INTERNATIONAL CIVIL AVIATION ORGANIZATION

SEMINAR ON FREQUENCY USE

(Bangkok, Thailand, 16-18 September 2024)

FINAL REPORT

1. INTRODUCTION

1.1 The Seminar on Frequency Use was held at the ICAO Asia and Pacific (APAC) Regional Office in Bangkok, Thailand, from 16 to 18 September 2024. The primary objective of the Seminar was to address various challenges in aeronautical frequency management, with a focus on the unique issues faced by the APAC Region. The event aimed to facilitate the exchange of best practices and experiences, particularly in frequency use to support the harmonization of frequency assignment procedures in the region.

1.2 The Seminar was attended by 38 participants from 12 States/Administrations, (Australia, China, Hong Kong China, India, Indonesia, Lao P.D.R, New Zealand, Philippines, Sri Lanka, Thailand, United States and Viet Nam), 3 International Organizations (IATA, EUROCONTROL and ICAO). The list of participants is provided in **Attachment 1** to this report.

1.3 On behalf of the ICAO Regional Director, Mr. Tao Ma, Mr. Luo Yi, Technical Officer CNS of Air Navigation Bureau (ANB), former Regional Officer CNS of APAC, extended a warm welcome to the participants. He emphasized the significance of managing aeronautical frequencies efficiently in light of increasing demand for spectrum resources.

1.4 The Seminar was facilitated by Mr. Derek How from Hong Kong Civil Aviation Department, who served as Regional Officer at ICAO APAC Office in 2021-2022, moderated by Mr. Bertrand Desperier from EUROCONTROL, Ms. Rui Liu from Aviation Data Communication Corp. of China and Mr. Chainan Chaisompong, Chairperson of the Spectrum Review Working Group (SRWG) with assistance from Mr. Robert Witzen, former Technical Officer CNS of ANB.

1.5 The Seminar was conducted in English only, inclusive of all presentations and this Report. The list of presentations is provided in **Attachment 2** to this Report. All presentations could be referred from this link.

2. SEMINAR AND DISCUSSIONS

2.1 In the Seminar, participants were provided an in-depth overview on regulatory framework, frequency assignment planning, management, frequency management software tools, frequency management challenges in APAC and potential solutions, with insights shared from Europe.

2.2 The presentations highlights are provided as follows, in the order of discussion in the Seminar:

SP/01 - General principles in planning the assignment of aeronautical frequencies and overview of ICAO Doc. 9718 - by Secretariat

2.3 The presentation summarized the general principles in planning the assignment of aeronautical frequencies. In ICAO Annex 10 Volume V, a frequency allotment plan table is included national and for international/national use. It was noted that 117.975 – 137 MHz will need to be coordinated through ICAO Regional Offices. Each Region develops its allotment plan where sub-bands in the band 117.975 – 137 MHz are allocated for specific use of air-ground communication services. Review of the allotment plan, while protecting existing frequency assignments, may increase the amount of spectrum for use for use to support air traffic control services. Besides, the Secretariat highlights that the Frequency Finder can tailor the designated operational coverage (DOC) to the minimum DOC that is operationally required, and such use could be more frequency efficient. Current frequency coordination procedures in APAC were also presented and it was also noted that Extended Range facilities is no longer considered as interferer between each other. On ICAO Doc 9718, the Secretariat introduced the two Volumes, namely Spectrum Management and Frequency Management respectively, and explained the concept adopted for the compatibility criteria for frequency coordination. Discussions were made on the need for regional review of allotment table, and the DOC values used for compatibility analysis for air-ground communication and acknowledged the need for further discussion and review.

SP/02 - Asia Pacific Regional Frequency Management Manual - by China

2.4 The presentation introduced the Asia Pacific Regional Frequency Management Manual recommended from SRWG/4 in 2020 and adopted by CNS SG/27/05 to facilitate States/Administrations in the APAC Region to implement the frequency assignments in a coordinated manner with air navigation service provider (ANSP), civil aviation authority (CAA) and national frequency authorities, to satisfy future operational needs or the introduction of new technologies, with emphasis on communications and navigation systems. The presentation introduced by chapters on the objective and scope, the institutional framework, spectrum coordination and management, and detailed summary of the consideration of frequency management for air-ground communication (HF, VHF (including the use of back-up frequencies)) and radio navigation aid (NDB/ILS/VOR/GBAS/DME). The meeting acknowledged that further studies needed on HF allotment in the APAC Region, and more research on frequency assignment may need to enrich in certain navaids such as NDB is needed.

SP/06 - Regulatory Framework in Europe – by EUROCONTROL

2.5 The presentation firstly gave the overall introduction of situation in European air traffic management situation and background of EUROCONTROL and its network management, then it introduced the roles of the Frequency Management Group (FMG) in ICAO EUR/NAT Office, and high-level overview of ICAO EUR Doc 011, the Network Manager regulation in EU and the Radio Frequency Function (RFF) with its Stakeholder Groups including RAFT, ARIA, OTRA and MOST.

SP/03 - Frequency Situation in Europe – by EUROCONTROL

2.6 The presentation introduced the general situation of Frequency Management in Europe Region with the overall summary of frequency use in the ICAO Global Database. The seminar recognized the frequency congestion situation in Europe, including COM in respective TWR, APP and ACC levels, ILS & ILS DME, VOR & VOR DME and NDB & locators. VHF COM Services and the use in the band of 118 – 137 MHz in Europe were reviewed in the seminar. The presentation further introduced the history and implementation of channel spacing in Europe, with a highlight that the implementation of 8.33kHz channel spacing started from 1995 and gradually extended to full airspace in 2018 with a target to end any exemptions applied by 2030. The “5:1 Rule” (14dB D/U ratio) that used for co-channel separation calculation for VHF COM circular services was introduced with consideration of compatibility with Terrain. For VHF COM, it was noted that EUROCONTROL

adopted frequency shift to make room for specific frequency requests if found colliding with existing allotment, via Block Planning at twice a year, for the optimal use of spectrum with all requests and shifts computed together. The topic on how Block Planning was practically carried out was discussed in the seminar.

2.7 The presentation invited discussions on the potential application of datalinks as a solution to ease the use of VHF voice frequency congestion. In addition, in response to an enquiry in the seminar that the frequency use has been operating for many years with no interferences, but the Frequency Finder calculated with incompatibility, it could be due to the calculation assumed some degree of "over protection" while in actual use there could be compatible due to various factors, e.g. terrain.

2.8 A key take-away from the discussion on the presentation was that should any regions, including APAC, identified the need for implementation of 8.33kHz channel spacing, they should start early, referencing the experience of EUROCONTROL which took around 30 years to gradually transiting the airspace to the expected full use of 8.33kHz channel spacing with ending of all exemptions by 2030. It was noted that APAC has conducted simulations at regular interval of every 5 years for projection of the need for 8.33kHz channel spacing, and it was understood that the current 25kHz channel spacing could be largely satisfy the need for VHF COM use until 2030, with noted uncertainty to determine medium-term spectrum requirements for VHF COM services as identified in SRWG/6 in 2022.

SP/16 – FAA Frequency Support for Oil Rigs - United States

2.9 The presentation shared the information on FAA's use on oil rig frequencies, and their roles in frequency licensing for oil rigs in engineering and coordinating frequencies. The presentation shared the details for frequency assignment processes for VHF for ATC voice communications, NDB, Weather Station (AWOS), and ADS-B on 1090ES and 978 UAT respectively.

SP/04 – Oil Rigs Frequency use in Europe - by EUROCONTROL

2.10 The presentation introduced the general oil rig situation in Europe, including the highlights of different practices in assignment and usage/sharing in NDB and VHF COM, and the frequency density maps on NDB and VHF COM in Europe, the North Sea and the situation in United Kingdom respectively.

SP/17 – CNOOC Bohai Oilfield Helicopter NDB Navigation Frequency Multiplexing Research and Practice – by China

2.11 The presentation introduced the background of Bohai Oil Field in China, and overall usage and problems associated with the shortage of NDB frequencies available with respect to the increase in number of new built oil platforms. To resolve the bottleneck, two solutions were proposed. Unmanned oil platforms were gradually deployed in replacing traditional ones, and oilfields are divided into different regions first and then NDB frequencies were multiplexed in time-division within the same region, so that the same frequency could be reused at different times. The presentation further summarized the implementation methodology, shared the case studies on actual operations of NDB frequency multiplexing on operating helicopters, and provided future expectation in promoting the use of such time-division multiplexing on NDB frequency.

SP/08 – Frequency Management Tools – by EUROCONTROL

2.12 The presentation introduced the two software tools employed in EUROCONTROL, namely the *Spectrum & Frequency Information Resource* (SAFIRE), which is an online database used for assignments registration and coordination; and *Advanced Frequency Management (AFM)*, which is a tool set supporting assignments evaluation and compatibility calculations. Mr. Bertrand Desperier

demonstrated the various features of the AFM tool in the Seminar, including frequency assignment display and edition, polygon display and edition, compatibility to standards and terrain, frequency search, map plotting for spectrum visualization, displaying RT areas, density maps, 3D maps, terrain, coverage; ground sites; airspace module with ACC, APP, TWR and airport info, airspace structure and navaids details; FM broadcast compatibility and admin features, including generation of Auditing Report based on AIPs.

SP/18 – Demonstration on Frequency Finder – by India

2.13 The presentation demonstrated the ICAO Frequency Finder, software tool used in APAC and available to all the member states, for frequency allocation and coordination using frequency assignment planning criteria stipulated in ICAO Doc. 9718 and Annex 10. Various modules (VHF COM and NAV modules) from the Frequency Finder software tool were demonstrated in the Seminar and included demonstration of how frequencies were tested for compatibility as a stand-alone station or as an extended range.

SP/07 – Procedures in Europe – by EUROCONTROL

2.14 The presentation introduced the frequency coordination procedures in Europe. National Frequency Managers (NFM) served as State representatives for their CAAs or telecom authorities to coordinate frequency usages for all frequency users in their respective States to work with the Network Manager, Radio Frequency Function (NM RFF) in EUROCONTROL. The presentation shared various domains in frequency coordination in defining/planning for assessment of requests and identification of optimum solutions, facilitating coordination with other spectrum users, supporting service implementation and providing support to assure the ongoing use of assigned frequencies. The presentation also explains the coordination flowchart and the work of Network Manager Radio Frequency Function organization via providing services, tools and studies, to mitigate the impact on the network of the shortage of aeronautical frequency channels. The presentation further explained the details in spectrum management, the interregional coordination, and evaluation tasks carried out by EUROCONTROL, which would be useful for the APAC region to crosscheck its entries in Frequency Finder for identifying duplicated/erroneous entries thus facilitating more efficient use of frequencies in the APAC region. With discussion, Mr. Bertrand Desperier would kindly share their frequency audit report on APAC frequencies for crosschecking the entries in Frequency Finder tool.

SP/09 – Aeronautical frequency management in the APAC Region – by Secretariat

2.15 The presentation introduced the frequency management requirements (general regional requirements and special regional requirements) as stipulated in the Air Navigation Plan (ANP). The established APAC practice for radio spectrum coordination and management, based on the outcome from the 3rd Asia/Pacific Regional Air Navigation Meeting (Doc. 9614, ASIA/PAC/3 (1993)) and the updated ICAO Handbook on Radio Frequency Spectrum Requirements for Civil Aviation (Volume II), were highlighted. The role and function of the ICAO APAC Regional Office in frequency management, i.e. defend and promote ICAO position on various WRC agenda items affecting aviation, coordinate and manages the assignments of aeronautical frequencies were highlighted. The presentation also introduced the aeronautical frequency coordination procedures, the computer tools used for frequency coordination, formerly Frequency Manager and currently Frequency Finder. Regional efforts related to frequency management were also presented. It highlighted the achievements on frequencies coordinated and the interregional coordination conducted, achievements of the Spectrum Review Working Group (SRWG), the official regional contributory body related to frequency spectrum management under CNS Sub-Group in APAC Region, VHF COM requirement study , ILS/VOR 50kHz Channel spacing study, revision of VHF COM Frequency Allotment Plan, the drafting and adoption of APAC Regional Aeronautical Radio Frequency Management Guidance Material, and the coordination work in addressing radio frequency interferences.

SP/10 – Challenges for aeronautical VHF COM spectrum at APAC Region – by China

2.16 The presentation detailed various challenges in VHF COM spectrum in the APAC region, based on the study from the ad-hoc expert group on APAC VHF COM frequency allotment plan formed in SRWG/7 in 2023.

2.17 The first part of the presentation provided details on the frequency use analysis. The general allotment of 117.975–137MHz in APAC region was explained with analyses on sub-band usage (TWR, APP, ACC, FIS, AOC, VDL). The meeting also noted that each sub-band was being used by other services out of that intended usage, and some frequency allotment proposals had fallen into non-allotted part of APAC VHF COM frequency allotment plan. In addition, some allotments were found under-utilized which provide room for accommodating allotments from saturated frequencies or new requirements.

2.18 In the second part of the presentation, the progress on APAC VHF COM Allotment Plan research was presented. The meeting was informed that, based on the outcome of survey conducted by the ICAO APAC Regional Office, further discussion was required for the utilization and protection of the 128.950MHz for Traffic Information Broadcasts by Aircraft (TIBA). The meeting also noted that the continued use of the frequency 128.950 MHz for TIBA purpose may have been replaced by the use of air-to-air VHF communication channel on the frequency 123.450 MHz on a global basis (Annex 10, Volume V, 4.1.3.2) .

2.19 In addition, the outcomes from Aeronautical Spectrum Seminar held in Chengdu, China in 2023 which reviewed the frequency allotment plan were presented and discussed. The frequency allotment plan reviewed focused mainly in the frequency band 122.000–123.675 MHz (not allotted), 128.900–132.025 MHz (AOC) and 136.000 –137.000 MHz (VDL) sub-bands). It was recommended that various allotment of "sub-services" be converged to the main service to allow for more flexibility to accommodate new/modified frequency assignments requests from States/Administrations. The outcome from SRWG/8, where it was agreed that States/Administration intending to use or are using VHF frequencies for satellite-based VHF experimental system during the time that relevant SARPs and planning criteria are being developed should inform ICAO of their use, was also presented. The meeting also noted the plan to focus on the study of frequency band reduction for AOC service to provide more resources for other congested services.

SP/11 – Airline Spectrum Challenges – by IATA

2.20 The presentation described the overall aviation spectrum assigned over the past 40 years, with all new requests from various industries, in particular, the telecommunications industry. Relocation or sharing of existing frequencies would be the only option for accommodating new services, and the use of adjacent frequencies to existing frequencies allocated to aviation would be unavoidable. With the urgent need for frequencies from the telecommunication industry to cater the revolution in new technologies and services, e.g. 5G, there's a potential threat to legacy equipment e.g. radio altimeters (RADALT). The presentation emphasized the need for the aviation industry to more quickly adapt to technological advancement. An example was given that while new RAD ALT standards and designs were being developed, the telecommunications industry was already able to design a higher performing RF filter for aviation. 6G-Sky, an aviation and telecommunication industries partnership, was also highlighted. The presentation also suggested airlines prepare, financially and technically, for multiple avionic upgrades in the coming decade, to consult avionics vendors to ensure supply chains are rectified and have an action plan for implementation of new RAD ALT MOPS, to investigate and provide airlines perspective on the technology development pipeline at avionics vendors. As for the aviation industry, the presentation suggested the involvement of SMEs from telecommunications industry for new connectivity services, acknowledging that 2025 edition of RAD ALT MOPS did not account for all planned spectrum and technology deployments in coming decade including 6G, and to coordinate with telecommunications organization industry for mutual benefits and spectrum coexistence. Other spectrum issues were also highlighted, this included impact to the operation of radio

altimeter from 6G spectrum, potential interference to ILS/VOR/GBAS from digital FM and potential interference to VHF datalink from LED lighting.

SP/05 – Frequency use for VDL as registered in the APAC Frequency List 3 – by Secretariat

2.21 In this presentation, the use 128.800 MHz, 131.450 MHz, 131.550 MHz, 131.725 MHz, 131.850 MHz, 136.900 MHz, 136.925 MHz, 136.950 MHz and 136.975 MHz for VDL networks in the APAC region as published in the ICAO Frequency List 3 were reviewed and analyzed in depth. It is anticipated that air-ground datalink use will increase significantly because of requirements from aircraft operators to exchange more data pertinent to the operation of the aircraft. Currently in the APAC Region most of the use of frequencies for VDL was concentrated in the frequency band which is allotted for AOC in the APAC Region. The co-use of data link frequencies and other overlapping services, including ARINC/SITA or other unspecified datalink networks, were analyzed by plotting the respective coverage on the google earth to illustrate the situation to draw attention for further coordination / rectification for overlapping of service areas of different networks that may cause interference. The presentation referred to Europe's practice that if the first adjacent channel used for VDL Mode 2, the first adjacent 25kHz frequency could be used when the transmission from one VDL ground station is not received by other stations operating on the first channel. It was recommended that, frequency assignments registered as VDL but used for ACARS should be ideally registered in the APAC Frequency List 3 as AOC, VDL Modes 2 or VDL Mode 4 should be accommodated in the frequency band 136.5 – 136.975 MHz with each VDL Mode 2 network assigned one or more discrete frequencies, and all VDL Mode 2 networks should share 136.975MHz, the VDL Mode 2 Common Signaling Channel (CSC).

SP/12 – Datalink Frequencies – by EUROCONTROL

2.22 The presentation shared the operational roles for datalink in Europe, which were the VDL Mode 2 mandated above FL 285 for Controller/Pilot Data Link Communications (CPDLC), and the VDL Mode 2 and ACARS for AOC. With the high airspace coverage and high airborne equipage, CPDLC is one of the measures to reduce the reliance on VHF voice comms for ATC instructions. VHF Comms datalink were introduced to commercial aircraft only and often combined with 3rd DSB-AM (voice) radio for ACARS and VDL Mode 2 with dedicated sub-bands. Under EUROCONTROL, VDL Mode 2 uses Carrier Sense Multiple Access (CSMA) with a VDL channel, a service covering entire European airspace and no need to coordinate for the services. VDL Mode 2 channels are protected all over Europe for interregional coordination and ground stations would need protection. The current and future plans for VHF datalink sub-band were introduced, with expanding from current 5-channel plus CSC model with guard channels, to 11-12 channel plus CSC without the interleaving guard channels with the need for more coordination between DSP for ground station protection.

SP/13 – Aeronautical Operational Control (AOC) Frequencies Use – by China

2.23 The presentation introduced the background of Aeronautical Operational Control (AOC), which is used for communicating (voice and data) airline information between aircraft and its airline or service partners on the ground, which can be accessed through various applications. The information conveyed includes engine and aircraft status monitoring, pilot reports, fuel status, pilot-dispatcher communications, Out-Off-On-In (OOOI) and terminal weather for pilots. The AOC comms consists of voice (HF/VHF/SAT COM) and data (HFDL/VDL/SAT COM). AOC frequency could be assigned to each airline differently or shared by several airlines using independent ground stations, remote control systems or by VoIP, with each type of use, the benefits of centralized management of AOC equipment and frequency explained in depth in the presentation.

SP/14 – Asia Pacific Telecommunity (APT) Update on the Preparation for World Radio Communication Conference - 2027 (WRC-27) – by Thailand

2.24 The presentation provided an overview on the role and the importance of the World Radiocommunication Conference (WRC)to the aviation community. The highest level of spectrum management takes place at WRC to review Radio Regulation (RR), an international treaty governing the use of radio frequency spectrum, and addresses radiocommunication issues of a worldwide character. The availability and access to frequency spectrums, to ensure safe and efficient air traffic management through the assurance of reliable communication, accurate navigation, accurate/reliable surveillance, provision of weather information, timely and errorless situation awareness (via ACAS/Radio Altimeter) is dependent on the outcome of WRC. In preparation for WRC-27 for APAC, APT, an intergovernmental organization with 38 Member States from APAC, organizes the Conference Preparatory Group for WRC (APG) to develop common proposals for various WRC Agenda Items for submission at WRC as a Regional position. The presentation also provided the Agenda Items for WRC-27, highlight Agenda Item 1.7 (sharing and compatibility studies to identify additional spectrum for International Mobile Telecommunication (IMT)) and Agenda Items 1.19 (consider a new primary allocation in all Regions to Earth Exploration Satellite Service (EESS)) where the use of radio altimeter/wireless avionics intra-communication (WAIC) operating in the band 4200-4400 MHz could be affected. The outcome of the first APG meetings was also presented and States were encouraged to participate at National, Regional Preparatory Group Meetings to ensure favorable outcomes for aviation at WRC-27.

SP/15 – Addressing GNSS Vulnerability – by Secretariat

2.25 ICAO has been according importance to the issue of GNSS vulnerability, which includes interferences like jamming and spoofing. The topics has been discussed in various ICAO forums, both globally in ICAO Assembly and regionally in APANPIRGs, CNS Sub-Groups and SRWGs, and ICAO has formulated the mitigation strategies in addressing the issue, including encouraging States to establish and enforce robust regulatory frameworks, to establish interference detecting and reporting systems, to ensure aeronautical navigation redundancy and diversification, to ensure civil-military coordination in sharing and managing GNSS interference, and to raise the publish awareness and training on personnel in handling interference scenarios. Actions and recommendations were summarized in the presentation, including the development of contingency procedures, real-time monitoring, NOTAM issuance, strengthening conventional navigation systems, enhancing legal and regulatory measures and international cooperation in addressing GNSS vulnerabilities. Future prospects and innovations including the integration of new GNSS constellations, the deployment of dual-frequency multi-constellation (DFMC) GNSS and advanced receiver autonomous integrity monitoring (ARAIM) etc. would further enhance the navigation capabilities. In addition, there were roles from various stakeholder entities to improve the GNSS RFI situation. Governments and regulators were encouraged to implement Resolution COM 5/5 from WRC-23. Industry players were encouraged to invest in research and development to further advance GNSS technologies, and to work closely with regulatory bodies and stakeholders. International organizations would continue to lead, support and facilitate GNSS implementation and enhancements. Last but not least, through international collaboration, regional cooperation and adhering to global standards and best practices would enhance the implementation of GNSS.

3. SUMMARY OF OUTCOMES

3.1 The Seminar concluded with the following key outcomes:

i. Recognized the effort in APAC Region from numerous studies to increase the use of frequency resources in the region, noting the fruitful outcomes from SRWG;

ii. Further studies are needed on HF allotment in the APAC Region, and more research on frequency assignment may be needed for NDB and the Asia Pacific Regional Frequency Management Manual revised.

iii. Advance planning is required if APAC identified the need to implement 8.33 kHz channel spacing for VHF COM.

iv. Recommend to consider the need for frequency evaluation in APAC, similar to those conducted by EUROCONTROL, to improve the accuracy of frequency registration, identify errors to allow for a more effective use of frequency resources;

v. Noted time-division multiplexing of radio frequency as a possible solution to resolve frequency congestion for NDBs;

vi. Safety concern from potential interference to radio altimeter, operating in the frequency band 4200-4400 MHz, from 5G;

vii. Recognizing the impact to safety and efficiency to civil aviation from frequency interference on CNS infrastructure, in particular the impact to GNSS from spoofing and jamming, it was recommended that States in APAC (1) implement ICAO's recommendations/mitigation strategies and (2) monitor and report frequency interference encountered to appropriate Regional Working Group/Task Force for further consideration and action.

viii. Recommend that States/Administration (1) review and indicate frequencies, under their current frequency assignment, being used for ACARS in the "Remark" column in ICAO COM List 3, and (2) request for new frequency assignment(s), allocated for datalink communication, intended for use for ACARS should be clearly indicated in their request to ICAO in the "Remark" section in the Frequency Finder.

ix. Recommend that States/Administration in APAC region refers to the model used in Europe for the allocation and assignment for VDL Mode 2 for more efficient use of the frequency spectrum;

x. Recommend the need to review VHF COM Allotment Plan for APAC on a regular basis to increase the amount of spectrum available to support future growth in air traffic, and enhancement of frequency management software tool to support frequency assignment in APAC;

xi. Recommend co-ordination with ICAO APAC Regional Office for frequency assignments, as well as, enhance inter-regional coordination to mitigate interference and ensure efficient frequency use; and

xii. Recommend States/Administrations in APAC Region to support ICAO position on WRC-27 agenda items to ensure a favourable outcome for the aviation industry.

4. ANY OTHER BUSINESS

The Seminar was well-received by all attendees, who expressed appreciation for the opportunity to engage with experts in sessions and share their experiences in managing spectrum resources. Special thanks were extended to the moderators, Mr. Bertrand Desperier, Ms. Rui Liu and Mr. Chainan Chaisompong for their guidance and support throughout the event.

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* Online Attendance

LIST OF PRESENTATIONS

NO.	TITLE OF PRESENTATIONS	Presented by
SP/01	General Principles and ICAO DOC 9718	Secretariat
SP/02	Asia Pacific Regional Frequency Management Manual	China
SP/03	Frequency Situation in Europe	Eurocontrol
SP/04	Oil Rigs Frequency use in Europe	Eurocontrol
SP/05	Frequency use for VDL as registered in the APAC Frequency List 3	Secretariat
SP/06	Regulatory Framework in Europe	Eurocontrol
SP/07	Procedures in Europe	Eurocontrol
SP/08	Frequency Management Tools	Eurocontrol
SP/09	Aeronautical frequency management in the APAC Region	Secretariat
SP/10	Challenges for aeronautical VHF COM spectrum at APAC Region	China
SP/11	Airline Spectrum Challenges	IATA
SP/12	Datalink Frequencies	Eurocontrol
SP/13	Aeronautical Operational Control (AOC) Frequencies Use	China
SP/14	APT Update on the Preparation for WRC-27	Thailand
SP/15	GNSS Vulnerability	Secretariat
SP/16	Focus on offshore platform - FAA	USA
SP/17	CNOOC Bohai Oilfield Helicopter NDB Navigation Frequency Multiplexing Research and Practice	China
SP/18	Demonstration on Frequency Finder	India