Lensson1 History of Airport

Stage one:Pre-Powered Fligt 200BC--1903AD

In this period of time the major forms of aircraft were kites, balloons, glider

Stage two:Early-Powered Flight 1903-1914

The first airplane was invented by the Wright Brothers and it contributed greatly to aeronautical engineering and it was regarded as one of the most important inventions in the world.

Stage three:World War I and II 1914-1945

During World War I, aircraft were mainly used for military purposes such as reconnaissance, spotting artillery and attacks.

Stage four: Past-war Jet age

Military aviation focused on eliminating the pilot(the unmanned aircraft Global Hawk)

Lesson2 Aircraft General

The major components of an airplane include a fuselage, wings, an empennage, landing gear and a power plant.

Fuselage is the central body of an airplane, which accommodate POB and cargo and connect all the other major components of an aircraft .

Wings lift airplane into the air and store fuel, fuel system equipment and support engines, flaps, spoilers and ailerons.

Empennage consists of a horizontal and vertical stabilizer, albwing the airplane to maintain straight level flight and charge directions.

Landing gear support the airplane when it is parked, taxiing, taking off and landing.

Power plant generates thrust to propel an airplane move forward through the air and provides electrical, pneumatic and hydraulic power to different airplane systems and mechanisms.

Lesson 3 Component of Airport

了解基础的基本组成部分及功能

Runways :landing and takeoff operations of aircraft takes place

Taxiways:a path which connects each end of the runway with terminal area, apron and hangar

Apron:parking place for aircraft

Terminal building: airport administration facilities take place

Control tower:aircraft under a particular zone are controlled no matter they are on the ground or in the air

Hanger:repairing and servicing of aircraft is done

Parking:parking the vehicles of airport staff or passengers

Lesson 4 Airport Markings and Lighting

了解机场跑道和滑行道的标志

Runway markings；

Color:reflective white

Location:on all runways (except blast pads and overruns)

Typical markings:threshold markings, designators,and centerlines

Non-precision instrument runways:threshold markings, designators, centerlines, and sometimes an aiming point

Precision instrument runways:blast pad/stopway, threshod, designator, centerline, aiming point and touchdown zone marks

Displaced threshold

Taxiways markings:

Color:reflective yellow

Location:taxiways and non-traffic areas, such as blast pads and overruns

Typical markings:

Centerline, Edge markings, Closed marking, Holding point

了解机场标志的功能及重要性
Visual guidance:assist the pilot to navigate their way through the airfield to the required destination safely and expeditiously. If they are not identified and recognized, it may potentially cause confusion among airfield operators with disastrous consequence

Safety mechanism to direct the pilot to correct location and prevent runway incusion

Warn the operators of obstacles

Lesson 5 Air Traffic Control Services

空中交通管制服务的功能及类型

The primary function of Air Traffic Control system is to prevent collision between aircraft and to expedite the flow of traffic. It consists of three parts: aerodrome control services(机场管制服务),approach control service (进近管制服务) and area control service (区域管制服务). And air traffic control units specialize in providing all those services. Control positions (管制席位) are opened within each control unit to perform specific control task.

了解机场、进近和区调三大管制单位的职责和管辖空域

In general, there are three control positions in an aerodrome control tower and they are Delivery(放行), Ground(地面) and Tower(塔台). Delivery issues departure clearences to IFR flight. Ground handles traffic on the apron and taxiways. Tower is responsible for traffic on the runways and aircraft in the vicinity of an aerodrome.

An approach control unit handles departures and arrivals. At some airports it can be split into departure and arrival with an aim to relieve the workload of the approach control.

Area Control Center mainly controls traffic flying enroute and it also handles climbing traffic transferred from the Departure Control or descending traffic which will be handed off to the Approach Control.

Lesson 6 Flight Information Service

飞行情报服务目标：

Ensure the flow of aeronautical data and aeronautical information necessary for global ATM system safety, regularity, economy and efficiency in an environmentally sustainable manner.

飞行情报与管制指令区别:

Flight information is not responsible for giving instructions and providing separation. ATCs is responsible for issuing instructions and clearances.

飞行情报的内容:

1. meteorological information (METI)
2. Aerodrome information (AI)
3. Information on possible hazards to flight: ATIS, SIGMET, METAR, SPECIs, NOTAM, AIRMET, NOTAM, VOLMET, TAF

飞行情报的获取渠道：

In general, form dedicated FIS frequencies. In U.S., it is provided by FSS. In U.K., it is provided by FISO. In P.R.C, CAAC shall be responsible for the management of flight information in the whole country, while the regional management bureaus of CAAC shall be responsible for the specific management and operation of nautical information services under their jurisdiction respectively.

Lesson 7 Alerting Service

告警服务的概念:

Alerting Service refers to the Air Traffic Service provided to notify appropriate organizations regarding aircraft in need of search and rescue aid and to assist such organizations as required.

三个阶段并能用英文对他们做简单介绍

What are the three phase of alerting service?

Uncertainty/Alert/Distress

What factors should be considered when classifying into three phase of AS?

Time of communication failure/the number of unsuccessful attempt to establish communication /fuel on board.

熟悉提供告警服务的管制单位以及告警服务的步骤

When should issue ALNOT?

1. At the end of the information request.
2. At the estimated time when the missing aircraft’s fuel would be exhausted
3. When there is serious concern regarding the safety of the aircraft and its occupants

Steps for alerting service:

1. The first step is plot the aircraft on the chart to determine

(1)possible future position (2)maximum range of action form its last known position (LKP)

1. Plot the aircraft known operating in the vicinity of the involved aircraft to avoid potential collision.
2. Inform the operator (airlines)
3. Inform other aircraft nearby about what had happened (nature of emergency)
4. Announce the termination of the state of emergency

Lesson 8 ATFM

ATFM 的定义

ATFM is the regulation of air traffic in handling traffic in order to avoid exceeding airport or air traffic control capacity and to ensure the effective use of available capacity.

ATFM目标

1. to permit full use of ATC capacity
2. Maximum flexibility in the use of the route structure
3. Ensure minimum delay
4. Orderly distribution of traffic flows

ATFM实施前提

1. maximum use of all resources available
2. The implementation of ATFM should be established, planned and developed in stages
3. ATFM units should coordinate closely with other departments concerned
4. Ensure effective communication and cooperation among all relevant parties

ATM的阶段

1. Strategic planning (2) pre-tactical planning (3) tactical operations

具体措施

1. Flow Control (2) Ground delay program (3) Diversion (4) Change route

Lesson 9 Airspace Management

了解空域管理的定义和目的

Airspace should be managed in the interest of national security, public interest and with due consideration of the needs of civil and military aviation; The airspace should be planned in a unified manner to allow its rational, sufficient and effective utilization.

中国空域的划分

The airspace is usually divided into aerodrome flight airspace, airways(航路), air routes(航线), prohibited areas (禁飞区), restricted areas (限飞区), and danger areas (危险区), air corridors (空中走廊), fuel-dumping areas (放油区) and temporary flight airspace may be established when necessary when necessary for the need of airspace management and flight missions.

Lesson 10 Radio Communications

无线电通讯的发展及频率

Ever since radio communications equipment was installed in Cleveland in 1936, radio has become the primary means of pilot-controller communication. The earlist type was one way and it used the navigation frequence. Later, the technological development permitted the controller to transmit using the navigation navaid while still allowing the pilot to use the ground station for navigation. There are three radio frequency bands: HF, VHF, UHF.Each of them has its own characteristics and advantages.

了解选择呼叫的工作原理

Selective Calling (SELACL) is an International Civil Aviation Organization (ICAO) managed communications method used to notify aircraft that a ground radio station wishes to communicate. SELCAL works by each aircraft being assigned a different 4 character SELCAL code that allows airlines and communication providers to contract a specific aircraft on a common radio voice frequency.

熟悉CPDLC工作原理及优缺点

CPDLC means Controller Pilot Data Link Communications, it offers an alternative, unambiguous communication channel with no risk of misunderstanding, since crews and air traffic controllers can actually read the messages. The main benefits of CPDLC are reducing voice-channel congestion , less chance of being misunderstood, less fatigue and greater efficiency.

Lesson 12 VOR Navigation

了解VOR导航的定义、工作原理、机载设备、识别码、航图上的图形显示等并能用英文简单描述以上信息

(VOR) stands for Very High-Frequency Omnidirectional Range system and its provides guidance information for the pilots both ensure and during departure and approach.

A VOR system is made up of a ground component and an aircraft receiver component. Aircraft equipment includes a VOR antenna, a VOR frequency selector, and a cockpit instrument. The cockpit consists of an Omni-Bearing Indicator (OBI), CDI and To-From indicator.

VORs have AM voice broadcast ability, and each VOR has its own Morse code identifier that it broadcasts to pilots. After tuning to a VOR facility’s frequency and identifying that the Morse code is correct, pilots can determine on which radical to or from the VOR station the aircraft is located. VOR and their associated radials are depicted on charts with circle graduated with degree.

The VOR system is at risk of being decommissioned due to the popularity of new technology such as GPS, wide-area augmentation systems (WAAS), and automatic dependent surveillance-broadcast systems (ADS-B).

能够将VOR导航和其它主要的导航(NDB,ILS)进行比较

Compared with NDB, VOR is more much more reliable and accurate. It suffers less interference from thunderstorm and terrain. But as an instrument approach aid, it does not provide vertical guidance for the landing aircraft.

Lesson 13 现代导航PBN

了解PBN的定义及组成要素并能用英文简单描述

PBN is performance based navigation (所需性能导航). Its operations contain three fundamental elements: navigation specification, navigation application and navigation infrastructure . PBN includes two basic navigation (导航规范): RNAV (区域导航) and RNP (所需性能导航). They are fundamentally similar. The key difference between them is that RNP specification requires onboard navigation performance monitoring and alerting. Now RNAV and RNP are used together, but in the future, RNAV will be replaced by RNP.

能够将PBN和传统导航进行比较，PBN的优点

Compared with conventional air navigation, PBN has a wide variety of benefits. It increases airspace capacity, alleviates ATC and pilots’ workload, reduces gas and noise emission and yields more returns for airlines.

Lesson 14 ATC Surveillance System 空管监视系统

了解空管监视系统的功能和类型

Surveillance is regarded as the eye of the ATC. It provides ATC with necessary aircraft information. Without it, ATC can hardly ensure flight safety and efficiency.

ATC surveillance systems consists of three main types and they are Independent Surveillance, Dependent Surveillance.

了解一次和二次雷达的工作原理和各自的优点

Currently the most widely-used ATC surveillance system is radar. Radar systems are divided into Primary Surveillance Radar and Secondary Surveillance Radar. PSR relies on reflected radar return to measure aircraft’s speed and position while SSR relies on an airborne transponder to obtain the target aircraft’s information. Radar returns produced by PSR are easily disrupted by bad weather and ATC cannot correlate the target with a particular aircraft. With SSR, the replied signal is stronger and it provides ATC with more aircraft information such as callsign, altitude, speed, distance etc. But SSR cannot work independent of on-board transponders. Therefore, PSR is often used in conjunction with SSR to overcome their deficiencies.

Lesson 15 ADS-B 自动相关监视广播

了解自动相关监视广播的定义、功能

Automatic Dependent Surveillance Broadcast is a surveillance technology for air traffic control and is an integral part of Next Generation Transportation System in U.S. Aircraft with ADSB-out equipment periodically broadcasts its position and other relevant information to air traffic controllers and nearby aircraft with ADS-B-in equipment over dedicated data link technologies. It consists of transmitting subsystems, transport protocol and receiving subsystems.

能够将自动相关监视系统和其他监视系统进行比较，自动相关监视广播的优点

Compared with surveillance radar, ADSB has advantages of its own. To begin with, it is cheaper to install and maintain; secondly, it is more accurate due to its faster updating rate of relevant flight data; thirdly it improves surveillance coverage, especially in remote and oceanic areas. Fourthly, it greatly enhances the flight crew’s situational awareness and meteorological awareness via ADS-B and FIS-B, thus improving flight safety. Lastly it increases airspace capacity and reduces environmental impact.

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| ICAO | Air Traffic Control Officer | 国际民用航空组织 |
| ATCO | Air Traffic Control Officer | 空中交通管制人员 |
| ACC | Area Control Center | 区域管制 |
| ATS | Air Traffic Services | 空中交通服务 |
| ATC | Air Traffic Control | 空中交通管制 |
| FIC | Flight Information Center | 飞行情报中心 |
| FIR | Flight Information Region | 飞行情报区域 |
| FIS | Flight Information Service | 飞行情报服务 |
| IFR | Instrument Flight Rules  | 仪表飞行规则 |
| ILS | Instrument Landing System | 仪表着陆系统（盲降） |
| NOTAM | Notices to Airmen | 飞行通告 |
| SID | Standard Instrument Departure | 标准仪表离场程序 |
| TMA | Terminal Control Area | 终端管制区域 |
| VFR | Visual Flight Rules | 目视飞行规则 |
| DEL | Delivery | 放行席 |
| GND | Ground  | 地面席 |
| TWR | Tower | 塔台席 |
| APP | Approach | 进近席 |
| IAF | Initial Approach Fix | 起始进近定位点 |
| ARR | Arrival | 进场席 |
| DEP | Departure | 离场席 |
| ATCS | Air Traffic Control Services | 空中交通管制服务 |
| AS | Alerting Services | 告警服务 |
| ASM | Airspace Management | 空域管理 |
| ATFM | Air Traffic Management  | 空中交通流量管理 |
| ATIS | Automatic Terminal Information Service | 自动终端情报服务 |
| ATM | Air Traffic Management | 空中交通管理 |
| DME | Distance Measuring Equipment | 测距仪 |
| NDB | Non-directional Beacon | 无方向信标 |
| SSR | Secondary Surveillance Radar | 二次监视雷达 |
| PSR | Primary Surveillance Radar | 一次雷达 |
| AFIS | Aerodrome Flight Information Service | 机场飞行服务情报 |
| AIRMET | Airmen’s Meteorological Infonnation | 航空人员气情报 |
| FISO | Flight Information Service Officer | 飞行情报服务人员 |
| FSS | Flight Service Stations | 飞行服务站 |
| SIGMET | Significant Meteorological Information | 重要气象情报 |
| TCA | Terminal Control Area | 终端管制区域 |
| TIA | Traffic Information Area | 交通情报区域 |
| TIZ | Traffic Information Zone  | 交通情报带 |
| FIR | Flight Information Region | 飞行情报区域 |
| ALNOT | Alerting Notice | 告警信息 |
| AS | Alerting Service | 告警服务 |
| ELT | Emergency Locator Transmitter | 应急定位器发射机 |
| FOB | Fuel on Board | 机载燃油 |
| ND | Navigation Display | 导航显示 |
| POB | Person on Board | 机上人员 |
| RVSM | Reduced Vertical Separation | 垂直间隔 |
| RA | Restricted Area | 限制区域 |
| FL | Flight Level | 飞行高度层 |
| IAPS | Instrument approach procedures  | 仪表进近程序 |
| IFR | Instrument Flight Rules | 仪表飞行规则 |
| MSL | Mean Sea Level | 平均海平面 |
| HF | High Frequency | 高频 |
| VHF | Very High Frequency | 甚高频 |
| UHF | Ultra-high Frequency | 超高频 |
| RC | Radio Communications | 无线电通讯 |
| NAVAID | Navigation Aid  | 助行设备 |
| RTF | Radiotelephony Communication | 无线电陆空通话 |
| ADF | Automatic Directional Finder | 自动定向仪 |
| CDI | Course Deviation Indicator | 偏航指示器 |
| DME | Distance Measuring Equipment | 测距仪 |
| NDB | Non-directional Radio Beacon | 无方向性无线电信标 |
| ATM | Air Traffic Management | 空中交通管理 |
| ETA | Estimated Time of Arrival | 预计到达时间 |
| GBAS | Ground-Based Augmentation System | 地基增强系统 |
| GNSS | Global Navigation Satellite System | 全球卫星导航系统 |
| GPS | Global Positioning System | 全球定位系统 |
| ILS | Instrument Landing System | 仪表着陆系统 |
| LNAV | Lateral Navigation | 水平导航 |
| MAP | Missed Approach Point | 复飞点 |
| CAAC | Civil Aviation Administration | 中国民航总局 |
| VMC | Visual Meteorological Conditions | 目视气象条件 |
| MSA | Minimum Safe Altitude | 最低安全高度 |
| ETO | Estimated Time Over | 预计飞越时间 |
| RTO | Rejected takeoff | 中断起飞 |