# 工程及系統
ENGINEERING AND SYSTEMS

工程及系統部負責設計、規劃、統籌和提供香港航空交通管制(空管)系統、雷達、導航儀器和通訊等設備。為進一步提升部門的運作效率和協同效益,新的航空交通工程及標準部將於二零零八年四月一日成立。這分部由不同界別的同事組成,包括本部的電子工程師及資訊科技專才、航空交通管理部的航空交通管制人員及飛行標準及適航部轄下航空交通管理標準組的監管人員。

The Engineering and Systems Division is responsible for the design, planning, coordination, and provision of air traffic control (ATC) systems, radar, navigational aids, and communications facilities for Hong Kong ATC operations. With an initiative to further enhance operation efficiency and create synergy within the Department, a new Air Traffic Engineering and Standards Division is to be established on April 1, 2008. It will consolidate various disciplines of experts including electronic engineers and information technology (IT) professionals from the Division, ATC operations officers from the Air Traffic Management Division (ATMD), and the ATM regulators from the Air Traffic Management Standards Office of Flight Standards and Airworthiness Division.
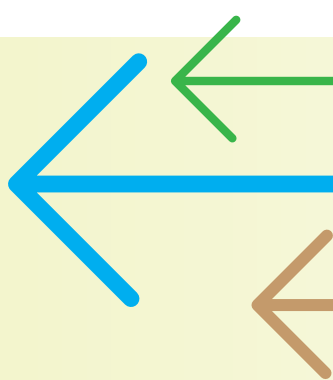
年內，本部繼續致力維持高水平的服務、穩定可靠的空管系統，以支援各項空中交通服務。現時的空管系統於一九九七年驗收，其可用期將在二零一二年屆滿。鑑於系統相當複雜，本部已開始制訂更換計劃，務求新系統能適時投入服務。有關項目於二零零七年五月十一日獲立法會財務委員會通過撥款，相關系統整體設計、詳細運作要求及新空管系統招標文件等準備工作亦隨即展開，進度良好。

衛星通訊、導航及監察／航空交通管理系統的發展計劃進展順利，六個系統構件已投入運作，另外六個正進行測試，以評估相關運作效益。為應付區內航空交通增加的需求，新的系統構件如廣播式自動相關監察、電子飛行進程單和S模式監察等技術，亦在積極籌劃之中。

本部繼續推廣及推行嶄新資訊科技的應用，提升電腦網絡基建和設施，以配合本處和政府服務電子化的目標。

航空交通管制系統的發展

更換航空交通管制雷達模擬系統

更換新航空交通管制雷達模擬系統的合約已於二零零八年三月十四日批予獲選的供應商。新系統可提升模擬雷達運作的處理能力，其先進功能將適時應付空管人員的訓練需要。新模擬系統預計可在二零零八年十二月投入運作。

航空無線電通訊技術工作組成立十週年

鑑於時有機師報告指甚高頻無線電通訊頻道受無線電干擾，一個由本港及內地專家組成的航空通訊專家組早於一九九七年成立，處理有關問題。專家組經過多年來努力，通訊受干擾的情況已大有改善，每年接報數目亦由一九九八年時超過六百五十宗，減少至二零零七年的九十宗。為表揚專家組過去多年達致的工作成果，專家組於二零零七年十一月二十九日在香港慶祝成立十週年。民航處處長於儀式中擔任主禮嘉賓，出席嘉賓包括中國民用航空總局空中交通管理局副局長、中國信息產業部無線電管理局副局長及中國人民解放軍電磁頻譜管理委員會辦公室參謀。

During the year, the Division continued its efforts in maintaining a high standard, stable, and reliable ATC system to support air traffic services. The existing ATC system, commissioned in 1997, would reach the end of its usable life around 2012. Given the complexity of the system, the Division had initiated an action plan for a timely replacement. With the funding approval received from the Finance Committee of the Legislative Council on May 11, 2007 for the required replacement exercise, detailed design of the system architecture, refinement of operational requirements, and preparation of tender documents for acquisition of the new ATC system were progressing well.

The Satellite-based Communications, Navigation and Surveillance/Air Traffic Management (CNS/ATM) Systems Project continued to progress in a satisfactory manner, with six system elements now in operational use and six on trials to assess their operational benefits. To cope with the rapid air traffic growth in the region, trials and implementation of new CNS/ATM system elements like Automatic Dependent Surveillance-Broadcast (ADS-B), Electronic Flight Progress Strips, Mode S Surveillance etc, were actively pursued.

The Division also continued to implement new IT applications and enhance the computer network and infrastructure in line with the departmental e-business development and the e-government objectives.

AIR TRAFFIC CONTROL SYSTEMS DEVELOPMENT

Replacement of ATC Radar Simulator

A contract was awarded to the selected supplier on March 14, 2008 for provision of a replacement ATC radar simulator that is to provide high simulation capacity and enhanced functionalities as required for up-to-date training of air traffic controllers. The new simulator would be ready for service in December 2008.

10th Anniversary of Technical Working Group on Aeronautical Radio Communications

Since 1997, a dedicated Technical Working Group (TWG) comprising members of Hong Kong and Mainland ATC and Telecommunications Authorities had been set up to tackle the harmful radio frequency interference (RFI) experienced on the air-ground VHF radio communication channels as reported by the pilots. The situation had improved significantly with annual interference incidents/reports decreasing from over 650 reports in 1998 to less than 90 reports in 2007. In recognition of its fruitful achievements, a commemoration for 10th anniversary of the TWG was held in Hong Kong on November 29, 2007. The event was officiated by the Director-General of Civil Aviation, and attended by the Deputy Director-General of Air Traffic Management Bureau, Civil Aviation Administration of China, Deputy Director-General of Radio Regulatory Department, Ministry of Information Industry, and Staff Officer of Radio Frequency Spectrum Management Commission of People's Liberation Army from the Mainland.

香港與內地航空通信專家組成立十週年紀念儀式於2007年11月29日在香港舉行。
The Commemoration Event for the 10th Anniversary of Technical Working Group on Aeronautical Radio Communications was held in Hong Kong on November 29, 2007.

提升話音記錄系統

二零零七年六月本分部為已使用超過十年的話音記錄系統進行提升工程。舊系統已由一個高容量的先進記憶儀器取代。系統經過提升後，其耐用性、維修保養及可靠程度各方面都得到進一步加強。

空管系統的安全及風險評估

本處對各個空管系統的安全及風險評估，均會作出定期檢討。為符合國際民用航空組織（國際民航組織）的安全管理要求，本分部已就空管系統、重要的屋宇設施及由承辦商提供的相關儀器維修保養服務，制訂了一套安全管理系統的推行計劃。

Upgrading of Voice Recording System

The Voice Recording System had been in service for over 10 years and was successfully upgraded in June 2007 by using a high-capacity state-of-the-art storage system. With such equipment upgrade, the availability, maintainability, and reliability of the system were considerably enhanced.

Safety and Risk Assessment on Hong Kong ATC Systems

Regular reviews were conducted with respect to safety and risk assessments on different Hong Kong ATC systems. To meet the ICAO safety requirements, the Division had formulated a structural plan to implement safety management system (SMS) for ATC systems, critical building services facilities and relevant equipment maintenance services provided by contractors.
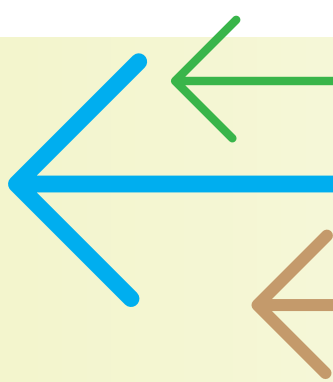
更換航空交通管制系統

現有空管系統的處理能力與功能均無法應付預期中的航空交通增長需求及航空業的發展,為保持香港作為區內航空交通樞紐的地位,有需要更換一套高效能及配備最新功能的空管系統,以加強香港飛行情報區內航空交通服務的效率。二零零七年五月十一日,立法會財務委員會通過撥款予民航處更換現有的空管系統,預算成本為15.65億元。為進行系統設計及作詳細規劃,本處年內曾派員到海外的航空交通管制中心及塔台實地考察、進行市場調查、並邀請有關儀器供應商來港作示範。就空管系統的更換,制訂運作要求及系統規格的準備工作經已展開,預計各空管系統的招標工作會於二零零九年首季至二零一零年首季內分階段進行。

位於沙洲的進場監察雷達站。
Sha Chau Approach Surveillance Radar Station.

衛星通訊、導航及
監察 / 航空交通管理系統

為配合國際民航組織就衛星通訊、導航及監察/航空交通管理系統所訂的全球和地域實施計劃,本處繼續研究系統的最新發展,並詳細測試系統每個構件。有關系統的技術和運作測試均進展順利,部分技術成熟的系統構件經已投入服務,以便早日發揮系統的功能,提升和優化香港空管服務的水平。

數據化自動航站情報服務、數據化遠航氣象情報服務、飛前放行指示數據鏈路服務、香港與曼谷之間的主幹航空電訊網,以及與三亞的空中交通服務設施間數據通訊已投入運作,用量亦日見增加。現時,每月平均有約40 000次要求提供數據化自動航站情報服務 / 數據化遠航氣象情報服務;平均每日有206架次離港班機使用飛前放行指示數據鏈路服務,約佔香港國際機場每日離港航班數目的49%。

Replacement of Air Traffic Control System

The capacity and functionalities of the existing ATC system were unable to cope with the projected air traffic growth and expansion of the aviation industry. To maintain Hong Kong's position as an international aviation hub, it was considered necessary to plan for a replacement ATC system with high capacity and the latest functionalities so as to enhance the efficiency in the provision of air traffic services in the Hong Kong Flight Information Region. On May 11, 2007, funding approval was received from the Finance Committee of Legislative Council for the CAD to replace the existing ATC system at an estimated cost of $1 565 million. To facilitate system design and project planning, fact-finding visits to overseas ATC centres and towers, market survey, and equipment demonstrations by potential suppliers were conducted during the year. Preparation of the operational requirements and system specifications were underway. It is expected that tender invitation for the various replacement systems would be carried out in phases between first quarter of 2009 and first quarter of 2010.

SATELLITE-BASED COMMUNICATIONS, NAVIGATION AND SURVEILLANCE/AIR TRAFFIC MANAGEMENT (CNS/ATM) SYSTEMS

To comply with the Global and Regional Implementation Plans of the ICAO for the Satellite-based CNS/ATM systems, studies on the latest CNS/ATM development and detailed investigations on various elements of the CNS/ATM systems continued. Satisfactory progress was achieved on relevant technical and operational trials. Mature system elements were put into operational use to reap the benefits of early CNS/ATM applications, which enhanced and upgraded the ATC service of Hong Kong.

So far the Digital-Automatic Terminal Information Service (D-ATIS), Digital-Meteorological Information for Aircraft in Flight (D-VOLMET) service, Pre-Departure Clearance (PDC) delivery via datalink, the ATN backbone connecting Hong Kong with Bangkok, and the Air Traffic Services Inter-facility Data Communication (AIDC) with Sanya were put into operational use. These new services continued to gain popularity with a monthly average of 40 000 requests for the D-ATIS/D-VOLMET services, and a daily average of 206 departing aircraft using the PDC service via datalink, representing approximately 49 per cent of the daily departure traffic from the Hong Kong International Airport (HKIA).

Aeronautical Telecommunication Network and ATS Message Handling System

In the revised ICAO Asia-Pacific Regional Plan, States in the Region should implement Aeronautical Telecommunication Network (ATN) and ATS Message Handling System (AMHS) by 2009. Hong Kong, being one of the ATN/AMHS backbone sites in the Region, mounted an open tender on March 7, 2008 to acquire a high capacity AMHS for trials and operations with the neighbouring ATC authorities including Beijing, Tokyo, Taipei, Bangkok, Manila, and Macao etc.

航空電訊網及航空交通服務訊息處理系統

按照國際民航組織的亞太地區修訂計劃，區內國家須在二零零九年年底前建立航空電訊網及航空交通服務訊息處理系統。香港作為區內一個航空電訊網／航空交通服務訊息處理中樞，須購置一部高效能航空交通服務訊息處理系統，以配合與北京、東京、台北、曼谷、馬尼拉和澳門等鄰近地區的空管單位作進一步測試和運作。新系統的招標程序已於二零零八年三月七日展開。

先進場面活動引導和控制系統

由於先進場面活動引導和控制系統在香港國際機場的初步測試結果理想，本分部已進一步擴展有關系統，並連接機場其他系統，當中包括場面活動雷達、二次監察雷達和飛行區地面燈號系統。新系統可對機場內活動的飛機及配備了特別裝置的車輛作全天候安全監察，提供更準確的位置、防碰撞提示和闖入跑道的預警功能。系統現正進行優化，預計可於二零零八年下半年進行運作測試。

廣播式自動相關監察

為評估廣播式自動相關監察訊號在香港地理環境下的覆蓋情況和性能，本分部特別在大帽山安裝一台廣播式自動相關監察儀器，有關技術測試已於二零零七年四月至六月間進行，結果令人滿意。本處現正與政府飛行服務隊研究將這種技術應用於監察在本港低空飛行的直升機。

位於小磨刀多普勒甚高頻全向無線電信標及測距儀。
Doppler Very High Frequency Omni-directional Radio Range and Distance Measuring Equipment (DVOR/DME) System at Siu Mo To.

### *Advanced Surface Movement Guidance and Control System*

Following the satisfactory results obtained from the evaluation of an Advanced Surface Movement Guidance and Control System (A-SMGCS) on the prime surveillance area of HKIA, the Department had expanded and integrated the system with other existing airport facilities including the Surface Movement Radar, Secondary Surveillance Radar, and Airfield Ground Lighting System. The new system could provide all-weather surveillance of aircraft and specially equipped vehicles operating at HKIA with more accurate positions, conflict detection, and runway incursion alerting functions. The system was currently under site optimisation and would be put into operational trial in second half of 2008.

Automatic Dependent Surveillance - Broadcast (ADS-B)

Technical trials using a standalone ADS-B equipment at Tai Mo Shan were conducted with targets of opportunity between April to June 2007 to evaluate the ADS-B signal coverage and its performance in Hong Kong geographical environment. With the satisfactory results, study was being made with Government Flying Service in the application of ADS-B technology for surveillance of helicopter movements at low level.

在大帽山所安裝的廣播式自動相關監察儀器測試系統的天線組件。
ADS-B Trial System at Tai Mo Shan.

抵港航班管理系統

在抵港航班管理系統的公開招標程序完成後，系統合約已於二零零七年七月九日批予獲選的供應商。基本系統已於二零零七年底驗收，運作評估亦已於二零零八年一月四日開始。該系統可向空管人員提供抵港航班序列提示，讓他們能更有效地利用本港空域，減少抵港航班的整體延誤情況。系統的優化工作正在進行中，並預期於二零零八年七月完成。
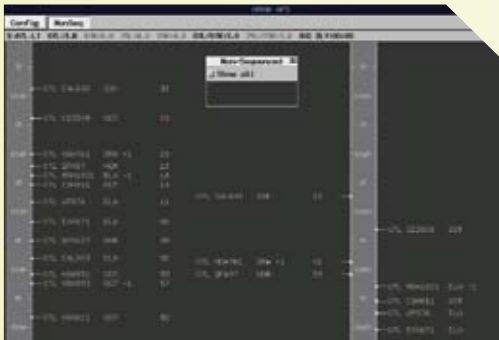
抵港航班管理系統。
Arrival Manager System.

Arrival Manager System

Following an open tender exercise, a contract for the supply and installation of an Arrival Manager System was awarded to the selected supplier on July 9, 2007. A basic system was delivered in late 2007 and made ready for operational evaluation on January 4, 2008. The system could offer sequencing advice to the air traffic controllers to facilitate their efficient use of the Hong Kong airspace and reduce overall delay of arrival aircraft. Further optimisation and enhancements of the system were progressing well and expected for completion in July 2008.

Performance Based Navigation

The study and design of Area Navigation (RNAV) Non-Precision Approach (NPA) procedures were completed in September 2007, with flight check scheduled for April 2008 to validate these new Performance Based Navigation (PBN) procedures. The next phase of the PBN study would focus on the use of Ground-based Augmentation System to support the Satellite Landing System for Category I operation at the HKIA.

基於性能的導航

區域導航及非精密進場程序的研究和設計已於二零零七年九月完成、飛行校驗亦已安排於二零零八年四月進行。下一階段的研究工作將集中如何運用陸基增強系統及其相關技術,並利用有關技術在香港國際機場提供第一類着陸要求的運作。

資訊科技的應用

年內,數個有助本處運作流暢的資訊科技項目已投入應用,包括電子試卷、電子值班記錄資料庫和航班流量顯示系統。本分部年內亦優化了多個資訊科技系統,包括部門圖書館系統及管制代理人資料庫等。另外,亦正為新空管系統建立一個中央資料庫,以儲存航班數據及其他空管運作資訊,供各分部作共享、分析和統計匯報之用。

民航處電腦網絡(CADNET)及電子辦公室設施繼續不斷改善,包括提升伺服器、添置資訊科技儀器、使用高速線路連接至政府主幹網絡等。本分部亦優化了民航處的內部電郵(Lotus Notes)伺服器,提升其處理速度及容量,而有關改良(包括對機密電郵系統)亦增加了系統復原功能,可在有需要時使用。二零零七年十一月,民航處電腦網絡亦進行了一次資訊科技保安風險評估,結果令人滿意,再次確認本處電腦網絡安全可靠。

IT APPLICATIONS

During the year, several new IT applications to facilitate the operations of the Department had been implemented. These included Electronic Test Paper, e-Watch Keeping Log Database, and Flight Movement Display System. Enhancements to the existing IT applications e.g. Library System and Regulated Agents Database, etc, were also completed in the year. A centralised database is being built with the new ATC systems to store the flight data and other operational information for sharing, analysis, and statistics reporting.

Ongoing enhancements were made on the departmental computer network (CADNET) and e-office facilities, including computer server upgrade, extra equipment provision, and the use of higher speed links to the government backbone network (GNET). The Lotus Notes mail servers of CAD were also upgraded with a high speed and large capacity platform whereas the departmental e-mail system (including the Confidential Mail System) was constructed in a resilient configuration to facilitate disaster recovery if needed. An IT security risk assessment on CAD network was conducted in November 2007 which once again confirmed that the CADNET was secure and safe.