopted the sample agreement for ADS-B data sharing, so that States who are sharing ADS-B data may make use of the sample agreement to formulate their own bi-lateral agreements.

1.2 Using the sample agreement as a guide, Indonesia and Singapore have developed their data sharing agreement.

1.3 During, ADS-B SITF/9, Indonesia and Singapore shared with the meeting that the entire sample agreement was revamped quite a bit as the parties tried to make the agreement more comprehensive, precise, simple, easier to read and more acceptable by both parties. It was requested by the meeting that an updated version of the template be provided.

2. DISCUSSION

2.1 The agreement between Indonesia and Singapore was signed on 22 December 2010. Description of the changes is shown in Attachment 1. The updated template, based on the signed agreement, is shown in Attachment 2.

3. ACTION BY THE MEETING

3.1 The meeting is invited to adopt the new template.

| Final agreement with brief description | Original wordings in sample agreement |
|---|---|
| <p>Pre-amble [We reworded the pre-amble stating that:</p> <ul style="list-style-type: none"> a) ADS-B will enhance safety; b) Recognising the benefits, APANPIRG established the ADS-B task force to implement ADS-B; c) Airlines expressed their desire to reap operational benefits through ADS-B d) CANSO voiced support for collaboration between ANSPs to share ADS-B data and VHF facilities; e) The parties are desirous of cooperation to enhance air traffic services; f) Parties enter into the agreement to reap full potential of ADS-B for the benefit of airlines.] | <p>Pre-amble (A) Having regard to the South East Asia Sub-regional Automatic Dependent Surveillance – Broadcast (ADS-B) Implementation Working Group (SEA ADS-B WG) objectives, including the optimisation of the provision and use of the ADS-B surveillance function through the installation of new facilities or the sharing of ADS-B data; (B) With a view to the establishment of the categories of services through the airspace of the regions specified in Annex A and I;</p> |
| <p>Article 1 – Definitions [We created a new section to define the various terms used in the agreement.]</p> | <p>[Not in existing template.]</p> |
| <p>Article 2 – Objective of the Agreement [We include the provision of VHF voice communication services (VHF services) as part of the objective.]</p> | <p>Article 1 – Objective of the Agreement 1 The objective of this Agreement is to improve safety and operations efficiency of civil air traffic by enhancing ADS-B coverage and ADS-B data availability in the Flight Information Regions for which the User is responsible and the areas within 150Nm from the boundaries of these Flight Information Regions 2 For this purpose, the Provider shall provide its ADS-B data to the User with effect from [date] and in accordance with the implementation schedule in Annex G. 3 The ADS-B data to be provided are specified in Annex B, H and I.</p> |

| Final agreement with brief description | Original wordings in sample agreement |
|---|---|
| <p>Article 3 – Installation of Required Equipment and Private Circuits [We amended the clause to include the provision of VHF services.]</p> | <p>Article 3 – Installation</p> <p>1 The Provider and the User shall install all required equipment at their respective premises.</p> <p>2 Both the Provider and the User shall arrange for the provision, installation and commissioning of private circuits and other associated equipment as specified in Annex B and F, required for the transmission of the ADS-B data from the Provider to the User.</p> <p>3 Initial testing of the equipment and private circuits for the provision of the ADS-B data be carried out in conjunction with the Provider and the User.</p> <p>4 The provision of the present article shall also apply in the event of modifications to the equipment or private circuits.</p> |
| <p>Article 4 – Operations and Maintenance [The maintenance of the equipment and the quality of the data are associated. Hence, the two articles are combined.]</p> | <p>Article 4 – Maintenance</p> <p>1 Unless otherwise specified in Annex C, the routine maintenance, repair and replacement service for the equipment and the private circuits installed for the provision of ADS-B data under this Agreement shall be executed by <u>technical staff available</u> at the Provider’s and at the User’s premises.</p> <p>2 Unless otherwise specified in Annex D, the routine maintenance, repair and replacement at the Provider’s premises referred to in paragraph 1 hereof shall be carried out free of charge by the Provider to the standards of maintenance commonly adopted by the Provider.</p> <p>3 The routine maintenance, repair and replacement at the User’s premises shall be done by and at the expense of the User to the standard of maintenance commonly adopted by the User.</p> |

| Final agreement with brief description | Original wordings in sample agreement |
|--|--|
| | <p>Article 7 – Integrity</p> <p>1 The Provider shall take all reasonable steps, in accordance with the standards commonly adopted by him, to monitor and maintain the quality and continuity of the provision of ADS-B data of the facilities specified in Annex B and F.</p> <p>2 Where this is reasonably practicable the Provider shall give the User such notice in respect to any planned periodic break in service as soon as such information is available and a minimum of 24 hours notice in case of any other planned break in service.</p> <p>3 The Provider shall report immediately or at the earliest reasonable opportunity any failure in the provision of the ADS-B data or any abnormality of ADS-B data provided, to the User’s technical supervisor centre.</p> <p>4 The User shall, in accordance with the standards commonly adopted by him, monitor the ADS-B data received from the Provider and report immediately or at the earliest reasonable opportunity any failure in the reception or any abnormality of the ADS-B data, to the Provider’s technical supervisor centre.</p> |
| <p>Article 5 – Modifications [We include VHF and other services as part of the possible proposed changes by the Users. The amended clauses address the costs of modification to be born by each party.]</p> | <p>Article 5 – Modifications</p> <p>1 Both the Provider and the User shall implement any modification in the equipment and the private circuits for the provision of ADS-B data at their respective premises due to any decision of the Provider. The modification shall be carried out in accordance with Article 3.</p> <p>2 The User may propose technical modifications of the specifications for the provision of ADS-B data to the Provider. The Provider shall decide on the implementation of it.</p> <p>3 The modifications to be implemented shall be specified by the Provider in writing to the User not less than six months before the date the modification shall be implemented.</p> |

| Final agreement with brief description | Original wordings in sample agreement |
|--|--|
| <p>Article 6 – Cost [We include VHF as part of the article.]</p> | <p>Article 6 – Cost 1 The cost apportionment for the use of ADS-B data as specified in Annex A, B and I shall be in accordance with Annex D.</p> |
| <p>Article 7 – Limitations on Use and Communication of ADS-B Data [In the original template, either party is only allowed to use the information for civil Air Traffic Services only. We added a provision stating that any other usage is subjected to the provider’s approval.]</p> | <p>Article 2 – Limitations 1 The User shall use the ADS-B data provided only to ensure the safe, proper and continuous operation of civil Air Traffic Services or activities in support of his Air Traffic Services and for technical demonstration, evaluation and test purposes related to his operational tasks, unless otherwise specified in Annex A. 2 The User shall not communicate to any party not specified in this Agreement in any matter of form whatsoever any information supplied pursuant to this Agreement. The said information shall not be used for any purpose other than those specified in paragraph 1 hereof, without the prior written consent of the Provider.</p> |
| <p>Article 8 – Liability [We amended in accordance to our mutual agreement.]</p> | <p>Article 8 – Liability [The requirements on this Article should be agreed bilaterally between States]</p> |
| <p>Article 9 – Force Majeure [We stated that the Provider is not in breach of this agreement in case of failure to perform its duty due to force majeure.]</p> | <p>Article 9 – Legal Aspect / Settlement of Dispute [The requirements on this Article should be agreed bilaterally between States]</p> |
| <p>Article 10 – Settlement of Disputes [We amended in accordance to our mutual agreement.]</p> | <p>Article 9 – Legal Aspect / Settlement of Dispute [The requirements on this Article should be agreed bilaterally between States]</p> |

| Final agreement with brief description | Original wordings in sample agreement |
|--|--|
| <p>Article 11 – Final Provisions [We include an article stating that nothing in the agreement shall prejudice the primary obligation of the parties whether under statute or otherwise, to ensure the safe, proper and continuous provision of civil air traffic services.]</p> | <p>[Not in existing template.]</p> |
| <p>Article 12 – Duration [Editorial changes to simplify the clause.]</p> | <p>Article 12 – Duration 1 The present Agreement shall enter into force on the day on which it is signed by the last of the contracting Parties, for a period of [duration to be decided by the Parties]. 2 Thereafter, that period shall be automatically prolonged unless any of the contracting Parties has, by giving written notice at least [duration to be decided by the Parties] before the expiry of the contract period or the termination date of prolonged period, terminated the Agreement. 3 The Agreement can early terminate in the event the provision of ADS-B data as specified in Annex A hereof is to be permanently withdrawn from service. The Provider shall give to the User not less than [duration to be decided by Parties] notice in writing in advance thereof. 4 The Agreement can early terminate on request of the User in the event of modifications to be implemented. The User shall give to the Provider not less than [duration to be decided by Parties] notice in writing in advance thereof.</p> |
| <p>Article 13 – Entire Agreement [The agreement and the annexes form the entire agreement between the parties.]</p> | <p>Article 11 – Annexes 1 Annex A, B, C, D, E, F, G, H and I are attachments to this Agreement. The Provider and User, in mutual consent and formal acceptance, are allowed to amend and up-date, as circumstances deem necessary, the contents of the Annexes, in so far as the amendments are not in contradiction to or out of scope with the text in this Agreement.</p> |

| Final agreement with brief description | Original wordings in sample agreement |
|--|---|
| | <p>Annex A – Parties Annex B – Interface Specifications Annex C – Maintenance Annex D – Cost Annex E – Correspondence Annex F – Equipment Provided By One Party to the Other Annex G – Implementation Schedule Annex H – Functional Performance Requirement Annex I – Coverage or Ground Station Details</p> |
| <p>Article 14 – Amendment [This article states the mechanism in which an amendment is valid.]</p> | <p>Article 11 – Annexes 1 Annex A, B, C, D, E, F, G, H and I are attachments to this Agreement. The Provider and User, in mutual consent and formal acceptance, are allowed to amend and up-date, as circumstances deem necessary, the contents of the Annexes, in so far as the amendments are not in contradiction to or out of scope with the text in this Agreement. Annex A – Parties Annex B – Interface Specifications Annex C – Maintenance Annex D – Cost Annex E – Correspondence Annex F – Equipment Provided By One Party to the Other Annex G – Implementation Schedule Annex H – Functional Performance Requirement Annex I – Coverage or Ground Station Details</p> |
| <p>Article 16 – Rights of Third Parties [Third parties are not allowed to enforce any terms in this agreement.]</p> | <p>[Not in existing template.]</p> |
| <p>Annex A – Providers and Users of ADS-B and DCPC Facilities [Defines the providers and users]</p> | <p>Annex A – Parties Annex F – Equipment Provided By One Party to the Other</p> |

| Final agreement with brief description | Original wordings in sample agreement |
|--|---|
| Annex B – Implementation Schedule [Defines the implementation schedule] | Annex G – Implementation Schedule |
| Annex C – Technical Scope of Work [The various technical details are combined to one annex] | Annex B – Interface Specifications Annex C – Maintenance Annex H – Functional Performance Requirement Annex I – Coverage or Ground Station Details |
| Annex D – Cost [This annex deals with cost issues] | Annex D – Cost |
| Annex E – Correspondence [This annex mentions about the official means of correspondence, which is by email, fax or letter.] | Article 10 – Correspondence 1 Correspondence to be applied in the framework of this Agreement is specified in Annex E. Annex E- Correspondence |

**LETTER OF AGREEMENT
ON AUTOMATIC DEPENDENT SURVEILLANCE BROADCAST (ADS-B)
COLLABORATION BETWEEN
[PARTY 1]
AND
[PARTY 2]**

This Agreement is made on the [] day of [] 2011

BETWEEN

The [Party 1] of [Address], hereinafter referred to as “[.]”,

And

The [Party 2] of [Address], hereinafter referred to as “[.]”;

(each individually referred to as a “Party” and collectively as the “Parties”).

WHEREAS

- (A) Automatic Dependent Surveillance – Broadcast (“ADS-B”) is a new surveillance technology that will enhance safety and efficiency of air traffic services provision, complementing the role of radars used by air navigation service providers currently;
- (B) The Asia Pacific Air Navigation Planning and Implementation Regional Group (“APANPIRG”), recognising the benefits of ADS-B, has established the ADS-B Implementation Task Force under the auspices of the International Civil Aviation Organisation to progressively implement ADS-B in the Asia-Pacific region;
- (C) It is the expressed desire of airlines, through representation by the International Air Transport Association, to reap operational benefits arising from the use of ADS-B surveillance by air navigation service providers in the separation of air traffic;
- (D) In line with the global thrust towards seamless air traffic services including over oceanic airspaces, the Civil Air Navigation Services Organisation has voiced support for collaboration between air navigation services providers on sharing of ADS-B surveillance data and VHF communications facilities and services, in order to reap the full capabilities of advanced technology in the most cost-effective manner;
- (E) The Parties are desirous of collaboration to enhance air traffic services in the South East Asia region by mutual sharing of the ADS-B surveillance data and to facilitate direct controller-pilot communications by availing communication facilities to each other (hereinafter referred to as “ADS-B Collaboration”);

- (F) The Parties have agreed to enter into this Agreement to govern their rights and obligations, to regulate their relationship with each other as Provider and User (defined below) of the ADS-B data and to reap the full potential of ADS-B for the benefit of airlines.

IT IS HEREBY AGREED as follows:

ARTICLE 1 – Definitions and Interpretations

1.1 For the purpose of this Agreement, the following definitions shall apply:

- (a) “ADS-B” or “ADS-B OUT” means a function on an aircraft or vehicle that periodically broadcasts its state vector (position and velocity) and other information derived from on-board systems in a format suitable for ADS-B IN capable receivers.
- (b) “ADS-B IN” means a function that receives surveillance data from ADS-B OUT data sources.
- (c) “ADS-B data” means information regarding aircraft position, altitude and status received from aircraft or other information generated from the ADS-B Ground Stations that receive the information from the aircraft.
- (d) “ADS-B Ground Station” means a duplicated ADS-B ground station comprising receivers and communications interfaces.
- (e) “ADS-B Filtering System” means the system to process the ADS-B data from the ADS-B ground stations or from other ADS-B sources before the data are sent to the Users. It includes the data fusion equipment, filtering equipment and routers.
- (f) Air Traffic Services (“ATS”) includes flight information service, alerting service, air traffic advisory service, air traffic control (“ATC”) service (area control service, approach control service and aerodrome control service).
- (g) All Purpose Structured Eurocontrol Radar Information Exchange (“Asterix”) means Eurocontrol standard format for data message exchange.
- (h) “Direct Controller-Pilot Communication” (“DCPC”) means VHF communications, or other approved communication media in future, which is the required means for communications in order to achieve radar-like separation.
- (i) “Private Circuit” means dedicated communication links between equipment sites, including those between the Provider’s and the User’s premises.

- (j) “Provider” means the respective party providing the ADS-B data, DCPC facilities or other services required for ADS-B Collaboration as stated in **Annex A**.
- (k) “Premises” of each Party means the building or land belonging to the Party, or to the Party who has possession and control over the building or land, as the case may be.
- (l) “User” means the respective party receiving the ADS-B data, using DCPC facilities or other services required for ADS-B Collaboration as stated in **Annex A**.
- (m) Very High Frequency (“VHF”) means the radio frequency band from 30MHz to 300MHz.
- (n) “VHF Station” means a duplicated VHF ground station comprising transmitters, receivers and communications interfaces.

1.2 Unless the context or the provisions of this Agreement otherwise require:

- (a) words importing the singular number include the plural number, and vice versa;
- (b) references to the neuter gender include the masculine and feminine genders, and vice versa;
- (c) words denoting one gender include all other genders;
- (d) references to Articles and Annexes are references to Articles and Annexes of this Agreement; and
- (e) the headings to the Articles hereof shall not be deemed to be a part thereof nor shall they be taken in consideration in the interpretation or construction of this Agreement.

ARTICLE 2 – Objective of the Agreement

- 2.1 The objective of this Agreement is to improve safety and operational efficiency in the Parties’ respective provision of air traffic services for civil air traffic flow in the Parties’ respective flight information regions by providing and enhancing ADS-B coverage, ADS-B data availability and DCPC facilities in these regions and where applicable, the areas including and up to 150 nautical miles from the boundaries of these flight information regions.
- 2.2 To achieve the objective specified in **Article 2.1**, the Parties shall provide their respective ADS-B data, DCPC facilities and other services required for ADS-B Collaboration in accordance with **Annex A** and according to the Implementation Schedule in **Annex B** and the Technical Scope of Works in **Annex C**.

- 2.3 The ADS-B data is to be provided for the technical and operational purposes specified in **Article 7.1**, including but not limited to:
- (a) ATC situational awareness;
 - (b) ATC safety nets;
 - (c) Support of procedural separation procedures; and
 - (d) Updating flight plans

ARTICLE 3 – Provision of Equipment and Private Circuits

- 3.1 The Provider and the User shall be responsible for the provision, installation and commissioning of all equipment and private circuits required for the provision of ADS-B data, DCPC facilities and other services required for ADS-B Collaboration under this Agreement at their respective premises, unless otherwise stated in **Annex C**.
- 3.2 The technical requirement of the required equipment and private circuits are stated in **Annex C**.
- 3.3 The Provider and the User shall collaborate to test the above-mentioned equipment and private circuits to support ADS-B Collaboration before operational use.

ARTICLE 4 – Operations and Maintenance

- 4.1 The Provider and the User shall perform the routine maintenance, repair and replacement services of the equipment and the private circuits installed for the provision of ADS-B data, DCPC facilities and other services required for ADS-B Collaboration under this Agreement at their respective premises, unless otherwise stated in **Annex C**. The required standards of such maintenance, repair and replacement services shall be applied by the respective parties performing such services in a manner to keep the equipment and the private circuits in good working condition and fit for its purposes.
- 4.2 Where reasonably practicable, the Provider shall give the User a minimum of [.] days' notice in respect of any planned periodic break and a minimum of [.] hours' notice for any other planned non-periodic breaks in service.
- 4.3 The Provider shall report immediately or at the earliest opportunity any failure in the provision of the ADS-B data, DCPC facilities and other services required for ADS-B Collaboration, or any abnormality in the ADS-B data, DCPC facilities and other services required for ADS-B Collaboration, to the User's technical supervisor centre, as listed in **Annex C**.

- 4.4 The User shall monitor the ADS-B data, DCPC facilities and other services required for ADS-B Collaboration from the Provider and report immediately or at the earliest opportunity any failure in the reception or any abnormality of the ADS-B data, DCPC facilities or other services required for ADS-B Collaboration, to the Provider's technical supervisor centre, as listed in **Annex C**.
- 4.5 The User will engage a maintenance agent for the routine maintenance, repair and replacement services of the DCPC facilities and other services required for provision of DCPC facilities.

ARTICLE 5 – Modifications

- 5.1 From time to time, the equipment, private circuits and facilities provided by the Parties may need to be modified to meet new requirements., in such situations, the Provider and the User shall be responsible, upon agreement being reached pursuant to this Article, to implement such modifications on the equipment and private circuits provided by them respectively, within the agreed timeframe. The apportionment of the modification costs is specified in **Annex D**.
- 5.2 Any proposal for such modification shall allow at least [.] or any agreed period between agreement of the modification and the date that the modification is proposed to become effective.
- 5.3 The Provider and the User shall collaborate to test the equipment, private circuits and facilities affected by such modification before operational use.
- 5.4 No modification to a Party's equipment, private circuits or facilities shall be effected without the express agreement in writing of the other Party if the modification will require the latter to also modify any of its equipment, private circuits or facilities.

ARTICLE 6 – Cost

- 6.1 The cost apportionment for the use of ADS-B data, DCPC facilities and other services required for ADS-B Collaboration including maintenance costs is specified in **Annex D**.

ARTICLE 7 – Limitations on Use and Communication of ADS-B Data

- 7.1 The User shall use the ADS-B data provided to ensure the safe, efficient and regular provision of civil air traffic services and activities in support of his civil air traffic services and for investigation or technical demonstration, evaluation, and test purposes. The User shall not, at all times, use such data for any other purpose, nor communicate to any party not specified in this Agreement in any manner or form whatsoever any data supplied pursuant to this Agreement, without the prior written consent of the Provider.

ARTICLE 8 – Liability

8.1 [To be mutually agreed between the Parties]

ARTICLE 9 – Force Majeure

9.1 A Provider shall not be in breach of this Agreement if any failure to perform its duties or to provide the ADS-B data, DCPC facilities and other services required under the ADS-B Collaboration, arises from or is caused by any event or circumstance which is beyond its control and which constitutes force majeure. Such Provider shall promptly inform the User and take all reasonable steps (under the circumstances) to minimise the disruption and to resume normal operations as quickly as possible.

ARTICLE 10– Settlement of Disputes

10.1 [To be mutually agreed between the Parties]

ARTICLE 11 – Final Provisions

11.1 It is understood that nothing in this Agreement shall prejudice or detract from the primary obligation of the Parties whether under domestic law or applicable international law, to ensure the safe, efficient and regular provision of civil air traffic services for the areas within their respective areas of responsibility.

ARTICLE 12 – Duration

12.1 This Agreement shall enter into force on _____ for a contract period of [.] years.

12.2 This Agreement shall automatically be extended for a further contract period of [.] years upon expiry of each contract period unless either Party has givenwritten notice to the other of its intention to terminate at least [.] months before the date of expiry of each contract period.

12.3 in the event the provision of any ADS-B data as specified in **Annex A** hereof is to be permanently withdrawn from service, the Provider shall give the User not less than [.] year notice in writing in advance thereof.

ARTICLE 13 – Entire Agreement

13.1 This Agreement (including the Annexes hereto) constitutes the entire agreement between the Parties in relation to its subject matter and supercedes all prior or contemporaneous agreements and understandings whether oral or written with respect to that subject matter.

ARTICLE 14 – Amendment

- 14.1 This Agreement shall not be amended, modified or supplemented by the Parties in any manner, except by an instrument in writing signed on behalf of each of the Parties by a duly authorized officer or representative.

ARTICLE 15 – Rights of Third Parties

- 15.1 For the avoidance of doubt, the Parties agree and acknowledge that no person who is not a party to this Agreement may enforce any term of this Agreement in his own right, in particular and to the extent legally possible, the Parties specifically exclude the application of any law in [State of party1], [State of party2] or elsewhere which provides that any third party has the right to enforce this Agreement.

SEA ADS-B WG/6 – WP/9
Attachment 2

In witness whereof, the parties having been duly authorized, have entered into this Agreement on the day and year first above written.

Signed for and on behalf of
[Party 1]

Signed for and on behalf of
[Party 2]

[Name and title of authorised signatory]

[Name and title of authorised signatory]

ANNEX A

PROVIDERS AND USERS OF ADS-B AND DCPC FACILITIES

1 In this Agreement, the Providers and Users are as specified below:

(a) [Facility 1]

Provider: [.]

User: [.]

(b) [Facility 2]

Provider: [.]

User: [.]

(c) [Facility 3]

Provider: [.]

User: [.]

2 Each Provider authorizes the User to communicate the Provider's ADS-B data to the maintenance agents appointed by the User for the purposes of maintenance and management of ADS-B equipment.

IMPLEMENTATION SCHEDULE

[To include time line for various facilities]

TECHNICAL SCOPE OF WORKS

1 Equipment, Facilities And Services To Be Provided By Each Party

1.1 ADS-B Stations

[Description of equipment to be provided by each party]

1.2 ADS-B Filtering System

[Description of equipment to be provided by each party]

1.3 DCPC Facilities (VHF Radio Voice Communication Station)

[Description of equipment to be provided by each party]

1.4 Private Circuits between States

[Description of equipment to be provided by each party]

2 ADS-B Data Sharing Interface Specification

2.1 Data Elements

2.1.1 ADS-B messages will comprise the data elements defined in Eurocontrol Asterix Category 21 version 0.23.

2.1.2 ADS-B Data received from each aircraft will be transmitted from each ADS-B station to the User(s) at an update rate of 1second.

2.1.3 The Asterix Category 21 version 0.23 standard allows packaging of multiple ADS-B records into a single data block, or alternatively to place a single ADS-B record per data block. Record packaging should be performed to the extent possible to minimise communication bandwidth requirements without delaying transmission of any given record.

2.1.4 The ADS-B stations and routers / processors shall not alter the contents of the data elements.

2.2 Message Description

2.2.1 The message format will be in accordance with Asterix Cat 21 version 0.23.

2.3 Communication Protocol

- 2.3.1 The network layer is to be implemented using the Internet Protocol (IP). The network shall support Internet Group Management Protocol (IGMP) level 0, 1 and 2 as defined in RFC3300.

Note: IGMP level 1 supports transmission of Multicast datagrams, level 2 supports transmission and reception of multicast datagrams, while level 0 corresponds to IP unicast.

- 2.3.2 For Asterix messages, the Network Layer will use the IP for the delivery of packets. An addressing scheme, as agreed, shall be used. Multicast shall be used.

2.4 Physical Aspects

- 2.4.1 The communication media will be VSAT data-link communications links and submarine cables. The bandwidth of the media shall be as follows:

[Description of communication media]

3 DCPC Facilities– VHF Radio Voice Communication interface

3.1 Communication Protocol

[Description of communication protocol]

3.2 Physical Aspects

[Description of communication media]

4 Maintenance

- 4.1 [Description of maintenance requirement]

5 Functional Performance Requirement

5.1 General Performance Requirements

- 5.1.1 The ADS-B data and DCPC facilities together with the systems and equipment that provide such data and DCPC will meet and comply with the relevant international standards and best practices for applying radar-like separation using ADS-B, or radar if such standards have not been defined for ADS-B.

5.2 Specific Performance Requirements

- 5.2.1 Unless otherwise stated, the ADS-B stations, ADS-B routers and DCPC facilities will be duplicated with no common point of failure.

5.2.2 The following standard will be met:

| | |
|--|--|
| Aircraft Updates | 1 second update rate |
| Network Latency | 95%: < 2 seconds of ground-station output (from ADS-B ground station to input of the User) |
| Reliability 1 | 2 autonomous ground-stations including antennae, each providing data with no common point of failure |
| Reliability 2 - MTBF | Each ground-station including antenna to have MTBF >10,000 hrs |
| Reliability – Communications Infrastructure | Completely duplicated, no common point of failure |
| Reliability – Total ADS-B Service | Total Service MTBF > 50,000 hrs |
| Availability – Total ADS-B Service | Total Service Availability > 0.999 |
| Integrity – Ground Station | Ground Station shall be checked by Site monitor and monitored by RCMS |
| Integrity – Data Communications & Processing | All systems up to ATM system, errors < 1 x 10E-6 |

5.2.3 The following standard for DCPC facilities will be met:

| Type | System Monthly Availability Minimum Requirement |
|-----------------------------------|---|
| VHF Base Stations (Per Frequency) | [State required availability] |

5.3 Filtering and Message Modification

5.3.1 The ADS-B data from aircraft is collected and formed into Asterix messages in accordance with the technical specification of the ground station. The content of the Asterix messages should not be removed or modified unless technically required.

6 Location and Contact Number of the Technical Supervisor Centres of Each Party

6.1 All routine co-ordination and fault reporting of the equipment, facilities or services provided by a Party will be addressed to the following technical supervisor centre at the Party's premises:

SEA ADS-B WG/6 – WP/9
Attachment 2

(a) Technical Supervisor Centre at [Party 1]'s premises:

[Contact details]

(b) Technical Supervisor Centre at [Party 2]'s premises:

[Contact details]

ANNEX D

COST

1 General

- 1.1 The costs to be borne by the Parties will be on a mutually-agreed basis between the Parties.
- 1.2 The costs will include equipment costs, installation and testing costs, maintenance and operating costs, private circuit or equipment lease costs, cost of performance reporting, administration costs and costs of relevant taxes including but not limited to goods and services tax and costs of relevant services including but not limited to consultancy services.

2 Costs for Provision of equipment, facilities and services

- 2.1 Unless otherwise specified in this Annex, each Party will pay for his own costs including all the capital and recurrent costs of the equipment, private circuits, facilities and associated services provided by him as specified in **Annex C**.

2.2 Costs of [Facility 1]

[Description on how cost of Facility 1 will be shared]

2.3 Costs of [Facility 2]

[Description on how cost of Facility 2 will be shared]

2.4 Costs of [Facility 3]

[Description on how cost of Facility 3 will be shared]

3 Technical and operational support costs

- 3.1 [Description on how technical and operational support costs will be shared]

4 Termination costs

- 4.1 [Description on how cost due to termination will be shared]

5 Modification costs

- 5.1 Unless otherwise agreed between the Parties, in the event of modification pursuant to **Article 5** of this Agreement, each Party will bear the modification costs of the equipment, private circuits, facilities and associated services provided by him as specified in **Annex C**.

6 Facilities Fees

6.1 [Description on fees for facilities, if any]

ANNEX E

CORRESPONDENCE

1. The correspondence between the Parties shall be posted and faxed or emailed to the addresses and attention it to the person indicated below:

To [Party 1]:
[Contact details]

To [Party 2]:
[Contact details]

2. Any Party may from time to time, by written notice to the other Party, designate a different person, facsimile or email to whom the correspondences, notices or communications must be attention to.