INTERNATIONAL CIVIL AVIATION ORGANIZATION

TWENTY NINTH MEETING OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (APANPIRG/29)

Bangkok, Thailand, 3 to 5 September 2018

Agenda Item 3: **Performance Framework for Regional Air Navigation Planning and Implementation**

3.4: **CNS**

NEED FOR ATS SURVEILLANCE AND DIRECT CONTROLLER AND PILOT COMMUNICATION VHF COVERAGE CHARTS FOR THE REGION

(Presented by Hong Kong China and Thailand)

SUMMARY

There is a need to enhance the surveillance and Direct Controller and Pilot Communication (DCPC) VHF coverage where gaps exist in APAC Region along some of the busy air traffic routes at boundaries between FIRs. In addressing such need, this paper proposes to establish a mechanism to produce charts and regularly update them to show the latest situation in ATS surveillance and DCPC VHF coverage in the Asia Pacific Seamless ATM Plan for the region, overlaid with busy air traffic routes, so that resources in enhancing the surveillance and DCPC VHF coverage can be prioritized and optimized to address the need in a holistic, collaborative and harmonized manner.

Strategic Objectives:

A: ***Safety*** *– Enhance global civil aviation safety*

B: ***Air Navigation Capacity and Efficiency****—Increase the capacity and improve the efficiency of the global aviation system*

1. INTRODUCTION

1.1. In order to achieve seamless Air Traffic Management (ATM) capabilities, continuous air traffic service (ATS) surveillance and Direct Controller and Pilot Communication (DCPC) VHF coverage, especially those along the busy air traffic routes at boundaries between Flight Information Regions (FIRs), is one of the key enablers. In APAC region, there is diverse pace in implementation of surveillance and DCPC VHF coverage. The Aviation System Block Upgrades (ASBU) under the ICAO Global Air Navigation Plan (GANP) provides a systematic methodology for States/Administrations to incrementally upgrade their surveillance and DCPC capabilities, through both terrestrial-based and spaced-based technologies, to achieve seamlessness in air traffic management.

1.2. According to the Asia Pacific Seamless ATM Plan (the Plan) Version 2.0, paragraph 6.8 identifies the main areas of the region lacking ATS surveillance and DCPC VHF coverage which need to be addressed with priority:

(a) highest priority: South China Sea airspace between Viet Nam, Brunei Darussalam and the Philippines (*Figure 1 in Annex 1*);

(b) high priority: Bay of Bengal airspace between the Indian subcontinent and the Andaman Islands (*Figure 2 in Annex 1*);

(c) medium priority: airspace between Indonesia and Australia (between Java and West Australia), and airspace between the Philippines and Indonesia (*Figure 1 in Annex 1*); and

(d) lower priority: Coral Sea between Papua New Guinea and Australia.

1.3. Although the Plan has highlighted the major areas where a lack of ATS surveillance and DCPC VHF coverage is identified, the Plan is only updated once every three years with the last update in September 2016. There is a need to take stock and assess the current and planned coverage thus identifying the gaps for the entire region, particularly to support the worldwide aircraft tracking initiative under the Global Aeronautical Distress and Safety System (GADSS). Besides, there is a lack of established mechanism for States/Administrations to update their latest development and information for incorporation into the Plan. If such a mechanism could be established, follow-up action could then be focused on managing the gaps with a view to expediting implementation of the Plan.

1.4. In view of the current and growing air traffic demand, there is an urgent need to produce the coverage charts for incorporation into the Plan which is due for review by 2019 with its Phase 2 planned for completion in November 2019. It is important for the Plan to reflect the current and planned coverage so as to enable assessment and identification of gaps, which will facilitate proactive measures to be taken for Phase 2 and Phase 3 implementation of the Plan. Without such provisions, resources may not be appropriately prioritized and optimized to address the need in a holistic, collaborative and harmonized manner.

2. DISCUSSION

2.1 There were some past or present efforts made with an attempt to produce coverage charts in ATS surveillance and DCPC coverage for the region/sub-region, such as the following WPs in ICAO meetings:-

(a) Joint efforts from Hong Kong China and Thailand in producing regional surveillance and DCPC charts/maps under the ICAO 3rd Asia Pacific Seamless ATM Planning Group (APSAPG/3) in January 2013. The APSAPG has been dissolved and the charts have been not been updated since then (APSAPG/3 WP23, see Annex 2 for the WP)

(b) MAAR (Aerothai Thailand) has updated the surveillance and DCPC charts for the South China Sea sub-region under the ICAO South China Sea Traffic Flow Review Group (SCSTFRG). However, update of the charts have been ceased since October 2016 (the 4th meeting) (SCSTFRG/4 WP03, see Annex 3 for the WP)

(c) Singapore has updated the ADS-B coverage charts for the South China Sea sub-region under the ICAO South East Asia and Bay of Bengal ADS-B Working Group (SEA/BOB ADS-B WG). The update of the charts continues with last update in November 2017 (SEA/BOB ADS-B WG/13 IP12, see Annex 4 for the IP)

2.2 It is noted that the efforts were scattered across different bodies while some past efforts have been discontinued. Riding on previous efforts and experience gained, a systematic

mechanism is proposed to be established with a view to producing the first version of the charts and updating them in a sustainable manner to show the latest situation in surveillance and DCPC VHF for the region :-

(a) Step 1: Conduct survey

ICAO Regional Office is requested to launch surveys to ask States/Administrations through State Letter to provide Point of Contact (POC) and updated information regarding surveillance and DCPC VHF coverage for enroute airspace at FL290 and above. The survey currently used by MAAR can serve as a good reference for relevant information collection (see Annex 5). States/Administrations would reply to the State Letter and provide updated information on their surveillance and DCPC provisions to ~~ICAO and~~ designated POC of Hong Kong China and Thailand. The information collected would be kept confidentially.

(b) Step 2: Produce coverage charts

In the light of the past efforts of Hong Kong China and Thailand on similar tasks, Hong Kong China and Thailand will volunteer and take lead to produce, based on the information collected from the POC and Survey in Step 1, the first version of ATS surveillance and DCPC coverage charts, with busy air traffic routes overlaid. Sensitive information (e.g. location of the facilities) might be de-identified from the charts as appropriate.

(c) Step 3: Publish first version of the charts and regular review/update

APANPIRG is requested to consider designating the tasks of regular updates of the coverage charts to CNS Sub-group and its contributory bodies (e.g. SURICG). Upon task designation, ICAO Regional Office could pass updated information collected from the Survey in Step 1 to CNS Sub-group and its contributory bodies for updating the charts regularly. The updated charts shall be reviewed and maintained by the CNS Sub-group and its contributory bodies. The endorsed charts may be incorporated into the Asia Pacific Seamless ATM Plan as annexes to it.

2.3 Timeline

2.3.1 A tentative timeline for implementation of the mechanism is proposed as follows:

Step	Description	Target Date
1	Conduct survey	(a) ICAO Regional Office to issue State Letter for a regular survey to APAC States/Administrations with an aim of collecting information related to the current and planned ATS surveillance and DCPC VHF coverage by **December 2018**. (b) States/Administrations to provide response to the survey to ~~ICAO and~~ designated POC of Hong Kong China and Thailand by **end February 2019**.
2	Produce coverage charts	(a) Hong Kong China and Thailand to produce the first version of ATS surveillance and DCPC VHF coverage charts by **end April 2019**. (b) The initial charts are reviewed and endorsed by the CNS Sub-group and its contributory bodies by **end July 2019**.

3	Publish first version of the charts and regular review/update	(a) APANPIRG/30 to consider for incorporation of the surveillance and DCPC VHF coverage in Asia Pacific Seamless ATM Plan in **September 2019**. (b) CNS Sub-group and its contributory bodies will regularly review updates to the coverage charts in its future meetings.

3. ACTION BY THE MEETING

3.1 The Meeting is invited to:

a) endorse the proposed mechanism as outlined in paragraph 2.2 in producing and regularly updating the coverage charts in ATS surveillance and DCPC for the region;

b) endorse the proposed timeline as outlined in paragraph 2.3 in implementation of the proposed mechanism; and

c) encourage States/Administrations to contribute relevant information and work with relevant parties in producing and updating the coverage charts through the following Conclusion.

Conclusion APANPIRG/29/xx (WP/xx) - Survey on Surveillance and DCPC VHF Coverage	
What: That, States/Administrations be urged to respond to regular survey on Surveillance and Direct Control and Pilot Communication (DCPC) VHF Coverage to be circulated through an ICAO State Letter and advise the Point of Contact.	Expected impact: X Political / Global ☐ Inter-regional Economic ☐ Environmental ☒ Ops/Technical
Why: To analyse the gaps of surveillance and DCPC VHF coverage for remedial action plans to be taken by States/Administrations to provide seamless ATM service in APAC Region	Follow-up: ☒Required from States
When: 5-Sep-2018	Status: Adopted by PIRG
Who: ☒ APANPIRG ☒ APAC States ☒ICAO APAC RO ☐ICAO HQ ☐Other:	

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Annex 1

Figure 1 – South China Sea surveillance gaps – Sep 2016

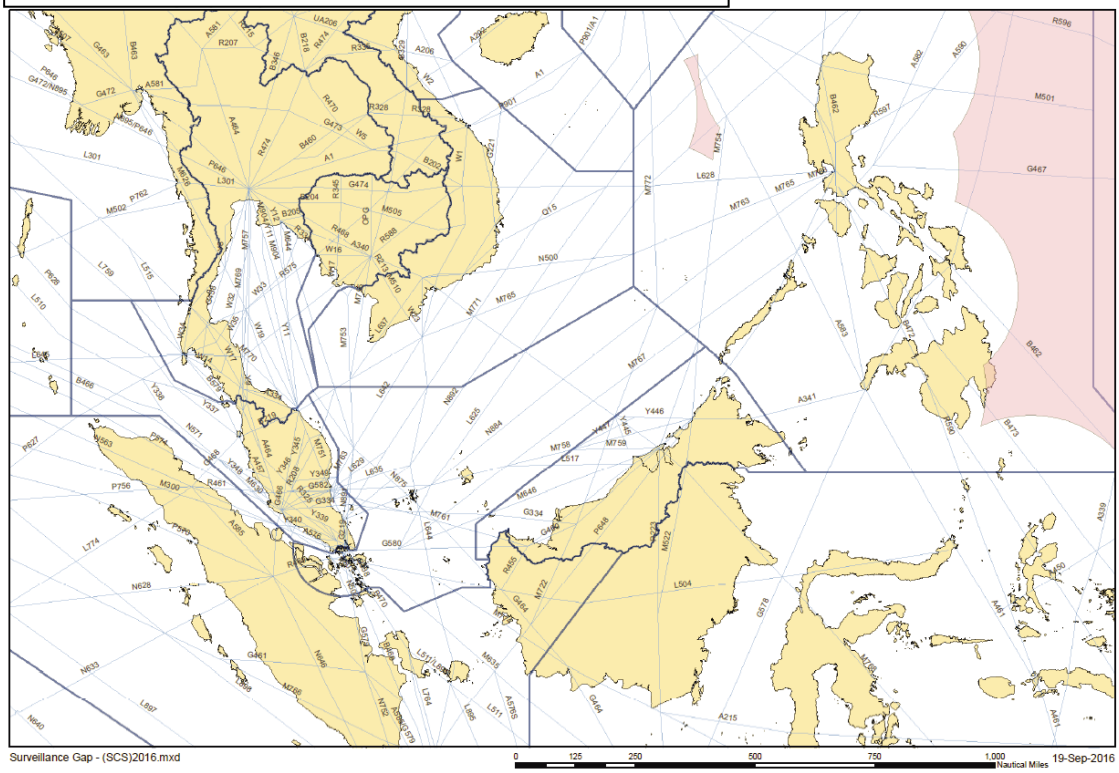
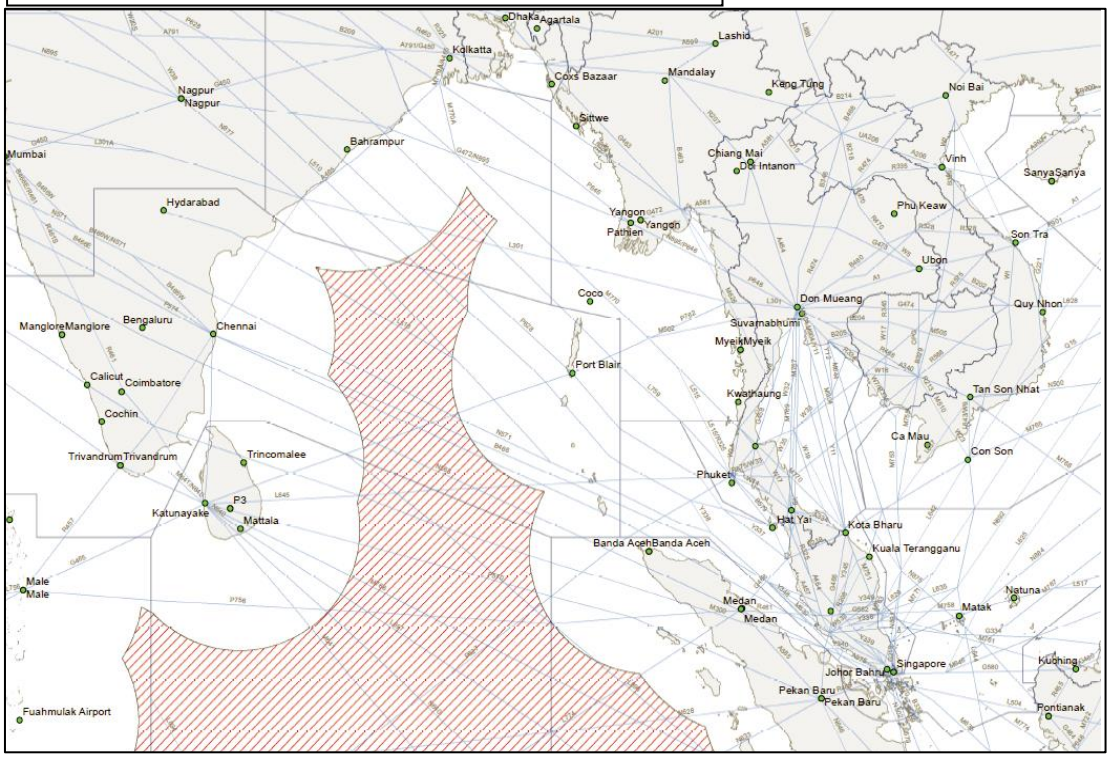


Figure 2 – Bay of Bengal surveillance gaps – Dec 2015



Annex 2

APSAPG/3−WP23
21-25/01/2013

International Civil Aviation Organization

Third Meeting of the ICAO Asia/Pacific Seamless ATM Planning Group (APSAPG/3)

Chennai, India, 21-25 January 2013

Agenda Item 4: Asia/Pacific Seamless ATM Status and Strategies

REGIONAL ATS SURVEILLANCE AND COMMUNICATIONS COVERAGE GAPS

(Presented by Hong Kong, China and Thailand)

To support the seamless ATM initiative, it is necessary to identify coverage gaps of ATS surveillance and communications along Major Traffic Flow (MTF) and intra-regional short-haul routes with busy traffic. This paper presents signal coverage gaps on ATS surveillance and communications along these short-haul regional routes in the APAC Regions. Concerned States/Administrations are encouraged to review their CNS strategy and propose plans to address coverage gaps in accordance with ASBU module B0-84 "Initial capability for ground surveillance" and ASBU module B0-40 "Improved Safety and Efficiency through the Initial Application of Data Link En-route", which are considered as critical ASBU upgrades for seamless ATM.

This paper relates to –

Strategic Objectives:

*A: **Safety** – Enhance global civil aviation safety*

*C: **Environmental Protection and Sustainable Development of Air Transport** – Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment*

Global Plan Initiatives:

GPI-1 Flexible use of airspace
GPI-2 Reduced vertical separation minima
GPI-4 Alignment of upper airspace classifications
GPI-5 RNAV and RNP (Performance-based navigation)
GPI-7 Dynamic and flexible ATS route management
GPI-8 Collaborative airspace design and management
GPI-11 RNP and RNAV SIDs and STARs
GPI-16 Decision support systems and alerting systems
GPI-17 Data link applications
GPI-18 Aeronautical information
GPI-21 Navigation systems
GPI-22 Communication infrastructure

1. INTRODUCTION

1.1 During previous APSAPG meetings, Thailand and Hong Kong presented working papers and flimsy outlining preliminary analysis on coverage of ATS surveillance and communications within the APAC Regions. The Meeting considered the working papers contained useful information to support studies on Major Traffic Flow (MTF) and Regional Routes with busy traffic with a view to identifying current status and improvements of seamless ATM capabilities in terms of ATS surveillance and communications.

1.2 To go one step further, the APSAPG in its 2nd Meeting urged States to contribute more effort and provide the necessary information on signal coverage of ATS surveillance and communications, rather than their exact geographical coordinates. As Hong Kong, China has been actively participating into the ADS-B Working Group and Task Force Meetings with regular update on implementation status of surveillance including ADS-B and radar, the Meeting tasked Hong Kong, China and Thailand to conduct a more comprehensive analysis to identify coverage gaps for ATS surveillance and communications within the APAC Regions.

2. DISCUSSION

2.1 In this working paper, initial focus was put on coverage gaps of ATS surveillance and VHF communications over the 16 selected intra-regional short-haul routes with busy traffic within the APAC Regions. These selected intra-regional short-haul routes were based on WP/04 "MTF and Sample Regional Route Study" presented by the ICAO Secretariat during the APSAPG/2 Meeting.

2.2 Information on ATS surveillance and communications is acquired from (a) States' AIP (b) working papers published by States/ICAO in various ICAO meetings/seminars (c) States' response to ICAO Questionnaire provided by the ICAO Secretariat (d) CNS FASID Table published on the ICAO web-site (e) CNS/ATM Implementation Matrix endorsed by APANPIRG/23 (f) ICAO Frequency List No. 3 provided by the ICAO Secretariat.

2.3 Surveillance (Secondary Surveillance Radar: SSR and ADS-B) and VHF communications coverage over the 16 intra-regional short-haul routes are shown in **Appendix 1 and 2** respectively. Preliminary analysis indicates that there are ATS surveillance and communications gaps along five routes, namely Route 3 (Manila – Tokyo), Route 6 (Ho Chi Minh – Manila), Route 8 (Hong Kong – Jakarta), Route 10 (Colombo – Bangkok) and Route 15 (Chennai – Singapore). In accordance with ASBU module B0-84 "Initial capability for ground surveillance" (ASBU Priority 1) and ASBU module B0-40 "Improved Safety and Efficiency through the Initial Application of Data Link En-Route" (ASBU Priority 1), these gaps need to be addressed with the highest priority through critical ASBU upgrades.

2.4 However, despite searching through various sources mentioned in paragraph 2.2, some information on ATS surveillance and communications still cannot be acquired. The absence of essential information, in particular locations of some facilities, limits accuracy of the analysis.

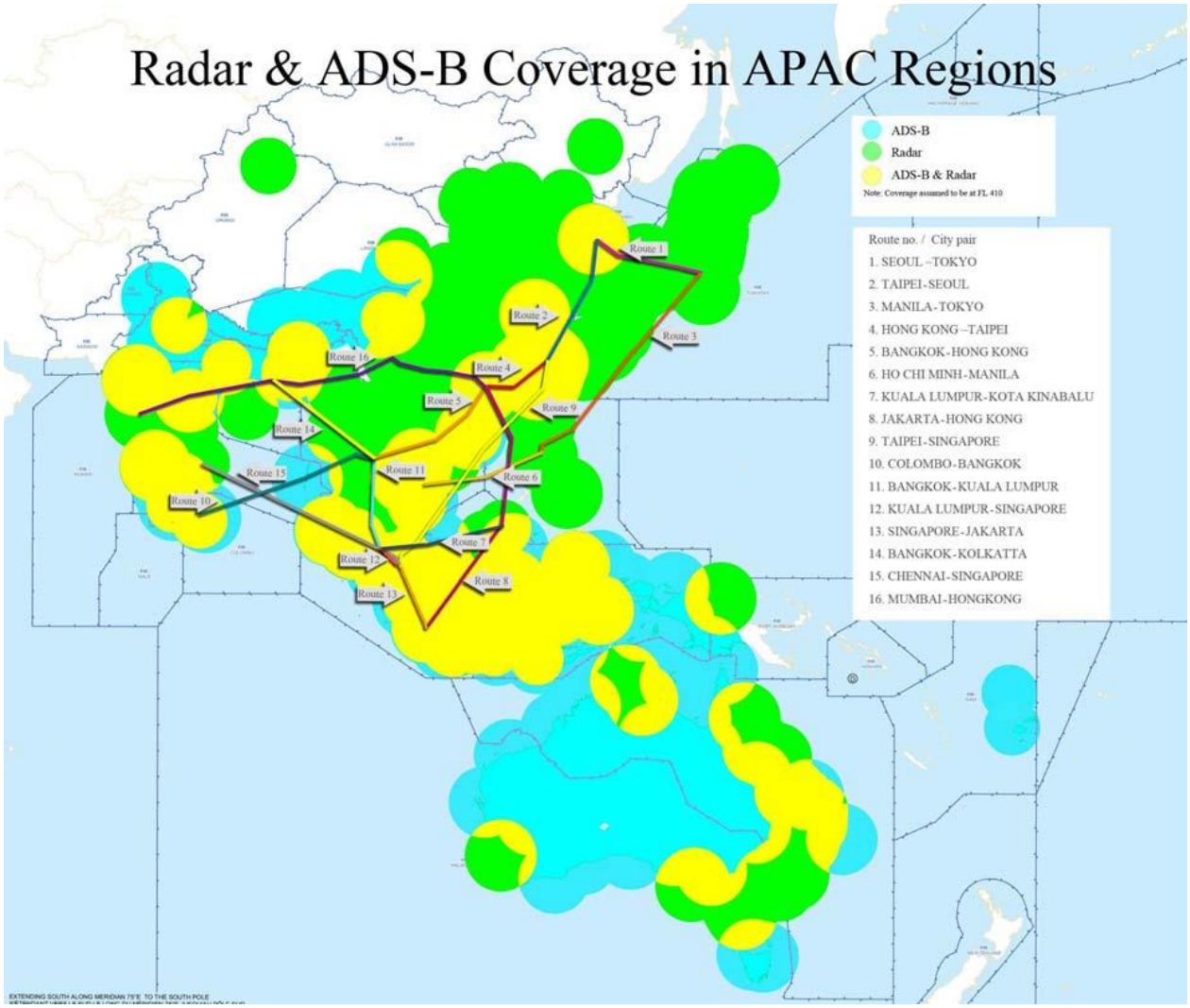
3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) make use of the signal coverage information to support work of the APSAPG; and

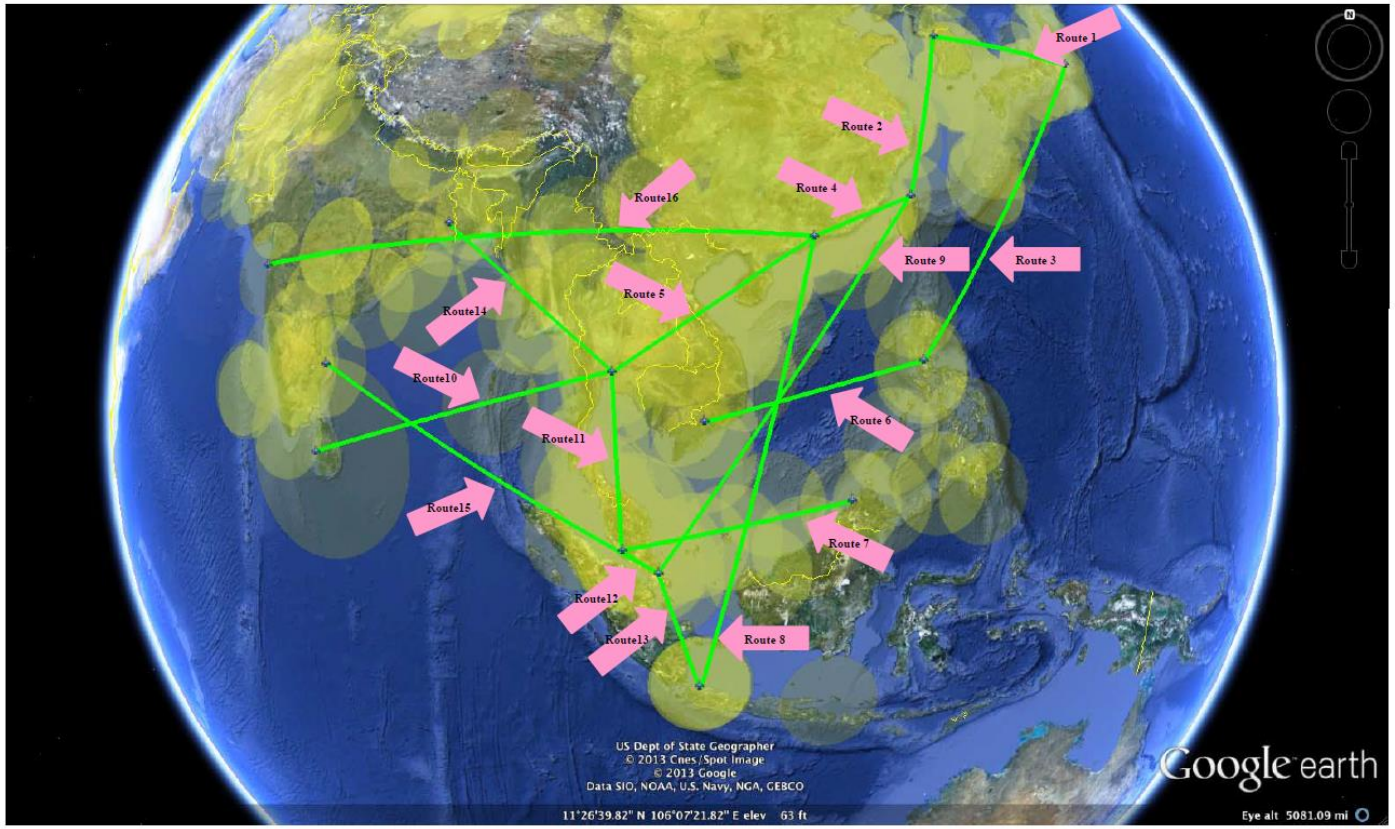
b) request the ICAO Regional Office to conduct a survey to acquire more comprehensive information from States/Administrations regarding ATS surveillance and communications coverage while addressing data sensitivity issues so as to enable a more accurate coverage gap analysis.

Appendix 1


Radar & ADS-B Coverage in APAC Regions
ADS-B
Radar
ADS-B & Radar
Note: Coverage assumed to be at FL 410
Route no. / City pair
1. SEOUL –TOKYO
2. TAIPEI-SEOUL
3. MANILA-TOKYO
4. HONG KONG –TAIPEI
5. BANGKOK-HONG KONG
6. HO CHI MINH-MANILA
7. KUALA LUMPUR-KOTA KINABALU
8. JAKARTA-HONG KONG
9. TAIPEI-SINGAPORE
10. COLOMBO-BANGKOK
11. BANGKOK-KUALA LUMPUR
12. KUALA LUMPUR-SINGAPORE
13. SINGAPORE-JAKARTA
14. BANGKOK-KOLKATTA
15. CHENNAI-SINGAPORE
16. MUMBAI-HONGKONG
Route 1
Route 2
Route 3
Route 4
Route 5
Route 6
Route 7
Route 8
Route 9
Route 10
Route 11
Route 12
Route 13
Route 14
Route 15
Route 16

Appendix 2

VHF Communications Coverage in APAC Regions



coverage assumed to be at FL410

Route no. / City pair

1. SEOUL –TOKYO
2. TAIPEI-SEOUL
3. MANILA-TOKYO
4. HONG KONG –TAIPEI
5. BANGKOK-HONG KONG
6. HO CHI MINH-MANILA
7. KUALA LUMPUR-KOTA KINABALU
8. JAKARTA-HONG KONG
9. TAIPEI-SINGAPORE
10. COLOMBO-BANGKOK
11. BANGKOK-KUALA LUMPUR
12. KUALA LUMPUR-SINGAPORE
13. SINGAPORE-JAKARTA
14. BANGKOK-KOLKATTA
15. CHENNAI-SINGAPORE
16. MUMBAI-HONGKONG

Annex 3

SCSTFRG/4−WP03
26-28/10/2016

International Civil Aviation Organization
The Fourth Meeting of South China Sea Traffic Flow Review Group
(SCSTFRG/4)
Changsha, China, 26-28 October 2016

Agenda Item 2: **Review of the current and planned CNS/ATM capabilities and identifying associated reduced horizontal separation**

Updated VHF, SSR, and ADS-B Coverage in WPAC/SCS

(Presented by Monitoring Agency for Asia Region)

SUMMARY

This paper presents an updated visualization of VHF, SSR, and ADS-B ideal coverage in WPAC/SCS airspace to assist SCS-MTFRG in reviewing and improving the existing route structures in the SCS Airspace.

1. INTRODUCTION

1.1 At SCS-MTFRG/3, MAAR was tasked to collect communication and surveillance information from States and plot the information geographically so that SCS-MTFRG can utilize the information to find opportunities to improve the existing SCS route structures.

1.2 In this paper, MAAR updated the plot to reflect any changes from the previous meeting.

2. DISCUSSION

2.1 MAAR updated information based on:

- Singapore's response during SCS-MTFRG/3;
- Viet Nam's response on 10th October, 2016 to reflect information published on the AIP Supplement; and
- Hong Kong's response on 14th October, 2016 to reflect an addition of ADS-B station which will give cover the southern part of Hong Kong FIR after 31st October, 2016.

Data Limitations

2.2 MAAR still needed to use legacy data for the following States:

- Malaysia's VHF sites
- Sanya FIR's VHF and surveillance sites
- Lao PDR and Cambodia

Generated Charts

2.3 **Attachment 1** shows a map of **VHF sites and their ideal coverage** by country in the region.

2.4 **Attachment 2** shows a map of **surveillance sensor sites and their ideal coverage** by country in the region.

Attachment 2

2.5 **Attachment 3** shows a map of **surveillance sensor sites and their ideal coverage** by sensor type in the region.

3. ACTION BY THE MEETING

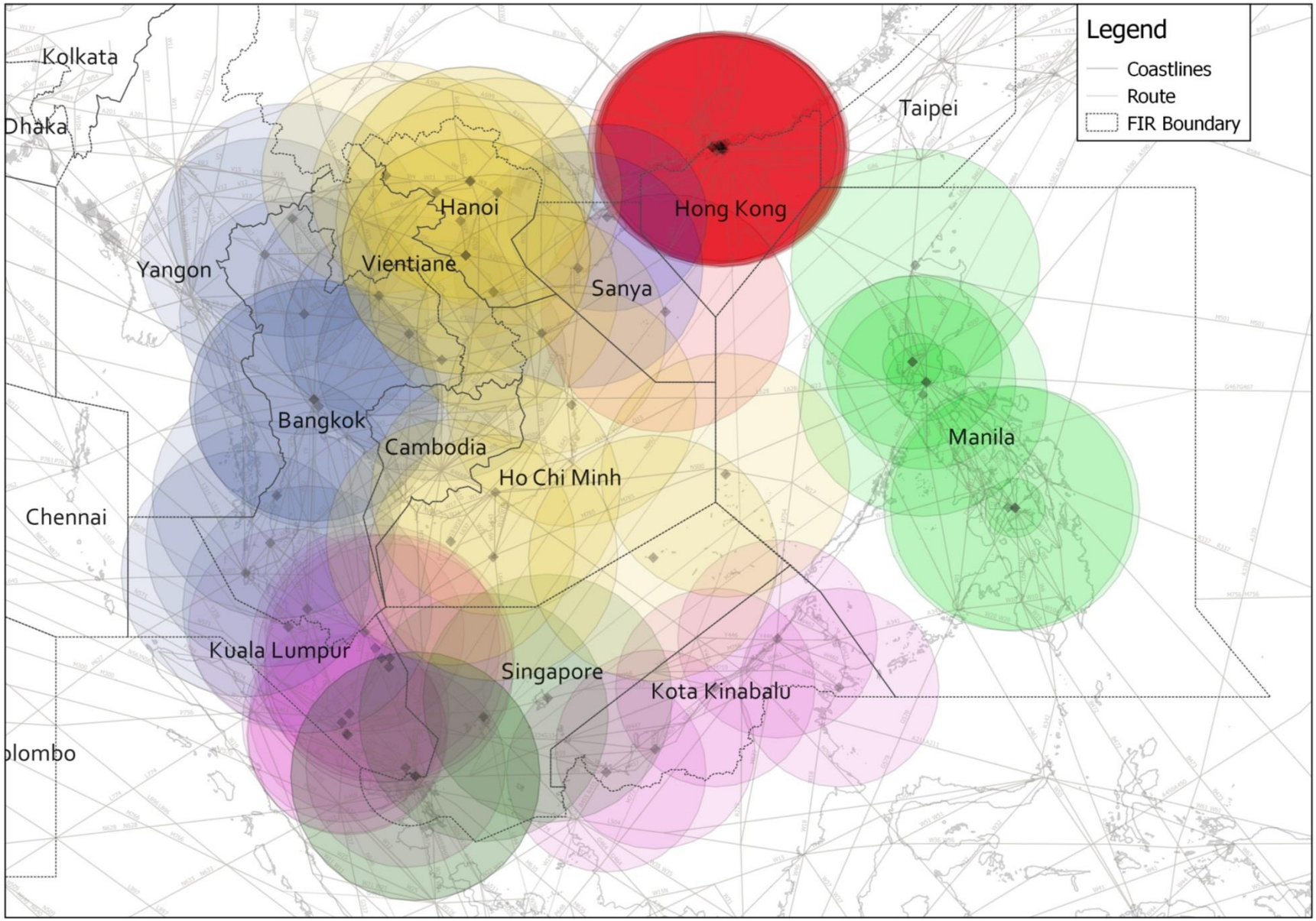
3.1 The meeting is invited to:

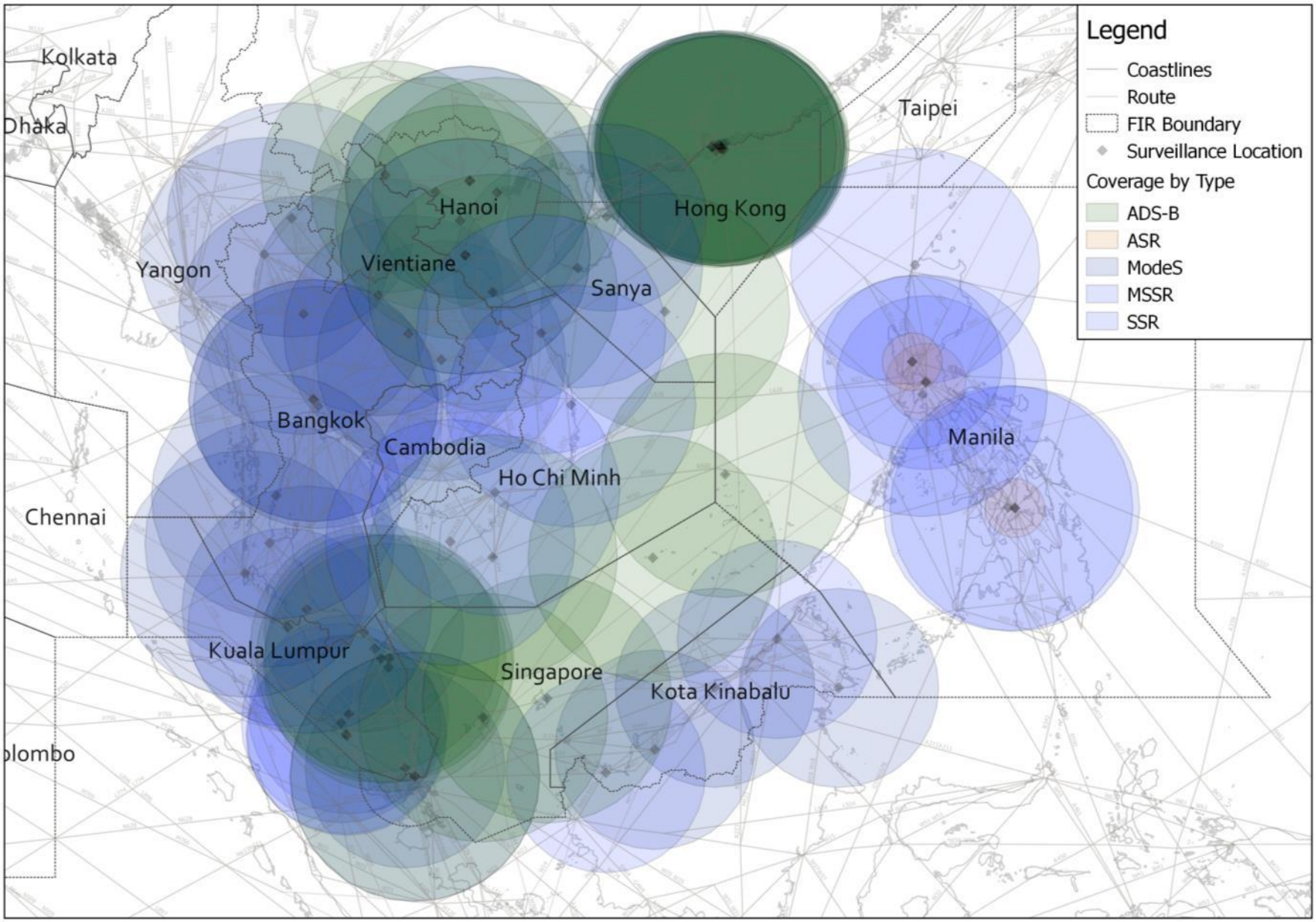
a) note the information contained in this paper; and

b) continually update MAAR of any changes in communication and surveillance information.


olkata
Taipei
Hanoi
Hong Kong
Vientiane
Yangon
Sanya
Bangkok
Cambodia
Ho Chi Minh
Manila
hennai
Kuala Lumpur
Singapore
Kota Kinabalu
Legend
Coastlines
Route
FIR Boundary
VHF Location
Coverage by Country
China
Hong Kong
Lao PDR
Malaysia
Philippines
Singapore
Thailand
Vietnam

Attachment 2




Legend
Coastlines
Route
FIR Boundary
Surveillance Location
Coverage by Type
ADS-B
ASR
ModeS
MSSR
SSR
Kolkata
Dhaka
Taipei
Hanoi
Hong Kong
Yangon
Vientiane
Sanya
Bangkok
Cambodia
Manila
Ho Chi Minh
Chennai
Kuala Lumpur
Singapore
Kota Kinabalu
olombo

International Civil Aviation Organization

THIRTEENTH MEETING OF THE SOUTH EAST ASIA/ BAY OF BENGAL SUB-REGIONAL ADS-B IMPLEMENTATION WORKING GROUP (SEA/BOB ADS-B WG/13)

Colombo, Sri Lanka, 14-16 November 2017

Agenda Item 3: Review implementation and co-ordination activities and sub-regional implementation plans

ADS-B COLLABORATION IN SOUTH CHINA SEA REGION

(Presented by Singapore and the Philippines)

SUMMARY

This paper updates the Working Group on the developments of ADS-B collaborations in the South China Sea region.

1. Introduction

1.1 In the South China Sea region, procedural separation used to be applied onto several air routes where surveillance or direct controller pilot communications (DCPC) gaps are present. ADS-B collaboration, which involves the sharing of ADS-B data and the provision of access to VHF radio facilities, can help to cover these surveillance and DCPC gaps.

1.2 ICAO, through its former ADS-B Study and Implementation Task Force (ADS-B SITF) and its Southeast Asia / Bay of Bengal ADS-B Working Group (SEA/BOB ADS-B WG), together with Civil Air Navigation Services Organization (CANSO) and International Air Transport Association (IATA) encourage ADS-B collaboration among States.

2. Current ADS-B Operations in South China Sea Region

2.1 In the South China Sea region, the surveillance and DCPC gaps on some of the major trunk routes have been covered following the collaboration between Indonesia and Singapore and between Singapore and Viet Nam. These trunk routes include ATS routes M753, L642, M771 and N892. As a result, aircraft entering part of the Singapore FIR above and including FL290 covering M753, L642, M771 and N892 were required to carry ADS-B with effect from 12 December 2013. Instead of procedural separation, 40NM longitudinal separation was initially applied on M753, L642, M771 and N892. (See diagrams below) Further reductions to 30NM and 20NM were made in Jun 2014 and Nov 2016 respectively.

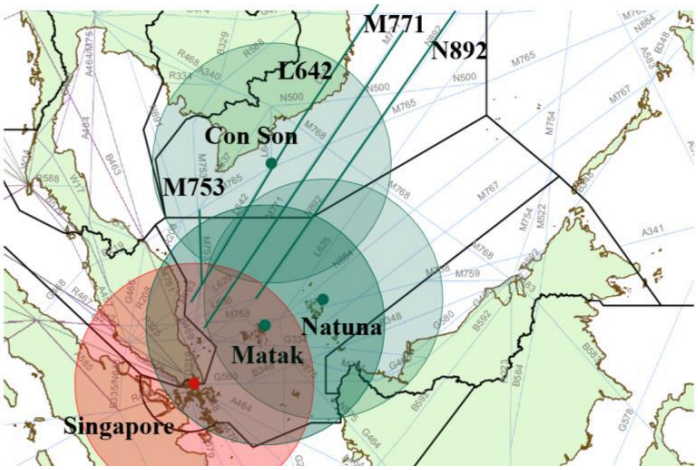


Figure 1: Theoretical coverage of ADS-B sensors

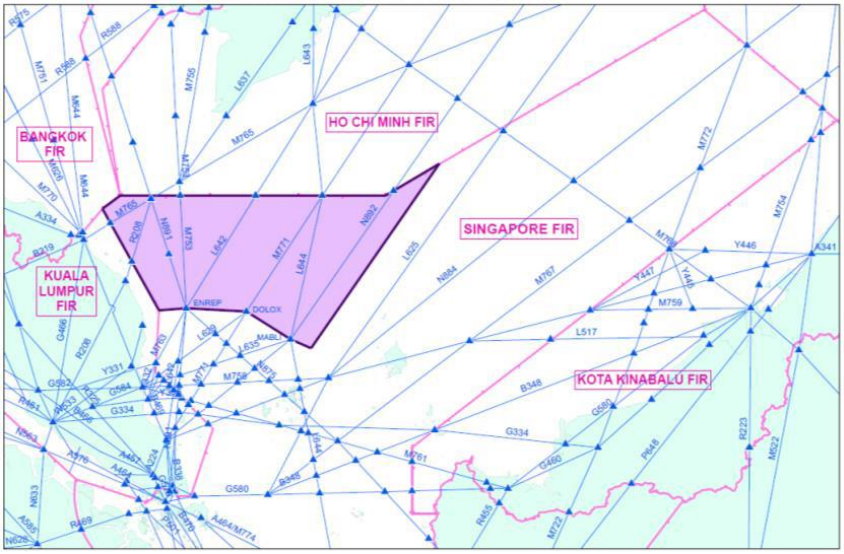


Figure 2: Airspace in the Singapore FIR where ADS-B is required above FL290

3. Further Enhancement

3.1 Recognizing the benefits of ADS-B collaboration and riding on the momentum of successful implementations, the Philippines and Singapore signed an ADS-B collaboration agreement in October 2015. This is to help cover parts of the surveillance and DCPC gaps on the ATS routes N884 and M767. As a result of this successful cross-border collaboration between Philippines and Singapore, ADS-B data and VHF radio facilities at Bataraza has been made available from Aug 2017 onwards to enhance air traffic safety through better situation awareness.

3.2 Discussions are also on-going between Brunei and Singapore on ADS-B collaborations to cover the remaining surveillance and DCPC gaps on ATS routes N884 and M767 in the Singapore FIR.

3.3 Viet Nam and Singapore are working on further collaboration to enhance the existing ADS-B coverage. An ADS-B collaboration agreement was signed in Jul 2016 where Viet Nam will provide Singapore with ADS-B data and VHF radio facilities from Ca Mau. The implementation is expected to be completed in 2018.

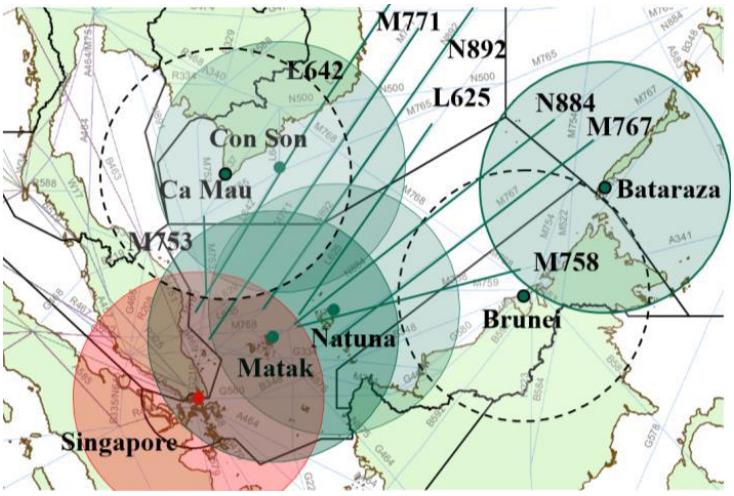


Diagram 4: Theoretical coverage with additional sites.

4. Conclusion

4.1 The meeting is invited to:

a) note the progress of the ADS-B collaborations among States in the South China Sea region with the aim of enhancing safety, capacity and efficiency of air traffic services in the region.

b) urge States for ADS-B collaborations to further enhance existing surveillance and DCPC coverage.

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ATS Surveillance and DCPC VHF Coverage Information Reporting Form

This form consists of 2 parts:

VHF_communication_sites coverage of **VHF air-ground radio communication**

Surveillance_sites coverage of **ADS-B, ModeS, or MSSR**

which are available for air traffic control service

Data Fields	Specifications
State	Responsible State
Site_Name	Unique station name
Surveillance Technology	**ADS-B, ModeS, or MSSR** for surveillance technology. No PSR, MLAT, or surface movement radar.
Latitude(decimal)*	Coordinate of the station - latitude in decimal degree (between **-90.0 and 90.0**)
Longitude(decimal)*	Coordinate of the station - longitude in decimal degree (between **-180.0 and 180.0**)
Coverage(NM)	Theoretical coverage radius (at approximately FL290) in nautical mile from the station's coordinate
Remark	Note on any significant information. For example, any significant missing portion from the theoretical coverage.

* If latitude and longitude of the station's coordinate are not available as decimal degree, please fill in all the data fields below.

Lat(degree)	Degree as a whole number between **0 and 90**
Lat(minute)	Minute as a whole number between **0 and 59**
Lat(second)	Second as a decimal number between **0 and less than 60**
N-S	**N or S** (North or South)
Lon(degree)	Degree as a whole number between **0 and 180**
Lon(minute)	Minute as a whole number between **0 and 59**
Lon(second)	Second as a decimal number between **0 and less than 60**
E-W	**E or W** (East or West)

DCPC VHF sites – Sample Entry

State	Site_Name	Latitude(decimal)	Longitude(decimal)	Coverage(NM)	Remark	Lat(degree)	Lat(minute)	Lat(second)	N-S	Lon(degree)	Lon(minute)	Lon(second)	E-W
AAA	AAA001	12	100	200									

Surveillance sites – Sample Entry

State	Site_Name	Technology	Latitude(decimal)	Longitude(decimal)	Coverage(NM)	Remark	Lat(degree)	Lat(minute)	Lat(second)	N-S	Lon(degree)	Lon(minute)	Lon(second)	E-W
AAA	AAA001	ModeS	10	100	250									
AAA	AAA002	ADS-B	15	100	250									
AAA	AAA003	MSSR	10	150	200									