

ICAO Webinar for China 2023

28 November 2023



ICAO

**INTERNATIONAL
CIVIL AVIATION
ORGANIZATION**

A UN SPECIALIZED AGENCY

CNS Activities in the APAC Region

亚太地区的CNS工作

罗奕，ICAO APAC地区通信、导航和监视官员

By Mr. LUO Yi, Regional Officer, Communications, Navigation and Surveillance

yluo@icao.int

RECONNECTING THE WORLD



- 罗奕, 四川珙县人, 1988年四川大学计算机科学系毕业分配到西南管理局通信处, 历任航管计算机室机务员、机房主任, 西南空管局通信总站航管站副站长、站长, 通信总站(现名技术保障中心)副站长, 规划发展处副处长, 2007年2月起任西南空管局通信导航监视处处长(部长), 2018年7月加入ICAO, 任亚太地区通信、导航和监视官员。
- 2001年担任CATS项目现场经理, 2004年担任成都二次雷达、16信道VHF、广元二次雷达项目组组长。
- 1999年获高级工程师资格, 曾参与民航空管专业高评委、民航工程咨询公司项目评审等工作。



Agenda

- What is CNS 什么是CNS
- Regional requirements and implementation 区域要求和实施
- Regional Officer, CNS 地区通信、导航和监视官员
- Challenges 挑战



CNS

- **Communications**^{*}:通信
 - Transferring information / for stakeholders 为利益相关者传递信息
 - Ground-ground, Air-ground 地对地、空对地
- **Navigation** 导航
 - Knowing the position / reference for pilot 了解位置/飞行员的参考
 - in a known coordinates system 在已知的坐标系中
- **Surveillance** 监视
 - Detect the desired target / tool of controller 检测所需目标/航空管制员的工具
 - Dependent and independent 相关监视和独立监视
- **Technology** ↔ **Requirements** 技术 ↔ 要求
- **ANS infrastructure** 航行服务基础设施

*ICAO DOC 7300 **Convention on International Civil Aviation**



地区办事处在 CNS 中的作用

- Interregional coordination, harmonized implementation of the CNS aspects included in ICAO Strategic Objectives, SARPs, PANS, SUPPs and ANPs, identification of deficiencies of regional ANS capabilities, and assistance to Member States to resolve the related issues. 地区间协调，统一实施国际民航组织战略目标、标准和建议措施、空中航行服务、SUPP 和 ANP 中包含的 CNS 方面，查明地区ANS 能力的缺陷，并协助成员国解决相关问题。
- Provides technical guidance and assists States in their implementation activities as well as monitors and reports the implementation of CNS facilities and services. Helps to establish regional and sub-regional priorities and targets through coordination with the PIRG, develops and/or coordinates CNS related proposals for amendments to the SUPPs and the ANPs, submits proposals of amendments for SARPs, PANS, ANPs from accredited States to ICAO headquarters, and provides CNS technical input to ICAO HQ. 提供技术指导并协助各国开展实施活动，并监测和报告 CNS 设施和服务的实施情况。通过与 PIRG 协调，帮助确定地区和次区域优先事项和目标，制定和/或协调 CNS 相关的 SUPP 和 ANP 修订提案，向国际民航组织总部提交归于亚太地区认可国家的 SARP、PANS、ANP 修订提案，并向国际民航组织总部提供 CNS 技术输入。



Air Navigation Objectives in CNS area

- providing States assistance in the effective **planning and implementation of CNS facilities, services and ICAO SARPs** related to CNS, aiming at increasing **capacity** and improving **efficiency** of the aviation system, helping achieve the **harmonization and interoperability** at regional and global level. 向各国提供援助，以有效规划和实施 CNS 设施、服务以及与 CNS 相关的国际民航组织标准和建议措施，旨在提高航空系统的能力和效率，帮助实现区域和全球层面的协调和互操作性。



➤ Communications

- Transition to AMHS, CRV, A-G data link 过渡到 AMHS、CRV、A-G 数据链

➤ Navigation

- GNSS based operations are encouraged 鼓励基于 GNSS 的运行
- Optimize the existing ground-based navigation network to support PBN operations 优化现有地基导航网络，支持 PBN 运行

➤ Surveillance

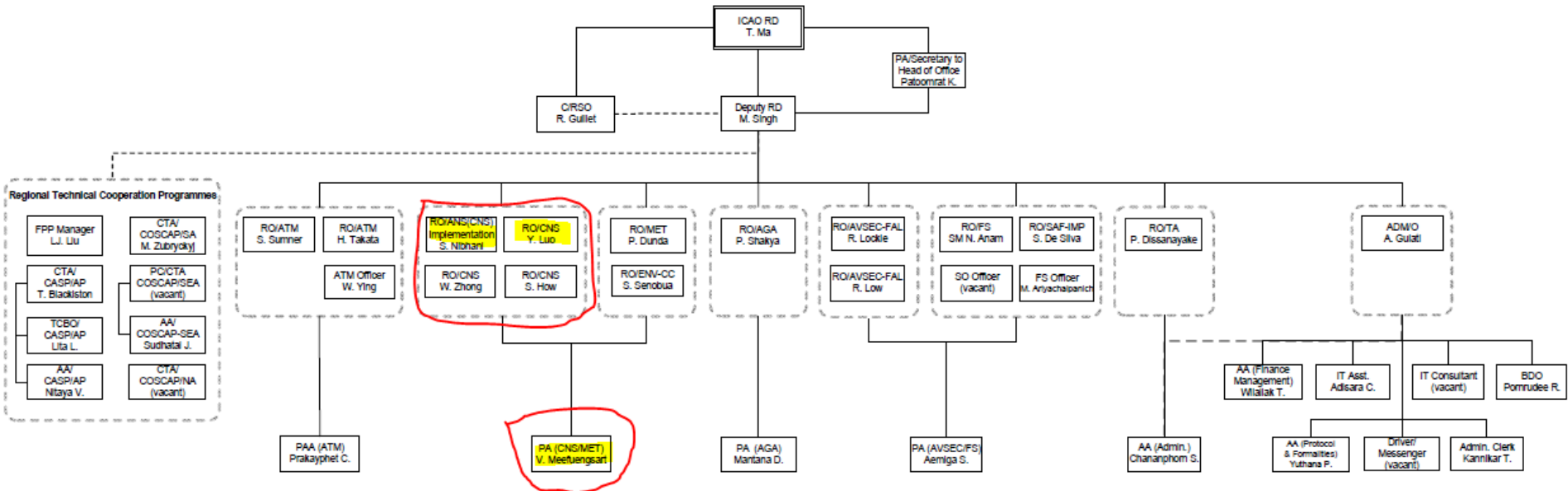
- mixed application of different surveillance techniques for the best cost-effectiveness 混合应用不同的监控技术以获得最佳成本效益
- improve air/ground common situational awareness 提高空中/地面共同态势感知

➤ Frequency

- Implement a global aeronautical frequency database 实施全球航空频率数据库



ICAO APAC RO Organizational Chart





REGIONAL OFFICER, CNS

- The Regional Officer, Communications, Navigation and Surveillance (**RO/CNS**) 地区通信、导航和监视官员
 - deals with and is accountable for the work on **all** matters pertaining to CNS and the safety of aircraft operations for Asia and Pacific (APAC) Region. He/she works under the supervision of the Deputy Regional Director. 处理并负责与亚太地区 (APAC) CNS 和飞机运行安全相关的所有事务的工作。
- **Qualifications and Experience** 资格和经验
 - First level university degree 大学学位
 - Considerable experience (10 years or more) 丰富的经验 (10年或以上)
 - Fluent reading, writing and speaking abilities in English 流利的英语阅读、写作和口语能力



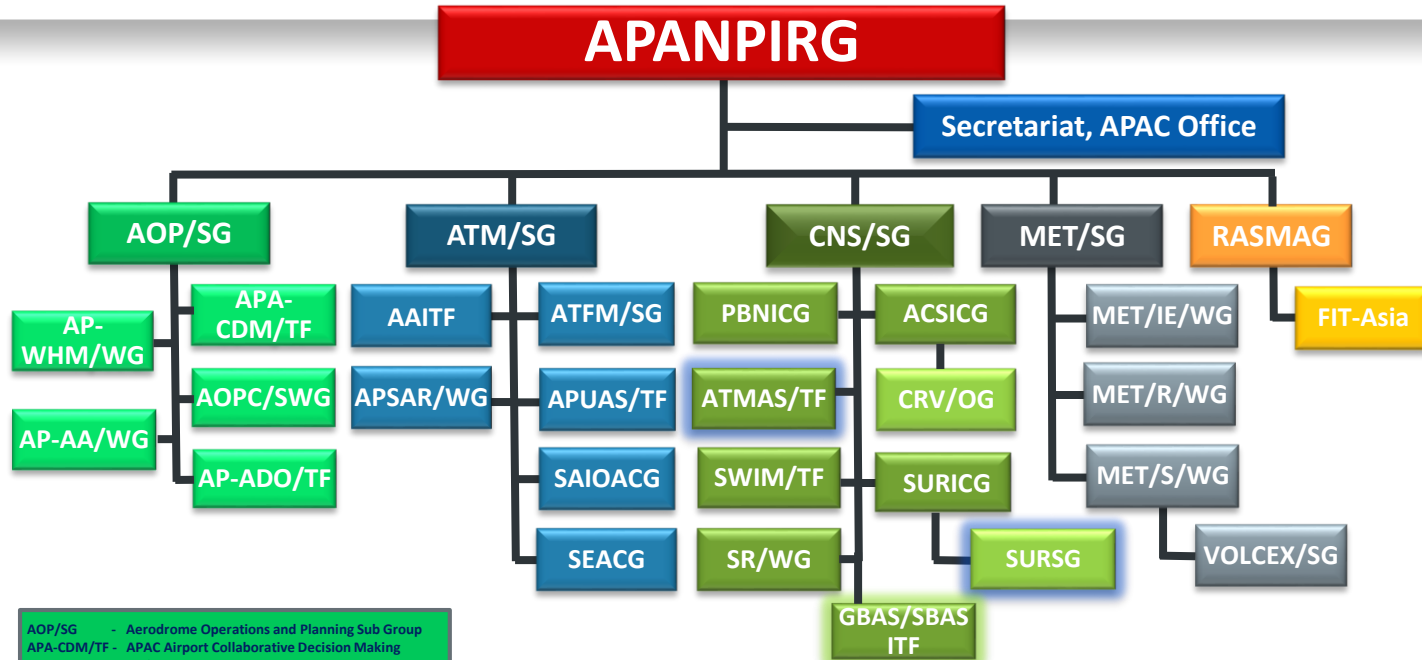
Considerations on Implementation

- Implement SARPs **appropriately** to the level and scope of the aviation activity in a member State, with the necessary human and financial resources. 根据成员国航空活动的水平和范围**适当**实施标准和建议措施,并配备必要的人力和财力资源。
- **ANP Vol 1. Part III CNS**, constitutes the agreed regional requirements considered to be the **minimum necessary** for effective planning and implementation of CNS facilities and services in the Asia and Pacific Regions and complements the provisions of ICAO SARPs related to CNS. ANP 第 1 卷第 III 部分 CNS 构成商定的区域要求,被认为是在亚太地区有效规划和实施 CNS 设施和服务所需的最低要求,并补充了国际民航组织与 CNS 相关的标准和建议措施的规定。
- In planning for these elements, **economy and efficiency** should be taken into account in order to ensure that the requirements for the provision of CNS facilities and services can be kept to a **minimum**. 在规划这些要素时,应考虑**经济性和效率**,以确保将提供 CNS 设施和服务的要求保持在**最低限度**。



APANPIRG

- **Asia/Pacific Air Navigation Planning and Implementation Regional Group** 亚洲/太平洋空中航行规划和实施地区小组
 - to ensure continuous and coherent development of the Asia/Pacific Regional Air Navigation Plan and other relevant regional documentation in a manner that is harmonized with adjacent regions, consistent with ICAO SARPs and Global Air Navigation Plan (DOC 9750) and reflecting global requirements; 确保以与邻近地区协调一致的方式持续、连贯地制定亚太地区空中航行计划和其他相关地区文件，符合国际民航组织标准和建议措施和全球空中航行计划（DOC 9750）并反映全球要求；
 - to facilitate the implementation of air navigation systems and services as identified in the Asia/Pacific Regional Air Navigation Plan (ANP or RANP) with due observance to the primacy of air safety, regularity and efficiency; 促进亚太地区空中航行计划（ANP或RANP）中确定的空中航行系统和服务的实施，同时严格地奉行空中安全、正常和效率的首要地位；
 - to identify and address specific deficiencies in the air navigation field. 找出并解决空中航行领域的具体缺陷。



- AOP/SG - Aerodrome Operations and Planning Sub Group
- APA-CDM/TF - APAC Airport Collaborative Decision Making Task Force
- AOPC/SWG - Aerodrome Operations Personnel Competency Small Working Group
- AP-ADO/TF - APAC Aerodrome Design and Operations Task Force
- AP-WHM/WG - APAC Wildlife Hazard Management Working Group
- AP-AA/WG - APAC Aerodrome Assistance Working Group

- ATM/SG - ATM Sub Group
- AAITF - AIS - AIM Implementation Task Force
- APSAR/WG - APAC Search and Rescue Working Group
- ATFM/SG - ATFM Steering Group
- APUAS/TF - APAC Unmanned Aircraft System Task Force
- SAIOACG - South Asia Indian Ocean ATM Coordination Group
- SEACG - South East Asia ATS Coordination Group

- CNS/SG - CNS Sub Group
- PBNICG - PBN Implementation Coordination Group
- ATMAS/TF - ATM Automation System Implementation Task Force
- SWIM/TF - System-Wide Information Management Task Force
- SR/WG - Spectrum Review Working Group
- ACSICG - Aeronautical Communication Services Implementation Coordination Group
- CRV/OG - Common aeRONautical Virtual Private Network (VPN) Operations Group
- SURICG - Surveillance Implementation Coordination Group
- SURSG - Surveillance Data Sharing Study Group
- GBAS/SBAS ITF - GBAS/SBAS Implementation Task Force

- MET/SG - Meteorology Sub Group
- MET/IE/WG - Meteorological Information Exchange Working Group
- MET/R/WG - Meteorological Requirements Working Group
- MET/S/WG - Meteorological Services Working Group
- VOLCEX/SG - (APAC) Volcanic Ash Exercises Steering Group

- RASMAG - Regional Airspace Safety Monitoring Advisory Group
- FIT-ASIA - FANS Implementation Team - Asia



Main Activities (agenda of meetings)

- Regional strategies地区战略
 - Promote AMS digital application & Datalink 推广AMS数字化应用及数据链
 - Transition to IP; 向IP过渡;
 - Encourage GNSS based application; 鼓励基于全球导航卫星系统的应用;
 - ADS-B Implementation and data sharing; ADS-B 实施和数据共享
 - SSR Mode S implementation; SSR S 模式实施;
 - Explore space-based ADS-B and VHF Voice/Data COM探索天基 ADS-B 和 VHF 语音/数据 COM
- Regional Guidance Materials地区指导材料
- Regional Project promotion and coordination: AIDC, AMHS transition, CRV, SWIM区域项目推广和协调: AIDC、AMHS 过渡、CRV、SWIM
- Operations support: AFTN Routine table, Frequency coordination, Resolution of interference, Radar IC management, SAC planning运行支持AFTN路由表、频率协调、干扰解决、雷达 IC 管理、SAC 规划
- ASBU implementation航空系统组块升级实施
- Human Factors and Air Traffic Safety Electronics Personnel (ATSEPs) 人为因素和空中交通安全电子人员 (ATSEP)
- Contingency planning and disaster recovery应急计划和灾难恢复
- Cybersecurity & Trust framework网络安全和信任框架
- Innovation in aviation (relevant to CNS) 创新（与 CNS 相关）



22 events in 2023

JAN	CRV Governance Workshop (31 Jan)				
	61				
FEB	CRV OG/11 (1-3 Feb)	WRC-23 Workshop(13-14 Feb)	SRWG/7(15-17 Feb)	FSMP-WG/16 (15-24 Feb)	
	65	123	58	115	
MAR	SURSG/3 (22-24 Mar)	Mode S and DAPs WG/6 (28-30 Mar)			
	102	76			
APR	PBNICG/10(19-21 Apr) RSO,CNS				
	79				
MAY	SWIM Seminar (8 May)	SWIM TF/7 (9-12 May)	ACSICG/10 (24-26 May)		
	73	73	62		
JUN	Aircraft Address and Target Identification in Surveillance Data and Flight Plan Workshop (5 Jun)	SURICG/8 (6-9 Jun)	SBAS/GBAS ITF/ 5 (21-23 Jun) RSO	ATMAS Seminar (27 Jun)	ATMAS TF /4 (28-30 Jun)
	72	79	81	87	81
SEP	CNS SG/27 (28 Aug – 1 Sep)	Innovation Workshop HQ, CNS, RSO (6 - 7 Sep)			
	104	36			
OCT	Workshop on Frequency Finder (9-13 Oct)	CP WG-I/38 (16-20 Oct)	CP WG-M/2 (23-27 Oct)		
	32	51	40		
NOV	SWIM TF/8 (6-10 Nov)			15 mtg+7 w/c	



ICAO is a forum*

国际民航组织是一个论坛

- <https://www.icao.int/APAC/Meetings/Pages/default.aspx>
 - The views expressed in this report should be taken as those of *ABC XYZ Meeting* and not of the Organization.
 - 本报告中表达的观点应视为*ABC XYZ会议*的观点，而非本组织的观点。

*ICAO Vision and mission statement

<https://www.icao.int/about-icao/Council/Pages/vision-and-mission.aspx>

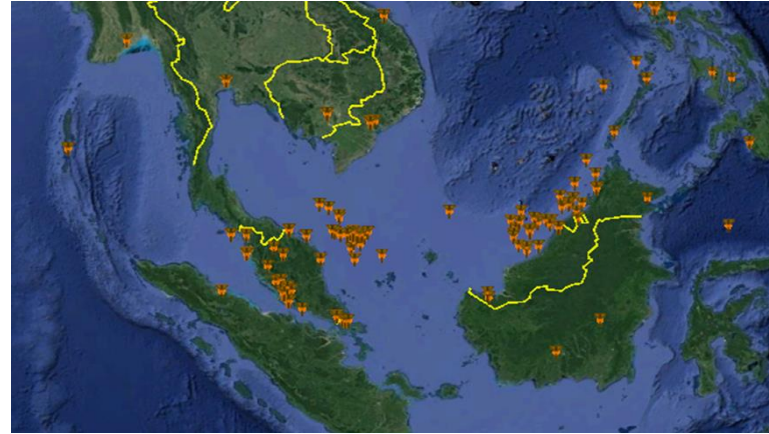


Example 1: Frequency Spectrum Matters

- Spectrum - A finite and limited **natural resource**, managed by ITU through WRCs held every four years. Changes are made to the ITU Radio Regulations, including the Table of Frequency Allocations, on the basis of proposals by **States**. 频谱:一种有限的自然资源, 由国际电联通过每四年举行一次的世界无线电通信大会进行管理。根据各国提案, 对国际电联《无线电规则》(包括频率分配表) 进行修改。
- For safe aircraft operations, CNS functions rely on a common resource — continued and interference-free access to **frequency spectrum**. 为了安全的飞机运行, CNS系统功能依赖于一个公共资源——持续且无干扰地访问频谱。
- **Regional Office地区办事处**
 - Frequency coordination for Exclusive aeronautical bands 专用航空频段的频率协调
 - Maintain Frequency Lists, Resolution of interference 维护频率表, 解决干扰
 - Defend ICAO position 捍卫国际民航组织的立场
 - ICAO Position contains the agreed radio frequency allocation requirements for aeronautical radio services to support safety-critical aeronautical CNS systems. 国际民航组织立场包含商定的航空无线电服务无线电频率分配要求, 以支持安全关键的航空 CNS 系统。
 - ICAO position used by civil aviation authorities in their national discussions with the radio regulatory authorities when developing proposals for submission by their administrations to meetings of regional telecommunication organizations (**APT** in APAC) which prepare regional positions for ITU conferences. 民航当局在与无线电监管当局进行国家讨论时使用国际民航组织的立场, 制定建议, 供其主管部门提交给地区电信组织(亚太地区的 **APT**) 会议, 这些组织为国际电联会议准备地区立场。
 - ICAO position is submitted by ICAO to the regional ITU conferences as IP. 国际民航组织的立场由国际民航组织作为信息文件(IP)提交给国际电联地区会议。

Example 2: Issues to be addressed

- **Frequency Use by Oilrigs** 石油钻井平台的频率使用
- Oil rigs usually use NDB and VHF COM (AOC) for operation. With more and more oil platforms are being implemented over the south China sea, and the need for assignment of AOC frequency to oceangoing ships, the current procedure and use of frequency is depleting the resource quickly and projecting risks to the safety and regularity of air transportation in Southeast Asia. 石油钻井平台通常使用NDB和VHF COM (AOC) 进行操作。随着越来越多的石油平台在南海建设, 以及向远洋船舶分配AOC频率的需要, 目前的频率程序和使用正在迅速耗尽资源, 并对东南亚航空运输的安全和正常带来风险。
- **ADS-B Implementation** ADS-B 实施
- Some States installed ADS-B g/s, which were intended not only to supplement the MSSR-based surveillance but also to extend the coverage in the far region with NRA operations. However, to ensure compliance with the PANS-ATM procedures while implementing ADS-B based surveillance services the quality of information has been rested on the States (or appropriate ATS authority) without any accompanying technical guidance. States have been unable to use ADS-B operationally for the provision of air traffic services- vectoring, separation- in order to realize efficient use of airspace. 一些国家安装了 ADS-B g/s, 其目的不仅是补充基于 MSSR 的监视, 而且是为了通过 NRA 扩大偏远地区的覆盖范围。然而, 为了确保在实施基于 ADS-B 的监视服务时遵守 PANS-ATM 程序, 信息质量由各国 (或适当的 ATS 当局) 承担, 而没有任何附带的技术指导。各国一直无法在运营中使用 ADS-B 来提供空中交通服务 (引导、间隔), 以实现空域的高效利用。





Evolution of CNS Elements CNS要素的演变

- CNS, **C**ommunications, **N**avigation and **S**urveillance are key technology elements to support today's ANS. 通信、导航和监视(CNS)是支持当今 ANS 的关键技术要素。
 - **C**: Transferring data, fundamental role in C,N,S elements, basis for all DEPENDENT application.
 - **C**: 传输数据, **C**、**N**、**S** 要素的基础, 所有相关应用的基础。
 - **N**: Dependency on conventional navigation infrastructure keeps going down, more and more new navigation means implemented with the use of GNSS, data communication and information processing.
 - **N**: 对传统导航基础设施的依赖不断下降, 越来越多的新导航手段利用 GNSS、数据通信和信息处理实现。
 - **S**: Ground-based surveillance is being replaced by GNSS application, ADS-B, bi-directional data communication, and common situation between pilot and controller now is possible.
 - **S**: 地面监视正在被 GNSS 应用、ADS-B、双向数据通信所取代, 飞行员和管制员之间的共同态势情境现在已经成为可能。



Contribute as an Individual

作为个体的贡献

- Think globally, act locally 全球化思考，本地化行动
- Opportunity to serve ICAO 为国际民航组织服务的机会
 - International exposure 国际曝光机会
 - Meetings: paper author/presenter, chairperson
 - 会议：论文作者/演讲者、会议主席
 - Careers in UN system 联合国系统的职业机会
 - Officer, Consultant, SME, JPO, Seconded
 - 官员、顾问、专家、初级专业官员、借调人员
- Involve in the process to make international standard 参与制定国际标准的过程
 - subscribing the email service from EUROCAE webpage at www.eurocae.net to benefit from the open consultation process in the standards development, to gain visibility and have the possibility to provide comments on draft standards
 - 订阅 EUROCAE 网页 www.eurocae.net 的电子邮件服务，从标准制定的公开咨询流程中受益，获得可见性并有可能对标准草案提供意见



ICAO

RECONNECTING THE WORLD



ICAO

North American
Central American
and Caribbean
(NACC) Office
Mexico City

South American
(SAM) Office
Lima

ICAO
Headquarters
Montréal

Western and
Central African
(WACAF) Office
Dakar

European and
North Atlantic
(EUR/NAT) Office
Paris

Middle East
(MID) Office
Cairo

Eastern and
Southern African
(ESAF) Office
Nairobi

Asia and Pacific
(APAC) Sub-office
Beijing

Asia and Pacific
(APAC) Office
Bangkok



THANK YOU