航空交通工程服務
Air Traffic Engineering Services

航空交通工程服務部負責設計、規劃、統籌、提供和驗收航空交通管制（空管）系統、雷達、導航儀器和通訊設備。

The Air Traffic Engineering Services Division (AESD) is responsible for the design, planning, coordination, provision and commissioning of air traffic control (ATC) systems, radars, navigational aids and communication facilities.

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現時的空管系統於一九九八年香港國際機場啟用時投入運作，至今已使用超過17年。為應付未來的航空交通需求，本處於二零零七年獲立法會撥款15.65億元更換現有的空管系統。整個新空管系統透過八份主要合約實施，當中七份合約的工作已如期完成，並由二零一三年起分階段啟用，運作暢順。至於餘下的航空交通管理（航管）系統，民航處按國際航空安全管理標準和政府既定程序，對系統進行了一系列的嚴格驗收測試（包括實地驗收測試、飛行校驗測試、可靠性驗收測試和系統整合測試），並對系統作全面的安全評估，以確保系統的運作符合安全管理規定和合約條款。

為進一步確保新航管系統在安全管理和運作方面準備就緒，民航處在二零一二年委聘了獨立顧問提供專業意見，以及舉辦安全評估工作坊，以助有關人員就新空管系統的設計、推行和過渡制訂安全個案報告。獨立顧問已完成有關工作，並提出了制訂安全個案報告的工作框架。民航處已採用該框架，以按照國際民航組織的規定，編製報告供內部評估。

運輸及房屋局（運房局）於二零一五年十一月初委聘另一顧問，評估系統與操作人員的準備狀況，並向運房局提供獨立意見，進一步確保新航管系統的運作安全、可靠和穩定。顧問以二零一五年十二月的情況為依據，進行了「定照」方式的檢討。根據顧問的評估，系統工程屬安全、穩定和可靠，與其他地區的空管中心的良好做法看齊。顧問並建議採用分階段的方式過渡至新系統。

民航處在考慮過運房局顧問的建議，以及內部對整體運作準備狀況的評估後，計劃由二零一六年六月起逐步推行新航管系統。民航處將就分階段啟用所累積的經驗和進展、操作人員的準備狀況和資源需求等相關因素進行審慎的評估，並會參考運房局及民航處聘請的海外獨立顧問的意見。在

The existing ATC systems have been in use for over 17 years since the opening of Hong Kong International Airport (HKIA) in 1998. To meet the future air traffic demand, the Legislative Council approved a provision of $1.565 billion in 2007 for replacement of the existing ATC systems. The new ATC systems are implemented through eight major system contracts, seven of which have been completed as scheduled. Seven systems have been put into operational use by phases since 2013 and operating smoothly. For the remaining Air Traffic Management System (ATMS), a series of stringent system acceptance tests (including Site Acceptance Tests, Flight Check Acceptance Tests, Reliability Acceptance Tests and System Integration Tests) and comprehensive safety assessment have been conducted in accordance with international aviation safety management standards and established Government procedures, in order to ensure that the system operation complies with the safety management requirements and contract conditions.

To further ensure safety management and operational readiness of the new ATMS, CAD engaged an independent consultant in 2012 to provide expert advice and conduct safety assessment workshops for colleagues involved in formulating the safety case reports on the design, implementation and transition of the new ATC Systems. The consultant completed its tasks and recommended a framework of actions for formulating the safety case reports. The framework was adopted by CAD in compiling the reports for internal assessment as required by the International Civil Aviation Organization (ICAO).

The Transport and Housing Bureau (THB) has separately appointed another consultant in November 2015 to assess system and staff readiness and render independent advice to THB as an additional check point in ensuring safety, reliability and stability of the new ATMS operations. The consultant completed a "snapshot" review, based on the situation as at December 2015. According to their assessment, the engineering aspect of the ATMS was safe, stable and reliable, and on par with the good practice of ATC centres in other jurisdictions. They further recommended a phased transition approach of the new system.

Taking into account the recommendation from the THB consultant as well as CAD's own assessment on the overall operational readiness, CAD planned to launch the new ATMS incrementally from June 2016 onwards. CAD will base on actual experience gained and progress of phased implementation, as well as other related factors such as staff readiness and resource needs to carry out prudent assessment, while making reference to the advice by the THB's and CAD's overseas independent consultants.

新空管系統進行全面測試。
The New ATC System was undergoing thorough testing.

系統和操作人員均準備就緒後，才會將新航管系統全面投入運作。

The new ATMS will be fully commissioned and operated after both system and staff are ready.

國際民航組織提出的航空系統組塊升級

民航處根據國際民航組織的航空系統組塊升級框架，並考慮到亞太地區的《無縫空中交通管理計劃書》的優先次序，成功地與航空業界共同制定相關策略，分階段在香港實施各個組塊升級項目。年內，民航處繼續就航空系統組塊升級項目與持份者合作，並取得相當進展，特別是先進場面活動引導和控制系統、廣播式自動相關監察系統和航空交通服務設施間數據通訊等項目。

ICAO's Aviation System Block Upgrades

In accordance with ICAO's Aviation System Block Upgrades (ASBU) framework and after taking into consideration the priorities stipulated in the Seamless Air Traffic Management (ATM) Plan for the Asia and Pacific region, CAD collaborated successfully with the aviation industry to develop strategies for phased implementation of ASBU modules in Hong Kong. Throughout the year, CAD continued working with the stakeholders on relevant ASBU modules and steady progress was achieved, especially in the areas related to Advanced Surface Movement Guidance and Control System(A-SMGCS), Automatic Dependent Surveillance-Broadcast (ADS-B) and Air Traffic Services Inter-facility Data Communication(AIDC).

持續發展安全管理系統，以提供穩妥的通訊、導航及監察服務和重要的屋宇裝備

在同事羣策羣力持續提升安全管理系統下，本部成功通過航空交通管理標準組對安全管理系統進行的全面監管審計，並獲續發安全管理系統證書，由二零一六年一月起生效，為期五年。這項重要成果，標誌着本部經提升的安全管理系統已更趨成熟和全面，完全符合國際民航組織的安全要求。本部亦全力配合航空交通管理標準組對衛星通訊、導航及監察/航管系統、外站運作，以及技術安全事故報告和調查程序所進行的定期審計和視察。

Ongoing Development of the Safety Management System in Support of the Provision of Safe Communications, Navigation, Surveillance and Critical Building Services

With concerted efforts of colleagues on continuous enhancement of Safety Management System (SMS), AESD passed the comprehensive SMS regulatory audits conducted by the Air Traffic Management Standards Office (ATMSO) and successfully renewed the SMS Certificate for another 5 years in January 2016. It was a great achievement signifying the enhanced SMS has become more mature and comprehensive while in full compliance with the ICAO safety requirements. AESD also provided full support to the ATMSO's regular audits and inspections on the satellite-based Communications, Navigation, Surveillance (CNS)/ATM systems, outstation operations, and Technical Safety Occurrence (TSO) reporting and investigation processes.

為配合持續不輟的安全保證工作，本部積極推行在職培訓，使更多相關同事成為認可審計人員，參與內部定期審計和視察工作。年內，本部繼續致力推廣安全意識，舉辦安全訓練和推廣活動。二零一六年二月，本部安排了海外專家到民航處總部，為同事提供培訓，以加強他們對通訊、導航及監察、航管和屋宇裝備／設施進行技術安全事故調查和分析的認識。

除了對現有通訊、導航及監察／航管系統的安全表現指標和目標進行定期安全趨勢檢視，以及按照檢視結果制訂有效的緩解風險措施之外，本部正參照適當的國際最佳做法，就屋宇裝備／設施（包括機電項目）和新空管系統，制訂新的安全表現指標和目標。

To support continuous safety assurance through regular internal audits and inspections, efforts were made to expand the pool of AESD approved auditors. Throughout the year, AESD continued its momentum in safety promulgation through organising safety training sessions and promotional activities. In February 2016, AESD arranged an overseas expert to provide training at the CAD Headquarters to better colleagues' understanding of TSO investigation and analysis on CNS, ATM and building services equipment/facilities.

In addition to the regular reviews of the safety trend of Safety Performance Indicators/Target (SPIs/SPT) for the existing CNS/ATM systems and formulating effective risk mitigating measures in accordance with the review results, new SPIs/SPT for the building services (including electrical and mechanical) equipment/facilities and new ATC systems were being formulated with reference to international best practices, as appropriate.

二零一六年二月，本部安排海外專家就通訊、導航及監察，航管系統和屋宇裝備／設施所進行的技術安全事故調查和分析工作，為民航處人員提供培訓，以加強他們對有關專業範疇的認識。
In February 2016, CAD arranged an overseas expert to deliver training courses on investigation and analysis of Technical Safety Occurrence on CNS, ATM and building services equipment/facilities to better colleagues' understanding in this specialised domain.

衛星通訊、導航及監察／航管系統

為遵從國際民航組織的全球空中航行計劃，民航處已開發及使用多項衛星通訊、導航及監察／航管系統和服務。當中，飛前放行指示雙向數據鏈路系統、電子飛行進程單系統和抵港航機排序系統在過去數年運作理想，為業界的營運帶來裨益。其他的最新發展概述如下：

(一) 航空電訊網、航空交通服務訊息處理系統和航空交通服務設施間數據通訊

按照國際民航組織亞太地區航空電訊網和航空交通服務訊息處理系統實施計劃，香港與曼谷的電訊網和訊息處理系統已投入運作。香港現正與北京進行測試和試行，兩地的電訊網和訊息處理系統預期於二零一七年投入運作。

本部利用航空固定電訊網，與三亞和台北實施了全日24小時航空交通服務設施間數據通訊，以加強飛行安全，並提升與毗鄰空管中心的通訊運作效率。此外，本部已經與廣州和馬尼拉協調，並計劃於二零一六年第二季開展航空交通服務設施間數據通訊的初期技術測試和試行。

(二) 先進場面活動引導和控制系統

鑑於航空交通量不斷增加及機場環境持續變動，本部安排了系統供應商全面檢視先進場面活動引導和控制系統訊號的完整性和覆蓋範圍。根據檢視報告的建議，機場中場客運廊已於二零一五年十二月增設外站單元機組，以增強系統訊號的覆蓋能力。我們並計劃提升同類系統，以配合即將進行的機場基建發展。

Satellite-based CNS/ATM Systems

To comply with the ICAO Global Air Navigation Plan, CAD has developed and implemented various satellite-based CNS/ATM systems and services. The Pre-Departure Clearance Two-way Datalink Service, the Electronic Flight Strip System and the Arrival Manager System have been in satisfactory operation for some years bringing operational benefits to aviation stakeholders. The latest development of the others is highlighted below:

(i) Aeronautical Telecommunication Network, Air Traffic Services Message Handling System and Air Traffic Services Inter-facility Data Communication

In accordance with the ICAO Asia-Pacific Regional Aeronautical Telecommunication Network (ATN) and Air Traffic Services Message Handling System (AMHS) Implementation Plan, the new circuit between Hong Kong and Bangkok has been put into operational use. Further tests and trials have been conducting with Beijing and the new circuit is planned for operational use in 2017.

The AIDC over Aeronautical Fixed Telecommunication Network with Sanya and Taipei has been put into 24-hour operation, enhancing flight safety and operational efficiency in communication with adjacent ATC centres. AESD has also coordinated with Guangzhou and Manila to schedule early AIDC technical tests and trials with Hong Kong in the second quarter of 2016.

(ii) Advanced Surface Movement Guidance and Control System

To cope with the increasing traffic and on-going changes in the airport environment, AESD has engaged the equipment supplier to conduct a comprehensive signal integrity and coverage study of the A-SMGCS. In accordance with the recommendations of the study report, additional A-SMGCS Remote Units were installed at the Midfield Passenger Concourse in December 2015 to enhance the signal coverage performance. Similar system enhancement has been planned to cater for forthcoming HKIA infrastructure development.

（三）廣播式自動相關監察系統

年內，民航處繼續與國際民航組織區域辦事處及亞太地區其他國家緊密合作，帶領建立區域數據庫，以處理廣播式自動相關監察系統偵察的航空電子設備問題報告，加強亞太地區的飛行安全。此外，民航處亦牽頭協助國際民航組織制定及修訂廣播式自動相關監察系統的實施指引，供亞太地區國家使用。在積極參與國際民航組織廣播式自動相關監察研究和實施專責小組的工作下，民航處一直在亞太地區相關領域的發展工作保持領導地位。

（四）陸基增強系統

為使採用全球衛星導航系統的飛機進場和着陸程序更為精確，民航處已就機場安裝陸基增強系統，進行了初步的選址研究。本部結合了本處和地政總署設於全港各處的全球衛星導航系統監測站所收集到的實時數據，設立全港衛星數據庫。此外，本部自二零一三年起使用電離層閃爍監測系統，並通過國際民航組織電離層研究專責小組，與周邊地區合作，共同研究亞太地區上空電離層對陸基增強系統的性能可能產生的影響，以及系統適用的緩解措施。

（五）機場協同決策

本部在二零一三年推出桌面版及手機版的機場協同決策互聯網平台，該平台一直獲業界大力支持，成績令人鼓舞。在民航處成功推展機場協同決策平台的基礎上，香港機場管理局已聘請承包商進一步改善和擴展機場協同決策計劃，以為提升香港國際機場的運作效率，民航處將在技術和運作方面提供意見和支持。

(iii) Automatic Dependent Surveillance-Broadcast System

Throughout the year, CAD continued to take lead in establishing the Regional ADS-B Avionics Problem Report Database, through close collaboration with ICAO Regional Sub-office and other Asia Pacific States, with a view to enhancing flight safety in the Asia Pacific Region. Besides, CAD took lead to support the ICAO in developing and refining the ADS-B implementation guidance materials for use by Asia Pacific States. Through our active participation in the ICAO ADS-B Study and Implementation Task Force, CAD has continued to maintain our leading position in ADS-B development in the region.

(iv) Ground-Based Augmentation System

To augment the precision of aircraft approach and landing operations using the Global Navigation Satellite System (GNSS), CAD has conducted a preliminary siting study in preparation for installing a Ground-Based Augmentation System (GBAS) at HKIA. A territory-wide satellite database was established by combining the real time data collected by CAD's and Lands Department's GNSS monitoring stations located around the territory. Moreover, CAD has commenced using an Ionospheric Scintillation System since 2013, which enabled the collaboration with neighbouring areas through the ICAO Ionospheric Studies Task Force on studying possible ionospheric effect on GBAS performance and mitigating measures for deploying GBAS in the Asia Pacific Region.

(v) Airport Collaborative Decision Making

AESD successfully launched the Airport Collaborative Decision Making (A-CDM) platform in both desktop and mobile versions on the Internet in 2013 with very encouraging feedback and support from the industry. Building on the successful implementation of the CAD's A-CDM platform, the Airport Authority Hong Kong (AAHK) has engaged a contractor to further enhance and extend the A-CDM scheme, which CAD will provide advice and support on technical and operation aspects, to strive for enhancing the overall HKIA's operational efficiency.

實施航空交通安全電子設備人員培訓計劃

為配合在二零一一年公布的「下一代航空專業人員」計劃，國際民航組織在空中交通安全電子協會國際聯合會、歐洲航空安全組織及各成員國的協助下，制定了《航空交通安全電子設備人員（電子設備人員）培訓手冊》（第7192號文件）。為此，民航處在二零一一年二月已為前線維修人員重組通訊、導航及監察／航管系統的傳統技術培訓計劃，加入更有系統並以技能為本的電子設備人員培訓模式。經過四年多的持續發展和實施後，按照國際民航組織第7192號文件編製的電子設備人員培訓計劃和文件，已經全面備妥，而香港國際機場的通訊、導航及監察和航管設備／設施對於航空安全至為重要，所有為該等設備／設施提供保養的前線維修人員，均需得到電子設備人員認證。

二零一五年九月，民航處的電子設備人員培訓計劃獲香港工程師學會正式認可，凡獲得電子設備人員認證的人員，可成為該學會的仲會員。這為「下一代航空專業人員」提供一個考取專業資格的清晰路徑，以投身航空業界，發展事業前途。

本部在二零一五年十月二十六日至三十日於菲律賓馬尼拉舉行的亞太地區民航局局長第52次會議上，提交了一份文件，與其他國家分享實施電子設備人員培訓計劃的經驗。該文件備受大會好評。隨後，蒙古民航局到訪民航處，希望從本部實施電子設備人員培訓計劃的經驗中借鏡觀形。

Implementation of Air Traffic Safety Electronics Personnel Training Scheme

With contributions from the International Federation of Air Traffic Safety Electronics Associations (IFATSEA), EUROCONTROL and various Member States, ICAO has developed the Air Traffic Safety Electronics Personnel (ATSEP) Training Manual Doc 7192 to support the Next Generation of Aviation Professionals (NGAP) initiatives published in 2011. In line with the NGAP initiatives, CAD commenced in February 2011 to revamp the conventional CNS/ATM technical training scheme for the frontline maintenance staff with a view to introducing a more structured competency-based ATSEP model. After more than four years of on-going development and implementation, the ATSEP training scheme and documentation based on ICAO Doc 7192 are considered full-fledged. As such, all the frontline maintenance staff for safety-critical CNS and ATM equipment/facilities of HKIA should be ATSEP certified.

In addition, in September 2015, the ATSEP training scheme was accredited by the Hong Kong Institution of Engineers (HKIE) by admitting personnel who were ATSEP certified to be Associate Members of the HKIE. This will map a clear path for technical staff of NGAP to pursue professional qualification as well as career development in the aviation discipline.

To share our experience with other States in ATSEP training, AESD presented a paper during the 52nd Conference of Directors General of Civil Aviation Asia and Pacific Regions held in Manila, Philippines from 26 to 30 October 2015 and the paper was well received by the Conference. Subsequently, the Civil Aviation Authority of Mongolia visited CAD to draw on our experience in ATSEP training.

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二零一六年一月，蒙古民航局訪問民航處，希望從香港實施電子設備人員培訓計劃的經驗中借鏡觀形。

In January 2016, Civil Aviation Authority of Mongolia visited CAD Headquarters to draw on our experience in implementing ATSEP training in Hong Kong.

推行資產管理系統

自二零一三年起，本部與機電工程署攜手展開計劃，為優化民航處總部空管大樓屋宇裝備的管理，推行ISO 55001資產管理系統。ISO 55001是一套國際認可的標準，用於管理資產在整個運作周期的表現。往後一年，本部與機電工程署共同進行一系列的特定工作，包括編製文件、培訓、管理檢討和內部審計。

空管大樓的機電系統、屋宇裝備系統和屋宇相關的電子設施系統所推行的資產管理系統，成功通過香港品質保證局的認證審計，獲得ISO 55001認證，為期三年。頒授儀式於二零一五年六月十五日舉行，標誌着兩個政府部門首次聯合獲發ISO 55001認證。

Implementation of Asset Management System

Since 2013, AESD and the Electrical and Mechanical Services Department (EMSD) had jointly embarked on a project to implement the ISO 55001 "Asset Management System" with a view to enhancing management of the building services facilities in ATC Building of the new CAD Headquarters. ISO 55001 is an internationally recognised standard for performance management throughout the whole life cycle of an asset. Throughout the subsequent year, AESD and EMSD jointly undertook a series of specified activities including documents development, training, management review, and internal audits, etc.

With the certification audits successfully conducted by Hong Kong Quality Assurance Agency (HKQAA), ISO 55001 certification was approved for the asset management system implemented for the electrical and mechanical systems, building services systems and building-related electronics systems in the ATC Building with a validity of 3 years. The presentation ceremony held on 15 June 2015 also marked the first joint ISO 55001 certification issued to two government departments.

更換空管系統項目的第二期計劃

新空管中心於二零一六年十一月完全投入服務後，本部將繼續進行更換空管系統項目的第二期計劃，在現時空管大樓的空管中心和南控制塔安裝新的設備。本部成立了空管大樓和控制塔翻新工作組，成員包括民航處、建築署、機電工程署、香港天文台的代表和民航處聘用的保養服務承包商。工作組已於二零一六年一月二十七日召開了首次會議，以督導各個項目的整體協調工作，當中包括多個屋宇翻新和維修工程項目、更換屋宇裝備，以及安裝和測試新空管系統。

Phase 2 Programme of Replacement of ATC System Project

Upon full commissioning of the new ATC Centre in November 2016, AESD would proceed with the Phase 2 Programme of the Replacement of ATC System Project, in which new equipment would be installed in the current ATC Centre and South Tower (S-TWR) at Air Traffic Control Complex (ATCX). AESD established the ATCX and S-TWR Refurbishments Task Force with members from CAD, Architectural Services Department, EMSD, Hong Kong Observatory and CAD's maintenance service contractor and a kick-off meeting was held on 27 January 2016 to steer the overall coordination of various works items on building refurbishments and repairs, building services equipment replacement, and new ATC systems installation and testing, etc.

ISO 55001頒授儀式於二零一五年六月十五日在民航處總部大樓舉行。
ISO 55001 Presentation Ceremony was held at CAD Headquarters on 15 June 2015.

資訊科技管理

通過妥善實施各項新的資訊科技措施和「電子政府」策略，資訊科技管理組繼續支援各分部的日常運作。年內，資訊科技管理組完成了以下大型資訊科技項目，以加強資訊科技服務和支援：

（一）二零一五年年初，資訊科技管理組委聘顧問，根據資訊保安管理標準（即ISO 27001），制定一套資訊科技保安政策、程序及指引。該標準是國際認可和廣為業界採納的最佳模式。同年年底，部門的資訊科技系統/服務、互聯網應用程式和支援服務，由認可的認證機構進行ISO 27001認證審計，並成功通過審計。這標誌着民航處的資訊科技系統和服務，符合資訊保安的國際最佳模式，達致國際最高級別標準。繼香港警務處、香港海關、房屋委員會及機電工程署後，民航處成為第五個獲得該項認證的政府部門。

Information Technology Management

The Information Technology Management Unit (ITMU) continued to support day-to-day operations of various divisions through effective implementation of new Information Technology (IT) initiatives and the e-Government strategy. During the year, the following major IT projects were completed for the betterment of IT service and support:

(i) In early 2015, ITMU engaged a consultant to establish a set of IT security policies, procedures and guidelines in accordance with the information security management standards (i.e. ISO 27001), which is a standard internationally recognised and widely adopted by the industry as the best practice. Towards the end of 2015, ITMU engaged a recognised certification body to carry out a certification audit on its compliance with the ISO 27001 standards focusing on IT systems/services, internet applications as well as helpdesk support. ITMU successfully passed the ISO 27001 certification audit, signifying that the Department's IT system/services are of top class in compliance with the international best practice for information security, making the CAD the fifth Government department to attain this accreditation, after the Hong Kong Police Force, the Customs and Excise Department, the Housing Authority, and EMSD.

空管大樓和控制塔翻新工作組於二零一六年一月二十七日成立並召開首次會議。
ATCX and S-TWR Refurbishments Task Force was established on 27 January 2016 and a kick-off meeting was held on the same day.

（二）為提升部門資訊科技保安和加強數據保護，資訊科技管理組設計和開發了一個安全的互聯網站，為空管人員提供資訊交流的平台。政府資訊科技總監辦公室亦為民航處的資訊科技基礎設施進行了網絡安全評估，結果令人滿意。

（三）為方便參與民航處舉辦的國際和本地航空界會議的人士，資訊科技管理組開發和推出了一個新的流動應用程式，以發放最新的會議議程、會議文件和通告等電子訊息，並提供一個既有效率又可即時通訊的交流和討論平台。

(ii) To enhance IT security and data protection, ITMU designed and developed a secured internet website to provide a platform for air traffic control officers to share information. The Office of the Government Chief Information Officer also conducted a cyber security assessment on the IT infrastructure of the department with satisfactory outcomes.

(iii) A mobile application was developed and implemented to disseminate electronic information, including up-to-date agenda, conference papers, announcements, etc., to participants of international and local aviation conferences and meetings to be held at the CAD Headquarters, so as to facilitate effective and timely communication and discussion.

於二零一六年三月十日舉行的ISO 27001:2013認證證書頒發儀式。
ISO 27001:2013 Certification Presentation Ceremony was held on 10 March 2016.