# 工程及系統
Engineering and Systems

工程及系統部負責規劃、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，並為香港飛行情報區提供航空電訊服務。

年內，本部繼續致力把整個空管系統維持於最高服務水平，確保有關設備運作穩定可靠，支援各項空中交通服務。香港在二零零四年十二月三十日和二零零五年一月十三日分別接收到來自西沙的二次監察雷達數據及甚高頻通訊訊號，而本處亦開始進行技術評估。這些訊號和數據可望在二零零五年年中正式使用，從而進一步提高飛行安全和空管運作效率。就東龍洲多普勒甚高頻全向無線電信標及測距設備的更換工程，招標工程將在二零零五年五月進行。此外，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，五個系統構件已投入運作，另外四個正接受測試，以評估運作效益。在邁向

The Engineering and Systems Division is responsible for the planning, coordination and provision of air traffic control (ATC) systems, radar, navigational aids and communications equipment for Hong Kong. The Division also provides aeronautical telecommunication services for the Hong Kong Flight Information Region (FIR).

During the year, the Division continued its efforts in maintaining the overall ATC System to the highest standard, thus enabling a stable and reliable equipment operation to support air traffic services. The secondary surveillance radar (SSR) data and Very High Frequency (VHF) air-ground communication signals from Xisha were made available to Hong Kong on December 30, 2004 and January 13, 2005 respectively for technical evaluation by this Department. It is expected that the above signals and data would be put into operational use in mid-2005 to further enhance flight safety and ATC operational efficiency. Tender invitation for the replacement of the Doppler Very High Frequency Omni-directional Radio Range and Distance Measuring Equipment (DVOR/DME) on Tung Lung Island would be made in May 2005. The Satellite-based Communications, Navigation and Surveillance/Air Traffic Management (CNS/ATM)
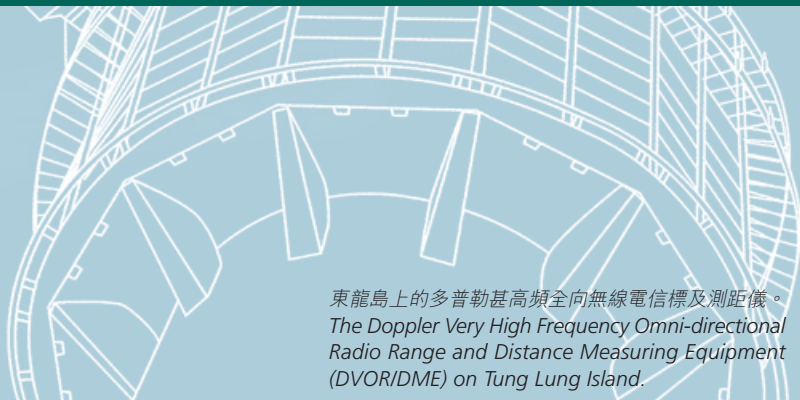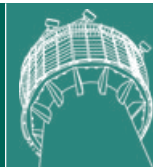
東龍島上的多普勒甚高頻全向無線電信標及測距儀。
The Doppler Very High Frequency Omni-directional Radio Range and Distance Measuring Equipment (DVOR/DME) on Tung Lung Island.

航空安全管理系統應用方面，本部已對所有關鍵空管系統進行安全及風險評估。另一方面，本部亦繼續推廣資訊科技系統的應用，擴大部門的資訊基建，以配合政府服務電子化的目標。

Systems project continued to progress in a satisfactory manner, with five system elements now in operational use and four on trials to assess their operational benefits. Besides, the Division conducted a safety and risk assessment on those critical ATC systems as part of the Safety Management System (SMS) migration process. On the other hand, the Division continued to promote the applications on information technology (IT) systems and expanded the IT infrastructure of the Department in line with the e-government objective.

航空交通管制系統的發展

更換東龍洲多普勒甚高頻全向無線電信標及測距設備

二零零四年四月，立法會財務委員會通過撥款更換東龍洲多普勒甚高頻全向無線電信標及測距設備（信標及測距設備）。我們目前正以公開招標的方式採購替換設備。同時，本處與建築署緊密合作，對改建及翻新站內的設施和屋宇裝備進行規劃。更換後的信標及測距設備可望於二零零六年年底投入運作。

AIR TRAFFIC CONTROL SYSTEMS DEVELOPMENT

Replacement of Doppler VHF Omni-Directional Radio Range and Distance Measuring Equipment on Tung Lung Island

Funding approval was given by the Legislative Council Finance Committee in April 2004 for the replacement of the Doppler VHF Omni-Directional Radio Range and Distance Measuring Equipment (DVOR/DME) on Tung Lung Island. Acquisition of the replacement equipment through open tendering was underway. At the same time, the Department worked closely with the Architectural Services Department to modify and refurbish the building and building services facilities of the station. It was planned that the replacement DVOR/DME would be ready-for-service in end 2006.

本處與中國民航總局空中交通管理局，在廣州簽署二次監察雷達及甚高頻通訊服務協議。
CAD signs with CAAC the SSR and VHF Communication Services Agreements in Guangzhou.

共用雷達數據和甚高頻通訊儀器

在本處與中國民用航空總局（中國民航總局）的緊密聯繫和合作下，西沙二次監察雷達的雷達數據及甚高頻通訊的訊號分別在二零零四年十二月和二零零五年一月傳抵香港，本處亦開展技術和運作評估。在順利完成飛行校驗，中國民航總局和本處在二零零五年三月九日在廣州簽署租用西沙二次監察雷達及甚高頻通訊設備的服務協議。

根據目前的時間表，新的西沙二次監察雷達及甚高頻通訊訊號可望在二零零五年年中投入運作。屆時，二次監察雷達和甚高頻通訊的服務範圍會覆蓋整個香港飛行情報區，有助進一步提高飛行安全及香港空管運作效率。

Sharing of Radar Data and VHF Communications Facilities

With close liaison and coordination with the General Administration of Civil Aviation of China (CAAC), the radar data from the secondary surveillance radar (SSR) and VHF communications facilities at Xisha were successfully relayed to Hong Kong in December 2004 and January 2005 respectively for technical and operational evaluations by the Department. Following confirmation flight inspections, the service agreements on sharing of the Xisha SSR and VHF communications facilities were signed between CAAC and the Department on March 9, 2005.

Based on the current schedule, it is expected that the new Xisha SSR and VHF communications signals would be put into operational use in mid-2005. The whole Hong Kong FIR would then have full SSR and VHF communications coverage. This would further enhance flight safety and operational efficiency of the Hong Kong ATC operations.
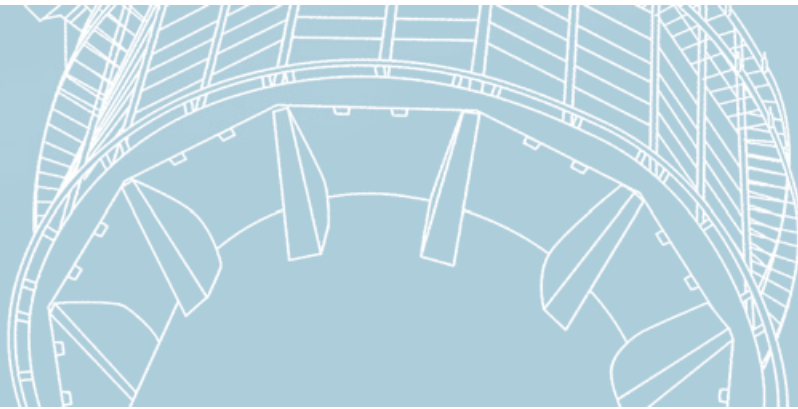
提升地區飛行氣象通報交換系統

為符合國際民航組織附件3第73項修訂的新規
定,本處已完成現有的地區飛行氣象通報交
換系統的提升工作並按國際民航組織的規
定,在二零零四年十一月二十五日將更新後
的系統投入運作。

航空交通管制設備的維修事宜

現時的空管設備維修服務是根據一項中央合
約提供的。由於該合約在二零零六年九月三
十日屆滿,本處正就新合約的招標工作、土
地徵用及相關的過渡安排與有關政府部門╱
局緊密合作,確保空管設備的運作和維修在
二零零六年九月以後,能夠繼續維持現時的
卓越水平。預計新的技術服務將於二零零五
年年中進行招標。此外,本處負責主持一個
跨部門督導小組會議,協調及安排外判現時
在太平山、畢拿山及鶴咀無線電站的技術服
務等工作。

Upgrade of Regional OPMET Bulletin Exchange Scheme System

To meet the new requirements as stipulated in Amendment 73 to
ICAO Annex 3, the existing Regional OPMET Bulletin Exchange
Scheme (ROBEX) System was upgraded and put into operational
use on November 25, 2004 as specified by ICAO.

ATC Equipment Maintenance

The ATC equipment maintenance services are currently provided
under a central contract, which is due to expire on September 30,
2006. The Department worked closely with the relevant government
departments and bureaux on the site acquisition, provision of
replacement services and the associated transitional arrangement
so as to ensure that the current high standards of ATC equipment
operations and maintenance can be maintained after September
2006. It is expected that tender invitation for the replacement
technical services would be made in mid-2005. The Department
also chaired the Inter-departmental Steering Group Meetings on
Future Arrangements for Outsourcing Technical Services currently at
Victoria Peak, Mount Butler and Cape D'Aguilar Radio Stations.
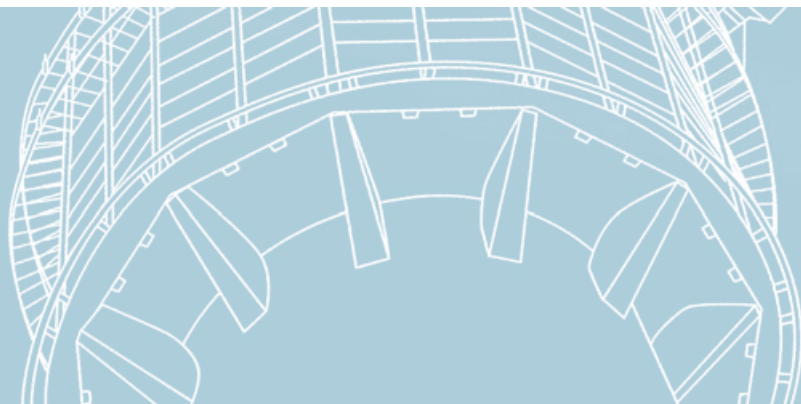
香港空管系統的安全及風險評估

二零零四年九月,本部領導的專責小組就香港國際機場／航空交通管制所配備的超過80個空管系統,進行安全及風險評估。其中五個系統被評為「對飛行安全有極大影響」,即雷達顯示系統、話音通訊系統、甚高頻通訊系統、飛機事故警報系統及飛行區地面燈號系統。另三個系統被評為「對飛行運作有極大影響」,即北跑道儀表着陸系統、航空電報轉送系統和風切變及湍流警報系統。所採用的評估方式是以國際民航組織就空中交通服務安全管理所頒布的法則為依據,當中包括檢討有關系統的運行目標;確定系統風險系數／單一故障點;評估風險的嚴重程度和出現概率;翻查過往系統的表現／故障記錄進行風險分析;確定／檢討風險緩解／應變措施以及提出改善建議。除了對上述八個空管系統作評估外,本處亦對空管大樓及機場控制塔進行火警風險評估。

評估工作在二零零五年三月完成,結果顯示現行措施(包括應變措施和後備安排)已屬足夠。為進一步加強系統安全,本處鑒定了16項改善措施,當中三項已予實行,其餘各項措施將在二零零六年三月前完成,或在有關系統五年維修保養期內完成。上述的評估有助加強香港空管系統的安全。

Safety and Risk Assessment on Hong Kong ATC Systems

In September 2004, the Division led a task force to conduct a safety and risk assessment on over 80 ATC systems installed for the Hong Kong International Airport (HKIA). Five systems were classified as "safety critical", i.e. Radar Display System, Speech Processing Equipment, VHF Communications System, Crash Alarm System and Airfield Ground Lighting System. Three systems were classified as "operationally significant", i.e. North Runway Instrument Landing System, Automatic Message Switching System and Windshear and Turbulence Warning System. The assessment methodology based on that promulgated by the ICAO on Safety Management for Air Traffic Services was employed. This included the review of performance targets of the system concerned, identification of system hazard factors/single point of failure, assessment of the severity and probability of hazard occurrence, risk evaluation by examining the past system performance/failure records, identification/review of risk mitigation/contingency measures, and recommendations for improvement. Apart from the assessment of the above eight ATC systems, a fire risk assessment on the ATC Complex and Aerodrome Control Tower was also conducted.

The assessment work was completed in March 2005, which indicated that the current provisions, including the contingency measures and fallback arrangements, were adequate. To further enhance the system safety, 16 improvement measures had been identified. Three had been implemented with the remaining to be completed by March 2006 or as part of the five-year maintenance work for the system concerned. Such assessment did help contribute the safety of the Hong Kong ATC System.
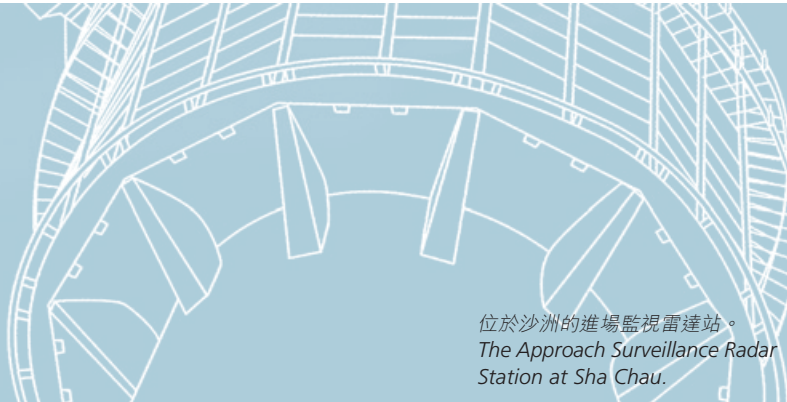
位於沙洲的進場監視雷達站。
The Approach Surveillance Radar Station at Sha Chau.

衞星通訊、導航及監察／航空交通管理系統

為配合國際民航組織就衞星通訊、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情況，並詳細測試系統的每個構件。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已經投入服務，以便早日發揮衞星通訊、導航及監察／航空交通管理系統的功能，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和香港與曼谷之間的航空電訊網已推出使用，而且用量亦漸趨普及。現時，每月平均有20 000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161架次離場飛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場飛機架次47%。

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 developments 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 can enhance and upgrade 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 and the Hong Kong-Bangkok ATN circuit have been put into operational use. The services continued to gain popularity with a monthly average of 20 000 requests for the D-ATIS/D-VOLMET services, and a daily average of 161 departing flights using the PDC service, representing approximately 47 per cent of the daily departing flights from the HKIA.
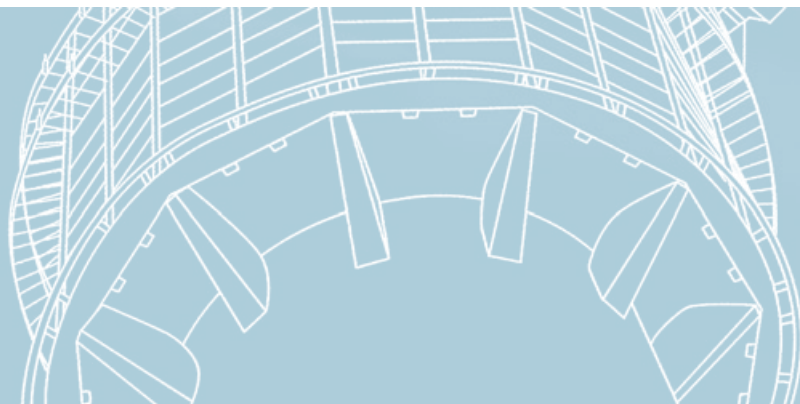
空中交通服務設施間數據通訊測試

年內，本處先後與廣州和海口就空中交通服務設施間數據通訊進行技術測試。本處繼續就運作測試與有關的航空交通服務當局保持聯繫，以期早日利用數據鏈路移交飛機的管制。

航空電訊網及航空交通服務訊息處理系統測試

按國際民航組織規定，亞太地區必須在二零零五年或之前建成航空電訊網，並選定香港作為區內其中一個中樞點。為此，本處在年內與北京、曼谷、台北、香港天文台和本地航空公司進行航空電訊網和航空交通服務訊息處理系統的技術測試。由於測試結果令人滿意，香港與曼谷之間的航空電訊網隨即在二零零四年六月二十三日開始運作，成為亞太區首個投入運作的航空電訊網，令航空交通服務訊息的傳送更快捷安全。

AIDC Trial

The Air Traffic Services Inter-facility Data Communication (AIDC) technical trials with Guangzhou and Haikou were conducted during the year. Liaison is ongoing with the ATS authorities concerned regarding the operational trials, with a view to facilitating early implementation of transfer of aircraft control via such datalink facility.

ATN and AMHS Trials

The ICAO specifies an Aeronautical Telecommunication Network (ATN) to be implemented in the Asia Pacific region by 2005, and Hong Kong was selected as one of the backbone sites in the region. To comply with this initiative, ATN and ATS Message Handling System (AMHS) trials were conducted during the year with Beijing, Bangkok, Taibei as well as Hong Kong Observatory and local airlines. With satisfactory trials results, the Hong Kong-Bangkok ATN circuit was put into operational use on June 23, 2004. This allowed a faster and more secure delivery of aeronautical messages and such circuit marked the first ATN implementation in the Asia Pacific region.
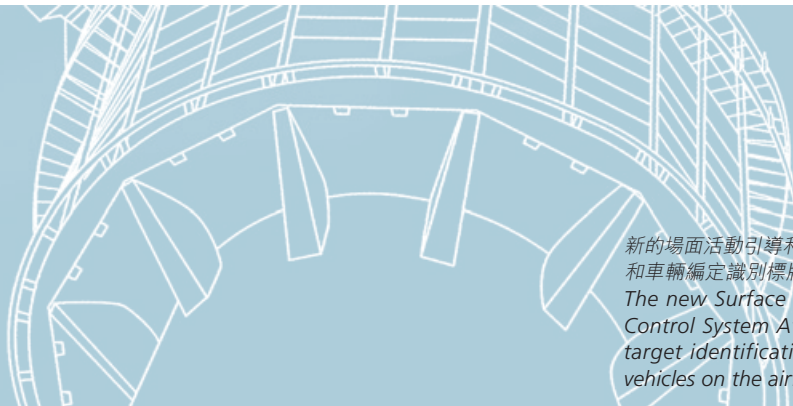
新的場面活動引導和控制系統可為機場內的飛機和車輛編定識別標牌。
The new Surface Movement Guidance and Control System Atenna (SMGCS) generates target identification labels for aircraft and vehicles on the airfield.
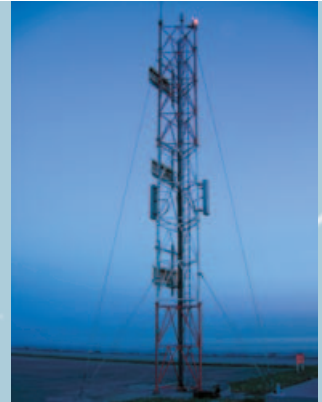
場面活動引導和控制系統測試

場面活動引導和控制系統的設備安裝和測試在二零零四年四月完成後，本處隨即在香港國際機場主要監視區域進行系統測試，測試期由二零零四年五月至十二月。該系統可為機場內的飛機和車輛編定識別標牌。由於所得結果令人滿意，本處計劃把系統測試範圍擴及整個機場。擴大後的系統不但能夠與現有的一次地面監察雷達和二次監察雷達系統相容，遇到有車擅闖跑道，更會發出警報。測試定於二零零六年年初展開。

空中交通管制快速模擬系統

由於新的空管程序複雜，為了使程序評估及分析可更快速靈活地進行，本處採購了一套空中交通管制快速模擬系統，並在二零零四年六月投入服務。

全球衛星導航系統

年內，香港飛行情報區繼續進行全球衛星導航系統訊號的質素研究及分析。過去兩年間，收集所得的全球衛星定位系統數據樣本超過200 000個，結果顯示系統訊號的可用性符合國際民航組織有關航路導航和終端導航的要求。

SMGCS Trials

Following equipment installation and testing in April 2004, the Surface Movement Guidance and Control System (SMGCS) trial on the prime surveillance area of the HKIA was conducted during the period from May to December 2004. The system can generate the target identification labels for aircraft and vehicles on the airfield. With satisfactory results obtained, it is planned to expand the trial system to cover the whole airport, with the capability to integrate with the existing primary Surface Movement Radar and secondary surveillance radar systems, as well as to provide runway incursion alert functions. This phase of trial was scheduled to commence in early 2006.

Air Traffic Control Fast Time Simulation System

To provide a faster and more flexible evaluation and assessment of new and complex ATC procedures, an Air Traffic Control Fast Time Simulation System was procured and put into operational use in June 2004.

Global Navigation Satellite System

The study and analysis on the Global Navigation Satellite System (GNSS) signal quality within the Hong Kong FIR continued over the year. Over 200 000 Global Positioning System (GPS) data samples had been collected in the past two years and the GPS signal availability was found meeting the ICAO requirements for en-route and terminal navigations.

關於使用全球衞星定位系統的修訂區域導航離場程序，飛行校驗在二零零五年三月完成，所得結果令人滿意。新的區域導航離場程序計劃在於二零零五年七月實施。

Flight check on the revised RNAV departure procedures using GPS was completed in March 2005 with satisfactory results. It is planned to implement the new RNAV departure procedures in July 2005.

電訊服務

電訊組專責提供固定航空通訊、流動航空通訊、航空氣象廣播和搜索及拯救行動通訊等服務。該組也負責就通訊運作事宜提供專業意見。

隨着地區飛行氣象通報交換系統的功能提升已於二零零四年十一月二十五日完成，使香港能夠處理來自亞太區其他空管當局提供的新類型氣象數據。

二零零五年三月一日起，電訊組也協助對新的西沙甚高頻通訊訊號進行技術及運作評估。由於暫得的評估結果令人滿意，上述甚高頻通訊計劃在二零零五年年中取代現有的高頻通訊。屆時，航空流動通訊中心將停止運作。

TELECOMMUNICATIONS SERVICES

The Telecommunications Unit is responsible for the provision of aeronautical fixed, mobile and broadcasting services as well as communications for search and rescue. The Unit also provides expert advice on operational communications matters.

With the inauguration of the upgrade of the ROBEX System on November 25, 2004, Hong Kong was able to handle the new types of meteorological data exchange with other ATS authorities in the Asia Pacific region.

The Telecommunications Unit assisted in the technical and operational evaluations on the new Xisha VHF communications facilities commencing March 1, 2005. With satisfactory evaluation results obtained so far, it was planned that the existing High Frequency (HF) Communications would be replaced by the above VHF in mid-2005. As a result, the Aeronautical Mobile Centre would be decommissioned.

固定航空通訊服務情況

Aeronautical Fixed Service

	二零零四／零五年度 2004/05	二零零三／零四年度 2003/04	升跌百分比（%） % change
處理電報總量 Messages handled	23 067 886	21 682 475	+6.39%

為了發揮香港作為亞太區航空電訊的樞紐，並符合國際民航組織以航空電訊網／航空交通服務訊息處理系統取代現有航空專用電傳通訊網的計劃，香港與曼谷之間的航空電訊網在二零零四年六月二十三日啟用，成為亞太區首個投入運作的航空電訊網。

As a leading telecommunications hub in the Asia Pacific region and in meeting the ICAO migration plan towards ATN/AMHS operations, the ATN circuit between Hong Kong and Bangkok was inaugurated on June 23, 2004. This was the first ATN implementation in the Asia Pacific region.

流動航空通訊服務情況

Aeronautical Mobile Service

	二零零四／零五年度 **2004/05**	二零零三／零四年度 **2003/04**	升跌百分比（%） **% change**
與航機聯絡次數　Aircraft contacts	150 547	124 089	+21.3%

連接香港與雅加達／印度尼西亞的新增M772航道在二零零五年一月二十日啟用。

二零零四至零五年度，隨着經濟強勁復蘇，航機升降數目激增，與航機聯絡次數大幅上升，地空通訊服務因而相應增加。

A new airway M772 between Hong Kong and Jakarta/Indonesia was put into operations on January 20, 2005.

With strong economic recovery in 2004/05, there was a significant increase in flight movements and hence the air-ground communications service, as reflected in the considerable increase in the number of aircraft contacts made.

航空氣象廣播服務情況

在氣象廣播服務方面，電訊組年內為航機提供合共214 942次氣象報告，數目與去年大致相若。

Aeronautical Broadcast Service

The broadcast service provided a total of 214 942 weather messages during the year. The number was roughly the same as in previous year.

資訊科技的應用

本部負責推廣處內人員更廣泛地應用資訊科技和電子貿易，以配合政府服務電子化的目標。目前，本部已把36種申請表格，包括飛機維修工程師執照、飛機登記、預約執照考試，以及根據《香港機場（障礙管制）條例》申請臨時豁免等表格上載本處的網頁，以供下載。航空業界亦可透過互聯網把申請經營不定期航班服務的電子表格交回本處處理。本處網站的重整工作在二零零四年十二月二十三日完成，以符合政府統一的「外觀與風格」標準。

本處在二零零四年四月成立資訊科技管理組，以加強部門內資訊科技應用及電子貿易發展的規劃、推行、培訓和支援。年內，資訊科技管理組開始設計及研發五套主要行政資訊科技系統，以支援部門內的電子貿易運作。

IT APPLICATIONS

The Division is charged with the responsibility of promoting IT applications and e-business within the Department in line with the e-government objective. A total of 36 application forms covering aircraft maintenance licences, registration of aircraft, licences examination booking and temporary exemption under the Hong Kong Airport (Control of Obstructions) Ordinance, etc are now available for downloading from the CAD website. An e-option form for permission to operate non-scheduled services can be submitted on-line to CAD for processing. The CAD website was revamped on December 23, 2004 to meet the Government's Common Look and Feel requirements.

An IT Management Unit (ITMU) was set up in April 2004 to enhance and strengthen the planning, implementation, training and support of IT applications and e-business developments within CAD. During the year, the ITMU commenced the design and development work on five major administrative IT systems to support the e-business operations of the Department.