

CAP 624

Air Traffic Controllers – Performance Objectives

Part 1 – Basic Training

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Foreword

1 Introduction

1.1 Background

This document is derived from the Requirements for Air Traffic Controllers developed for the European ATC Licence harmonisation project and has been produced to take account of requirements imposed by the European Union Directive (2006/23/EC) on a Community air traffic controller licence.

The European Union Directive 2006/23/EC (the Directive) on a Community air traffic controller licence specifies in Annex II that compliance is required with EUROCONTROL's 'Guidelines for air traffic controller Common Core Content Initial Training', edition of 10 December 2004. The requirement for the Common Core Content syllabus is designed to ensure that all ATC Initial Training carried out throughout the European Union (EU) is carried out to a given minimum standard.

Initial training is defined as training conducted by certified ATC Training Providers on courses approved by the CAA. Initial training comprises basic training and rating training. The object of initial training is to prepare a student for unit training.

The Common Core Content requirements are contained in EUROCONTROL Document T14 which may be found at http://www.eurocontrol.int/humanfactors/public/site_preferences/display_library_list_public.html#14. This provides, in nine documents, the Common Core Content (CCC) requirements for Initial training courses in Aerodrome Control Visual (ADV), Aerodrome Control Instrument (ADI), Aerodrome Radar Control Endorsement (ADI/RAD), Approach Control Procedural (APP), Approach Control Surveillance (APS), Area Control Procedural (ACP), Area Control Surveillance (ACS) and Terminal Control Endorsement (TCL). These requirements are incorporated in the relevant Parts of CAP 624.

Training organisations may also find useful EUROCONTROL's 'EATM Training Progression and Concepts', T38, which may be found at http://www.eurocontrol.int/humanfactors/public/site_preferences/display_library_list_public.html#38.

T38 classifies the training phases for Air Traffic Controllers (ATCOs) and Air Traffic Safety Electronic Personnel. It defines the concepts used in the specification of training and in the support of training design.

In T14, 'Part 2: Basic Training - Objectives and Syllabus' provides details of the training to be included in the basic training part of Initial training. As this is common to all ratings, it has been decided that a new CAP 624 Part (1) should be published containing these requirements. As a result, the CAP 624 Parts have been re-annotated Parts 1 to 17 inclusive and the title has changed to 'Air Traffic Controllers - Performance Objectives'.

Part 1 (this document) essentially contains topics which are common to all ratings and, normally, compliance with it is required only by providers of Initial training.

UK Air Navigation Service Providers (ANSPs) may assume that the training received by any student licence holder who has received their training from a CAA certified Initial Training Provider will have completed the Common Core Content syllabus as appropriate to the UK environment, for example, legislation. Such training will also be completed to the level as defined in the Terminal Objectives published for initial training courses. These terminal objectives are included in the rating parts of CAP 624.

CAP 744 Part 2, paragraph 6 details the procedures relating to the mutual recognition of Licences issued by other EU Member States in accordance with the EU ATCO Licence Directive. It is important to note that a student licence holder whose training has been carried out by an initial training provider based elsewhere in the EU normally will have been trained according to the national requirements of the State in which the training was carried out. Similar considerations will apply to an ATCO licence holder coming to the UK from another EU State.

It is the UK ANSP's responsibility to ensure that such a student/ATCO licence holder is trained in the relevant UK National requirements. ANSPs will be required to demonstrate that such training has been identified and successfully completed before unit training commences.

In this document, reference to the male gender should be understood to include both male and female persons, except where inappropriate.

1.2 **Determining Competence by Assessment**

In order to determine competence an Assessor (Examiner) seeks evidence of performance (can the student/trainee controller actually do the job) both by direct observation and by reference to the training records. Assessment differs from an examination system by taking a longer, more detailed view of performance, rather than taking an intense but short sample of the student/trainee's work. Performance is assessed in all areas under all conditions seeking to prove that the student/trainee can perform reliably and consistently to the required level of competence.

Performance must be assessed against the Performance Objectives on sufficient occasions to ensure competence has been demonstrated across all the Conditions for which performance evidence is required. Where performance is tested in only some of the contexts in the conditions, the application of knowledge must be tested by questioning for the remainder.

All items listed as Content must be tested to prove an understanding of the knowledge, the underlying principles and the application of the knowledge to performance in the workplace. A student/trainee who demonstrates practically that he can do the job and can explain his reasons for acting in a particular manner, thereby demonstrating understanding, has fulfilled all the requirements without the need for additional written testing. It is essential that the Assessor (Examiner) determines understanding, rather than pure knowledge, when determining competence.

1.3 **Summary of Terms**

Conditions

Describe the contexts in which the Performance Objective applies.

Essential Knowledge

The fundamental knowledge and understanding necessary to perform to the Requirements and to transfer the skills from one situation to another.

Key Role

Describes in broad terms, the principal components of the controller's job.

Performance Objective

Describes the actions of the controller that demonstrate the correct performance of the Sub-Topic.

Sub-Topic

Defines specific areas of the topic.

Topic

Divides the Key Role into definable common areas.

1.4 Introduction to the Course

The Common Core Content includes an Introduction Module comprising a number of topics. Some of these topics will be confidential between the particular employer and its staff. Where appropriate, providers of initial training may delegate responsibility for carrying out such requirements to the individual employer.

1.5 Language Proficiency

The reader should note that, although language proficiency is a prerequisite to licensing and is included in ICAO Annex 1, the subject has not been addressed in the CCC. UK requirements are detailed in CAP 624 Part 17.

1.6 Taxonomy

A taxonomy is a classification based on explicit principles. The purpose of taxonomies in the training domain is to classify training objectives. The CCC defines 5 'Levels' of knowledge and/or practical competence, together with the action verbs applicable to each Level, as shown in paragraphs 1.7 and 1.9. Historically, the UK has used only action verbs to show the levels of knowledge and skill required and this practice will remain, however the CCC details are provided here for information.

1.7 Levels

Five levels are identified, numbered 1 to 5 plus an initial level (named 0) of pure information. They are defined as follows:

Level 0 'To be aware of'.

Level 1 Requires a basic knowledge of the subject. It is the ability to remember essential points; the learner is expected to memorise data and to restore it.

Level 2 Requires an understanding of the subject sufficient to enable the learner to discuss intelligently. The individual is able to represent for himself certain objects and events, and to act upon these objects and events.

Level 3 Requires a thorough knowledge of the subject and the ability to apply it with accuracy. The learner should be able to make use of his repertoire of knowledge to develop plans and activate them.

Level 4 The ability to establish a line within a unit of known applications following the correct chronology and the adequate method to resolve a problem situation. This involves the integration of known applications in a familiar situation.

Level 5 The ability to analyse new situations in order to elaborate and apply one or other relevant strategy to solve a complex problem. The defining feature is that the situation is qualitatively different to those previously met, requiring judgement and evaluation of options.

1.8 Denomination of the Learner

'Learner' is the generic term for the person performing a learning activity without any reference to his statute.

In the case of ATCO training, the specific names according to the training phase are:

- participants in initial training are called 'ab initio' as they do not hold a student licence;

- participants in unit training are called 'student air traffic controllers' when they hold a student air traffic controller licence and 'trainees' when they hold an ATC licence;
- participants in continuation training or development training are called 'trainees' as they hold an ATC licence.

NOTE: The scheme and definitions apply in a simple way to a learner entering the system. In the cases of conversion or of multiple rating training, the scheme is more complex.

When the learner is converting from one rating to another, he will be enrolled in rating training when he already holds an ATC licence, so he will be a trainee. This rating training is considered as conversion and not as initial training.

When the learner is enrolled in an additional rating training after having successfully completed one rating training, he already holds a student licence and no ATC licence, so he will be a student.

For simplification purposes 'learner' will be systematically used.

1.9 Action Verbs

Performance objectives contain an action verb to ensure that the outcome is observable and that the difficulty level is stated according to a defined taxonomy (see 1.3).

1.9.1 Definition of Verbs – Level 1

Level 1: Requires a basic knowledge of the subject. It is the ability to remember essential points; the learner is expected to memorise data and to retrieve it.

| Verb | Definition | Example | Level |
|-----------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-------|
| Define | State what it is and what its limits are; state the definition | Define the global performances for CVOR and DVOR; Define the term 'alerting service' | 1 |
| Draw | Produce a picture, pattern or diagram | Draw the block diagram of the transmitter; Draw a holding pattern | 1 |
| List | Say one after the other | List the main software development processes used in industries; List the main structure components of an aircraft | 1 |
| Name | Give name of objects or procedures | Name who is designated to authorise changes in operational data; Name some components on a graphic | 1 |
| Quote | Repeat of what is written or said to underline | Quote ICAO definition of ATC service | 1 |
| Recognise | To know what it is because you've seen it before | Recognise on a diagram all the elements of the ADS; Recognise the information disseminated through AFTN like NOTAM, SNOWTAM | 1 |
| State | Say or write in a formal or definite way | State who are the local telecom providers and the service characteristics; State the major wind systems on earth | 1 |

1.9.2 **Definition of Verbs – Level 2**

Level 2: Requires an understanding of the subject sufficient to enable the learner to discuss intelligently. The individual is able to represent for himself or herself certain objects and events in order to act upon these objects and events.

| Verb | Definition | Example | Level |
|-----------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-------|
| Characterise | To describe the quality of features in something | Characterise consequences of an OS upgrade; Characterise various items of ATC equipment | 2 |
| Consider | To think carefully about it | Consider institutional issues and service provider responsibilities; Consider radar range | 2 |
| Demonstrate | Describe and explain; logically or mathematically proves the truth of a statement | Demonstrate the possible use of GBAS for approach and landing; Demonstrate how the earth is projected as a map | 2 |
| Describe | Say what it is like or what happened | Describe the architecture of the ATN network; Describe the methods by which telecommunication regulations are implemented | 2 |
| Differentiate | Show the differences between things | Differentiate on a diagram all the possible elements of the ADS C system; Differentiate between the various relevant charts | 2 |
| Explain | Give details about something or describe so that it can be understood | Explain the principles of non-blocking switches; Explain the purpose and function of ICAO | 2 |
| Report | Give an account, provide a detailed statement about an occurrence or situation | Report on the performance of a maintenance task | 2 |
| Take account of | Take into consideration before deciding | Take wind influence into account when calculating a ground speed | 2 |

1.9.3 Definition of Verbs – Level 3

Level 3: Requires a thorough knowledge of the subject and the ability to apply it with accuracy. The learner should be able to make use of his/her repertoire of knowledge to develop plans and activate them.

| Verb | Definition | Example | Level |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Act | Carry out, execute | | 3 |
| Apply | Use something in a situation or activity | Apply the appropriate model to the analysis of a relevant aviation system. Apply national requirements in abnormal situations | 3 |
| Appreciate | To understand a situation and know what is involved in a problem-solving situation, to state a plan without applying it | Appreciate criticality of the conditions; Appreciate the necessary (<i>sic</i>) for coordination. The learner says that the co-ordination will be done and with whom, he/she does not perform the actual co-ordination | 3 |
| Assist | Help somebody to do a job by doing part of it | Handle the operational HMI and assist in the tuning of the screens; Assist the pilot | 3 |
| Calculate | To discover from information you already have by arithmetic; to think about a possible cause of action in order to form an opinion or decide what to do | Calculate the values of the elements of a simple generic antenna system; Calculate transition level | 3 |
| Check | Make sure the information is correct (satisfactory) | Check the operational status of the monitor system; Check and maintain the integrity of the working position | 3 |
| Choose | Select out of number, decide to do one thing rather than another | Choose the appropriate type of line for a given specific application; Choose which aircraft should be vectored | 3 |
| Collect | Assemble, accumulate, bring or come together | | 3 |
| Conduct | Lead, guide | Conduct co-ordination | 3 |
| Confirm | Establish more firmly, corroborate | Confirm sequence order | 3 |
| Decode | Turn into ordinary writing, decipher | Decode a transponder message; Decode weather reports and forecast | 3 |
| Encode | Put into code or cipher | | 3 |
| Estimate | Form an approximate judgement of a number, form an opinion | Being given an aircraft route, estimate thanks to a software package or/and GPS receiver the availability of the constellation; Estimate distance between two points | 3 |

| | | | |
|----------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|---|
| Execute | Perform action | | 3 |
| Extract | Copy out, make extracts from, find, deduce | Extract data from a flight plan | 3 |
| Identify | Associate oneself inseparably with, establish the identity | Identify and locate data transmission problems; Identify a radar blip | 3 |
| Inform | Inspire, tell | Inform the planning controller | 3 |
| Initiate | Begin, set going, originate | Initiate a coordination procedure | 3 |
| Input | Enter in the system | Input data | 3 |
| Issue | Send forth, publish | Issue ATC clearance | 3 |
| Maintain | Carry on, keep up, refresh | Maintain flight data display 3 | 3 |
| Measure | Ascertain extent or quality of (thing) by comparison with fixed unit or with object of know(n) size | Measure the typical parameters of lines; Measure cross modulation in radio antenna system | 3 |
| Monitor | Keep under observation | Monitor traffic | 3 |
| Notify | Make known, announce, report | Notify runway in use | 3 |
| Obtain | Acquire easily, without research | Obtain aeronautical information | 3 |
| Operate | Conduct work on equipment | Operate test tools to analyse the system; Operate electronic data transfer equipment | 3 |
| Pass | Move, cause to go, transmit | Pass essential traffic information without delay | 3 |
| Perform | Carry into effect, go through, execute | Perform typical measurements on a receiver; Perform coordination effectively | 3 |
| Record | Register, set down for remembrance or reference | Record information by writing effectively | 3 |
| Relay | Arrange in, provide with, replace by ... | Relay pilot message 3 | 3 |
| Respond | Make answer, perform answering or corresponding action | Respond to the loss of aircraft radar identification | 3 |
| Scan | Continuously observe rapidly, sequentially and selectively in order to extract relevant data | Scan data display | 3 |
| Transfer | Hand over | Transfer information to receiving controller | 3 |
| Update | Refresh, make up-to-date | Update | 3 |

| | | | |
|--------|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---|
| Use | Employ for a purpose, handle as instrument, put into operation | Use the ICAO documentation to explain the principles related to signals in space | 3 |
| Verify | Establish truth of | Verify the impact of the requirements on the location and the type of the ground station; Verify, identify | 3 |

1.9.4 Definition of Verbs – Level 4

Level 4: Ability to establish a line within a unit of known applications following the correct chronology and the adequate methods to resolve a problem situation. This involves the integration of known applications in a familiar situation.

| Verb | Definition | Example | Level |
|-------------|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-------|
| Acquire | Gain by oneself and for oneself, obtain after research | Acquire relevant aeronautical information | 4 |
| Adjust | Change to a new position, value or setting | Adjust antenna system | 4 |
| Allocate | Assign, devote | Allocate the responsibility of separation during transfer | 4 |
| Analyse | Examine minutely the constitution of | Analyse the coverage of the radio system; Analyse traffic | 4 |
| Assign | Allot as a share, make over | Assign take off number | 4 |
| Co-ordinate | Bring part into proper relation | Co-ordinate with RCC | 4 |
| Comply | Act in accordance with | Comply with rules | 4 |
| Delegate | Commit authority to somebody | Delegate separation in case of aircraft continuing visually | 4 |
| Design | Conceive mental plans for | Design a NDB station according to operational requirements; Design... appropriate clearances and instructions | 4 |
| Detect | Discover existence of | Detect disturbances; Detect deviation from track | 4 |
| Ensure | Make safe, make certain | Ensure the agreed course of action is carried out | 4 |
| Expedite | Assist the progress of, do speedily | | 4 |
| Integrate | Combine into a whole, complete by addition of parts | Integrate adequately components into a LAN; Integrate a transferred aircraft into the controlled traffic | 4 |

| | | | |
|----------|-------------------------------------------------------------|-----------------------------------------------------------------------------------|---|
| Justify | Show the rightness of a choice or of an option | Justify and theorise the DME/N versus the DME/P; Justify and theorise the DVOR | 4 |
| Manage | Handle, wield, conduct | Manage aerodrome surface movements | 4 |
| Organise | Give orderly structure to, frame and put into working order | Organise arrival sequence | 4 |
| Predict | Forecast | Predict evolution of a conflict situation | 4 |
| Provide | Supply, furnish | Provide separation | 4 |
| Relate | Establish link with | Relate a pressure setting to an altitude | 4 |

1.9.5 Definition of Verbs – Level 5

Level 5: Ability to analyse new situation in order to elaborate and apply one or other relevant strategy to solve a complex problem. The defining feature is that the situation is qualitatively different to those previously met, requiring judgement and evaluation of options.

| Verb | Definition | Example | Level |
|-------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------|
| Appraise | Estimate, determine the benefit | Appraise the interest of a traffic management option | 5 |
| Assess | Estimate value or difficulty, evaluate | Assess flight inspection results; Assess workload | 5 |
| Balance | Weigh (a question, two arguments, etc., against each other) | Balance two control actions | 5 |
| Calibrate | Correct and adjust to enable the provision of accurate data | Calibrate the NDB system according to flight inspection | 5 |
| Discuss | Investigate by reasoning or argument | Discuss the distribution of integrity information through GALILEO; Discuss the impact of regulation | 5 |
| Evaluate | Ascertain amount of, find numerical expression for | Evaluate workload | 5 |
| Extemporise | Produce without preparation, improvise | Extemporise phraseology in abnormal situations | 5 |
| Imagine | Form mental image of, conceive | Imagine possible actions to cope with unusual situations | 5 |
| Interpret | To decide on something's meaning or significance when there is a choice | Interpret fault report based on various test tool measures; Interpret ICAO annexes | 5 |
| Resolve | Solve, clear up, settle | Resolve conflict | 5 |

| | | | |
|--------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|---|
| Review | Survey, look back on | Review previous clearance according to the latest aircraft relative positions | 5 |
| Select | Pick out as best or most suitable | Select the runway in use | 5 |
| Solve | Find answer to | Solve separation problems | 5 |
| Theorise | Extract general principles from a particular experience | Theorise the principles of ILS; Theorise the resolution of conflict between a slow and a fast aircraft | 5 |
| Troubleshoot | Trace and correct faults | Troubleshoot wrong bearing indications of a VOR | 5 |
| Validate | Make valid, ratify, confirm | Validate one radar vectoring option to expedite the traffic | 5 |

1.10 Introduction to Common Core Content Structure

When the CCC was being developed, the composition and topics were chosen according to the ICAO Annex 1 requirements for controller licensing, namely:

- Air Law (including Rules of the Air, National and International regulations and organisational structures) renamed 'Aviation Law',
- Air Traffic Control (ATC) Equipment (including modern systems and computers in general) renamed 'Equipment and Systems',
- Principles of Flight (including aircraft operations and functions, power plants and performance characteristics) renamed 'Aircraft',
- Human Performance renamed 'Human Factors',
- Language;
- Meteorology,
- Navigation,
- Operational Procedures renamed 'Air Traffic Management',
- Miscellaneous renamed 'Professional Environment'.

The taxonomy level does not go higher than level 3: 'to apply'.

NOTE: Some objectives are at level 0: 'to be aware of'.

When teaching to the training objectives, it is envisaged that different training methodologies will be used. No recommendation is made in this area, the pertinent document being Course Design Documents for Initial training courses and Unit Training Plans.

The **Essential Knowledge** column contains, in many sub-topics, a list of items prefixed by 'e.g.' This is intended to indicate that the list is not exhaustive.

Paragraph numbering in this part of CAP 624 is designed to allow direct compliance mapping to the relevant paragraphs in T14. For example, T1.2/2.1.1 refers to sub-topic T1.2 in this document and paragraph 2.1.1 of Subject 1 in T14.

In some topics in this document, the 'Essential Knowledge' column contains text in normal and bold. The normal text is that contained in the original CCC document, the bold text shows the UK references/requirements.

SUBJECT 1 INTRODUCTION TO THE COURSE

The general objective is:

Students shall describe the training programme that they will follow, the potential for development of their careers in ATC and state the rules and regulations concerning employment and security.

Topic T1 INTRODUCTION TO THE COURSE

Sub-topic T1.1 Course Management

| Performance Objectives | Conditions | Essential Knowledge |
|---------------------------------------------------------------------------------|------------|-----------------------------------------------------------------|
| T1.1/1.1.1 Explain the basic course, the aims and main objectives of the course | | Course objectives |
| T1.1/1.2.1 State the course administration | | Course administration |
| T1.1/1.3.1 Use the appropriate documentation for the course | | Methods of access to study materials and training documentation |

Topic T1 INTRODUCTION TO THE COURSE

Sub-topic T1.2 Introduction to the ATC Training Course

| Performance Objectives | Conditions | Essential Knowledge |
|--------------------------------------------------------------------|------------|---------------------------------------------------------------------------|
| T1.2/2.1.1 State the different methods of teaching the subjects | | Description of: Training methods used on the course Course contents |
| T1.2/2.1.2 Describe, in general terms, the content of the subjects | | |
| T1.2/2.2.1 Recognise the feedback mechanisms available | | Briefing, de-briefing, classroom briefings |
| T1.2/2.3.1 Describe the assessment process | | Assessment procedures, including resits and appeals |

Topic T1 INTRODUCTION TO THE COURSE**Sub-topic T1.3 Introduction to the ATCO's Future**

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------------------------------------------------|------------|---------------------------------------------------------------------------------------------------------------------------------|
| T1.3/3.1.1 Recognise an ATCO's working environment T1.3/3.1.2 Recognise career developments | | Area control; Approach control; Aerodrome control e.g. OJTI, LCE, supervisory posts, managerial posts, non-operational posts |

Topic T1 INTRODUCTION TO THE COURSE**Sub-topic T1.4 Conditions of Service**

| Performance Objectives | Conditions | Essential Knowledge |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------|
| T1.4/4.1.1 Take account of administrative employment rules and regulations that apply to a student T1.4/4.1.2 Take account of administrative employment rules and regulations that apply to an ATCO as an employee T1.4/4.1.3 State the licensing/certification system of the country | | |
| T1.4/4.2.1 Recognise the management/staff negotiation and discussion procedures T1.4/4.2.2 Recognise the roles of trade unions, other ATC associations and professional organisations | | |

Topic T1 INTRODUCTION TO THE COURSE**Sub-topic T1.5 Security**

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------|
| T1.5/5.1.1 Define security and safety T1.5/5.1.2 State the rules and regulations concerning the security at a facility and within ATC | | |

SUBJECT 2 AVIATION LAW

The general objective is:

Students shall apply the regulations governing Rules of the Air, airspace and flight planning and explain their development and incorporation into national legislation.

Topic T2 AVIATION LAW

Sub-topic T2.1 Introduction

| Performance Objectives | Conditions | Essential Knowledge |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T2.1/1.1.1 Name the key national and international aviation organisations T2.1/1.1.2 Describe the impact these organisations have on ATC and their interaction with each other T2.1/1.1.3 State the necessity for air law and the sources and development of air law | | International Civil Aviation Organisation (ICAO) European Civil Aviation Conference (ECAC) Joint Aviation Authorities (JAA) EUROCONTROL Dept for Transport (DfT) Civil Aviation Authority (CAA) Ministry of Defence (MOD) |
| T2.1/1.2.1 Explain the ATC licensing/certification process T2.1/1.2.2 Explain the privileges and limitations of controller licences | | Annex 2 European Aviation Safety Agency (EASA) Civil Aviation Act Air Navigation Order (ANO) Civil Aviation Publication (CAP) UK Aeronautical Information Publication (AIP) |
| T2.1/1.3.1 Describe the need for safety regulation T2.1/1.3.2 Explain how a safety management system complies with regulatory requirements T2.1/1.3.3 Describe the safety organisation T2.1/1.3.4 Explain the impact of safety regulation on the controller ESARR3ESARR5ANO | | ESARR3 ESARR5 ANO |

Topic T2 AVIATION LAW
Sub-topic T2.2 International Organisations

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T2.2/2.1.1 Explain the purpose and function of ICAO T2.2/2.1.2 Describe the methods by which ICAO notifies and implements legislation | | Annexes Standards and Recommended Practices (SARPS) Procedures for Air Navigation Services (PANS) |
| T2.2/2.2.1 Describe the purpose and function of other international agencies and their relevance to air traffic operations | | ICAO ECAC JAA EUROCONTROL DfT CAA MOD International Telecommunications Union (ITU) |
| T2.2/2.3.1 Describe the purpose of controller, pilot, airline and airspace user associations and their interaction with ATC | | International Federation of Air Traffic Controllers' Associations (IFATCA) International Federation of Airline Pilots' Associations (IFALPA) International Air Transport Association (IATA) Association of European Airlines (AEA) International Council of Aircraft Owner and Pilot Associations (IAOPA) The International Air Carrier Association (IACA) |

Topic T2 AVIATION LAW
Sub-topic T2.3 National Organisations

This topic contains:

| Performance Objectives | Conditions | Essential Knowledge |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------|
| T2.3/3.1.1 Describe the purpose and function of appropriate national agencies and their relevance to air traffic operations | | DfT CAA MOD Airport Operators Association (AOA) |
| T2.3/3.2.1 Describe the methods by which legislation is implemented and notified | | Civil Aviation Act ANO |
| T2.3/3.3.1 Name the body responsible for licensing and enforcing legislation and operational procedures T2.3/3.3.2 Describe how the regulatory body carries out its safety regulation responsibilities | | |
| T2.3/3.4.1 Describe the purpose of national controller, pilot, airline and airspace user associations and their interaction with ATC | | Guild of Air Traffic Controllers (GATCO) British Airline Pilots' Association (BALPA) AOA |

Topic T2 AVIATION LAW
Sub-topic T2.4 Rules and Regulations

| Performance Objectives | Conditions | Essential Knowledge |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T2.4/4.1.1 Differentiate between the air navigation services T2.4/4.1.2 Explain the considerations which determine the need for air traffic services T2.4/4.1.3 Differentiate between the air traffic services | | ICAO Doc 9161 ICAO Annex 11, Chapter 2 ATCS, ADVS, FIS, ALRS MATS Part 1, Section 1 Air traffic services AIP |
| T2.4/4.2.1 Explain airspace classification T2.4/4.2.2 Differentiate between the different types of airspace T2.4/4.2.3 Decode information from aeronautical charts | | ICAO Classes A-G, ICAO Annex 11, Chapter 2 National classification MATS Part 1, Section 1 - Air traffic services e.g. Control zones, control areas, airways, upper and lower airspace, restricted areas, prohibited and danger areas, FIR, aerodrome traffic zone MATS Part 1 - Glossary e.g. Control zones, control areas, airways, upper and lower airspace, restricted areas, prohibited and danger areas, FIR, aerodrome traffic zone AIP |

| Performance Objectives | Conditions | Essential Knowledge |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>T2.4/4.3.1 Explain the Rules of the Air</p> <p>T2.4/4.3.2 Appreciate any notified national differences with ICAO</p> <p>T2.4/4.3.3 Appreciate the influence of relevant flight rules on ATC</p> <p>T2.4/4.3.4 Appreciate the differences between flying in accordance with VFR and IFR, in VMC and IMC</p> | | <p>ICAO Annex 2 Chapter 3 ANO Section 2</p> <p>National legislation AIP - GEN section</p> <p>General flight rules, instrument flight rules, visual flight rules. ANO MATS Part 1</p> <p>ICAO Annex 2 Chapters 4 and 5 ANO MATS Part 1</p> |
| <p>T2.4/4.4.1 Explain the functions of a flight plan</p> <p>T2.4/4.4.2 Explain the different types of flight plan</p> <p>T2.4/4.4.3 Encode and decode flight plans (including supplementary flight plan information)</p> <p>T2.4/4.4.4 Encode and decode an appropriate selection of standard ICAO abbreviations</p> <p>T2.4/4.4.5 Describe flight plan processing</p> <p>T2.4/4.4.6 Describe any additional national procedures for flight plans</p> | | <p>ICAO form, AFTN format, national differences AIP MATS Part 1 CAP 694</p> <p>ICAO Doc 8585 ICAO Doc 8643 ICAO Doc 7910</p> <p>e.g. AFTN, IFPS AIP MATS Part 1 CAP 694</p> <p>AIP MATS Part 1 CAP 694</p> |
| <p>T2.4/4.5.1 Describe the units of measurement used in aviation</p> | | <p>ICAO Annex 5, national procedures MATS Part 1 - Glossary</p> |

SUBJECT 3 AIR TRAFFIC MANAGEMENT

The general objective is:

Students shall describe the basic principles of air traffic management and apply basic operational procedures.

Topic T3: AIR TRAFFIC MANAGEMENT

Sub-topic T3.1 Air Traffic Management

| Performance Objectives | Conditions | Essential Knowledge |
|----------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------|
| T3.1/1.1.1 Apply the units of measurement appropriate to ATM | | |
| T3.1/1.2.1 Define ATC service | | ICAO Annex 11, Chapter 1, definitions MATS Part 1 Section 1 – Air traffic services |
| T3.1/1.2.2 Explain the division of the ATC service | | ICAO Annex 11 |
| T3.1/1.2.3 Explain the responsibility for the provision of the ATC service | | ICAO Annex 11 |
| T3.1/1.2.4 Differentiate between the different methods of ATC service | | Surveillance, procedural |
| T3.1/1.3.1 Define FIS | | ICAO Annex 11 Chapter 1 MATS Part 1 Section 1 – Air traffic services |
| T3.1/1.3.2 Describe the scope of the FIS | | ICAO Annex 11 Chapter 4 MATS Part 1 – Air traffic services |
| T3.1/1.3.3 Explain the responsibility for the provision of the FIS | | ICAO Doc 4444 Chapter 9 MATS Part 1 – Air traffic services |
| T3.1/1.3.4 State the methods of transmitting information | | e.g. RTF, datalink, ATIS, VOLMET, etc. |
| T3.1/1.3.5 Issue information to aircraft | | e.g. SIGMET, serviceability of NAVAIDs, weather, flight safety information, etc. |

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>T3.1/1.4.1 Define ALRS</p> <p>T3.1/1.4.2 Describe the scope of the ALRS</p> <p>T3.1/1.4.3 Explain the responsibility for the provision of the ALRS</p> <p>T3.1/1.4.4 Differentiate between the phases of emergency</p> <p>T3.1/1.4.5 Describe the organisation of an ALRS</p> <p>T3.1/1.4.6 Describe the co-operation between units providing the alerting service and the SAR units</p> <p>T3.1/1.4.7 Differentiate between distress and urgency signals</p> | | <p>ICAO Annex 11 Chapter 1 MATS Part 1 Section 1 – Air traffic services</p> <p>ICAO Annex 11 MATS Part 1 Section 5 – Alerting service</p> <p>ICAO Doc 4444 Chapter 9 MATS Part 1 Section 5 – Alerting service</p> <p>Uncertainty, alert, distress MATS Part 1 Section 5 – Alerting service</p> <p>Responsibilities, local organisation AIP MATS Part 1 Section 5 – Alerting service</p> <p>AIP MATS Part 1 Section 5 – Alerting service</p> <p>e.g. Mayday, Pan, visual, etc. MATS Part 1 Section 5 – Aircraft emergencies</p> |
| <p>T3.1/1.5.1 Define ATFM</p> <p>T3.1/1.5.2 Describe the scope of ATFM</p> <p>T3.1/1.5.3 Explain the responsibility for the provision of ATFM</p> <p>T3.1/1.5.4 State the methods of providing ATFM</p> | | <p>ICAO Doc 4444 Chapter 3</p> <p>ICAO Doc 4444 Chapter 3</p> <p>ICAO Doc 4444 Chapter 3</p> |
| <p>T3.1/1.6.1 Define ASM</p> <p>T3.1/1.6.2 Describe the scope of ASM</p> <p>T3.1/1.6.3 Explain the responsibility for the provision of ASM</p> <p>T3.1/1.6.4 State the methods of managing airspace</p> | | <p>EUROCONTROL Airspace Management Handbook for the application of FUA</p> <p>EUROCONTROL Airspace Management Handbook for the application of FUA</p> <p>EUROCONTROL Airspace Management Handbook for the application of FUA</p> <p>e.g. FUA, airspace design</p> |

Topic T3: AIR TRAFFIC MANAGEMENT**Sub-topic T3.2 Radiotelephony (RTF)**

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T3.2/2.1.1 Explain the need for approved phraseology | | ICAO Doc 4444 Chapter 12 ICAO Doc 9432 RTF manual, standard words and phrases as contained in ICAO Annex 10 Vol 2 Chapter 5 MATS Part 1 Appendix E CAP 413 |
| T3.2/2.1.2 Use approved phraseology | | ICAO Doc 4444 Chapter 12 ICAO Doc 9432 RTF manual, standard words and phrases as contained in ICAO Annex 10 Vol 2 Chapter 5 MATS Part 1 Appendix E CAP 413 |
| T3.2/2.1.3 Perform communication effectively | | Transmission techniques ICAO Annex 1 language proficiency MATS Part 1 Appendix E CAP 624 Part 17 |

Topic T3: AIR TRAFFIC MANAGEMENT
Sub-topic T3.3 ATC Clearances and ATC Instructions

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------|------------|-------------------------------------------------------------------------------------|
| T3.3/3.1.1 Define ATC clearance | | ICAO Annex 2 Chapter 1 MATS Part 1 - Glossary |
| T3.3/3.1.2 Describe the contents of an ATC clearance | | ICAO Annex 11 ICAO Doc 4444 MATS Part 1 Section 1 – Control of traffic |
| T3.3/3.1.3 Issue appropriate ATC clearances | | |
| T3.3/3.2.1 Define ATC instruction | | ICAO Doc 4444 Chapter 1 |
| T3.3/3.2.2 Describe the contents of ATC instructions | | ICAO Doc 4444 Annex 11 |
| T3.3/3.2.3 Issue appropriate ATC instructions | | |

Topic T3: AIR TRAFFIC MANAGEMENT
Sub-topic T3.4 Co-ordination

| Performance Objectives | Conditions | Essential Knowledge |
|-----------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T3.4/4.1.1 Explain the principles, types and content of co-ordination | | e.g. Notification, negotiation, agreement, transfer of flight data and local agreements, etc. ICAO Annex 11, ICAO Doc 4444 MATS Part 1 Section 1 – Control of traffic |
| T3.4/4.2.1 Appreciate the need for co-ordination | | e.g. Electronic transfer of flight data, telephone, interphone, intercom, direct speech, RTF, local agreements, ICAO Doc 4444 MATS Part 1 Section 1 - Control of traffic |
| T3.4/4.3.1 Describe the means of co-ordination | | e.g. Datalink, telephone, intercom, voice, etc. |
| T3.4/4.3.2 Use the available means for co-ordination | | |

Topic T3: AIR TRAFFIC MANAGEMENT
Sub-topic T3.5 Altimetry and Level Allocation

| Performance Objectives | Conditions | Essential Knowledge |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T3.5/5.1.1 Appreciate the relationship between height, altitude and flight level | | QFE, QNH, standard pressure |
| T3.5/5.2.1 Appreciate the relationship between transition level, transition altitude and transition layer T3.5/5.2.2 Calculate transition levels | | ICAO Doc 4444 Chapter 4 ICAO Doc 8168 AIP – ENR section MATS Part 1 Section 1 – Altimeter setting and vertical reference |
| T3.5/5.3.1 Describe the cruising level allocation system T3.5/5.3.2 Choose appropriate levels | | ICAO Annex 2, table of cruising levels AIP – ENR section MATS Part 1 - Control of traffic Flight level, altitudes, heights MATS Part 1 Section 1 – Altimeter setting and vertical reference |

Topic T3: AIR TRAFFIC MANAGEMENT
Sub-topic T3.6 Separation Methods and Minima

| Performance Objectives | Conditions | Essential Knowledge |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------------------------------------------------------------------------------------------------------------|
| T3.6/6.1.1 State the vertical separation standards and procedures T3.6/6.1.2 Apply vertical separation | | ICAO Doc 4444 MATS Part 1 Section 1 – Separation standards |
| T3.6/6.2.1 State the longitudinal separation standards and procedures based on time and distance T3.6/6.2.2 Apply longitudinal separation | | ICAO Doc 4444 MATS Part 1 Section 1 – Separation standards |
| T3.6/6.2.3 State the lateral separation standards and procedures T3.6/6.2.4 Apply lateral separations | | ICAO Doc 4444 MATS Part 1 Section 1 – Separation standards |
| T3.6/6.3.1 State the occasions when visual separation can be used | | Separation provided by pilot VMC climb and descent MATS Part 1 Section 1 – Separation standards |
| T3.6/6.4.1 Explain the use of geographical separation | | MATS Part 1 Section 1 – Separation standards |
| T3.6/6.5.1 Explain the wake turbulence categories and separations | | ICAO Doc 4444 National categories MATS Part 1 Section 1 – Separation standards |
| T3.6/6.6.1 Explain the use of radar in ATS T3.6/6.6.2 Explain the radar separation standards and procedures T3.6/6.6.3 Apply radar separation | | ICAO Doc 4444 MATS Part 1 Section 1 – PSR, SSR ICAO Doc 4444 MATS Part 1 Section 1 – PSR, SSR |

Topic T3: AIR TRAFFIC MANAGEMENT
Sub-topic T3.7 Collision Avoidance and Safety Nets

| Performance Objectives | Conditions | Essential Knowledge |
|-----------------------------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T3.7/7.1.1 Explain the effect of airborne collision avoidance systems on ATC operations | | e.g. ACAS traffic alerts, ACAS ATC procedures, ICAO Doc 4444, Chapter 15 ICAO Doc 7030 EUROCONTROL Guidelines for Controller Training in the Handling of Unusual/Emergency Situations MATS Part 1 Section 1 – Airborne collision avoidance system |
| T3.7/7.2.1 Explain the effect of conflict alert systems on ATC operations | | e.g. Medium Term Conflict Alert (MTCA), Short Term Conflict Alert (STCA), Minimum Safe Altitude Warning (MSAW), Danger Area Infringement Warning (DAIW) |

Topic T3: AIR TRAFFIC MANAGEMENT
Sub-topic T3.8 Data Display

| Performance Objectives | Conditions | Essential Knowledge |
|-------------------------------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------------------------|
| T3.8/8.1.1 Extract pertinent data from a flight plan to produce a flight progress display | | e.g. Flight progress strips, electronic data display |
| T3.8/8.1.2 Extract pertinent data from other sources to produce a flight progress display | | Pilot reports, co-ordination, data exchange |
| T3.8/8.2.1 Update the data display to accurately reflect the traffic situation | | e.g. Strip marking symbols, strip movement procedures, electronic data MATS Part 1 – Appendix D |

SUBJECT 4 METEOROLOGY

The general objective is:

Students shall describe how the basic theory of meteorology affects ATS operations and aircraft performance and apply meteorological information in the basic operational procedures of ATS.

Topic T4 METEOROLOGY

Sub-topic T4.1 Introduction

| Performance Objectives | Conditions | Essential Knowledge |
|---------------------------------------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------------------------|
| T4.1/1.1.1 Apply the units of measurement appropriate to meteorology | | MATS Part 1 Section 7 – Glossary MATS Part 1 Section 7 – Meteorological services |
| T4.1/1.2.1 Explain the relevance of meteorology in aviation | | |
| T4.1/1.3.1 Name the basic duties, organisation and working methods of meteorological offices | | |
| T4.1/1.3.2 State the international and national standards for the exchange of meteorological data | | |
| T4.1/1.3.3 Recognise methods for the collection of meteorological data | | e.g. Barometer, thermometer, ceilometer, anemometer, weather balloons, transmissometer, radar, satellites |

Topic T4 METEOROLOGY**Sub-topic T4.2 Atmosphere**

| Performance Objectives | Conditions | Essential Knowledge |
|-------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T4.2/2.1.1 State the composition and structure of the atmosphere | | Gases, layers |
| T4.2/2.2.1 Describe the elements of the ISA T4.2/2.2.2 State the reasons why the ISA has been defined | | Temperature, pressure, density |
| T4.2/2.3.1 Describe the origin and movement of typical air masses T4.2/2.3.2 State the major wind systems on the Earth | | Polar, arctic, tropical, equatorial (maritime and continental) Polar easterly winds, westerly wind zone, trade winds, inter-tropical convergence zone |
| T4.2/2.4.1 Describe the high and low pressure systems T4.2/2.4.2 Appreciate the difference between various fronts and the associated weather | | Warm front, cold front, occluded front |

Topic T4 METEOROLOGY**Sub-topic T4.3 Atmospheric Processes**

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------------------------------------------------------------------------------------|
| T4.3/3.1.1 Recognise the processes by which heat is transferred and how the atmosphere is heated T4.3/3.1.2 Describe how temperature varies | | Radiation, convection, advection, conduction, turbulence Lapse rates, land/sea variations |
| T4.3/3.2.1 Differentiate between the different terms related to air saturation levels | | Saturation, condensation, evaporation, relative humidity, dew point, sublimation and latent heat |
| T4.3/3.3.1 Describe the relationship between pressure, temperature and height T4.3/3.3.2 Explain the relationship between pressure settings | | QFE, QNH, standard pressure |

Topic T4 METEOROLOGY
Sub-topic T4.4 Meteorological Phenomena

| Performance Objectives | Conditions | Essential Knowledge |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------|
| T4.4/4.1.1 Explain the different conditions for the formation of clouds T4.4/4.1.2 Recognise different cloud types and state their characteristics T4.4/4.1.3 State how the amount of cloud is measured T4.4/4.1.4 Define cloud base and ceiling T4.4/4.1.5 Differentiate between cloud base and ceiling | | |
| T4.4/4.2.1 Explain the significance of precipitation in aviation T4.4/4.2.2 Describe all types of precipitation and their corresponding cloud families | | e.g. Falling rain, snow, sleet, hail, precipitation and microphysics |
| T4.4/4.3.1 Explain the causes of atmospheric obscurity | | e.g. Advection fog, radiation fog, mixing, evaporation, mist, drizzle, snow, haze |
| T4.4/4.4.1 Explain the significance of wind phenomena and types T4.4/4.4.2 State how wind is measured T4.4/4.4.3 List forces which influence wind | | e.g. Veering, backing, gusting, jet streams, land/sea breezes, Föhn, surface, upper EUROCONTROL CBT |
| T4.4/4.5.1 State the meteorological hazards to aviation T4.4/4.5.2 Describe the effect of meteorological hazards on aviation | | e.g. Turbulence, thunderstorms, icing, microbursts, squall, macroburst |

Topic T4 METEOROLOGY**Sub-topic T4.5 Application of Meteorological Information**

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------|
| T4.5/5.1.1 Decode and apply the content of weather reports and forecasts | | METAR, SPECI, TAF, SIGMET, FIS, clearances, instructions |
| T4.5/5.2.1 Decode and apply information from the most commonly used weather charts | | e.g. Low-level charts, high-level charts, significant weather charts, FIS, clearances, instructions |

SUBJECT 5 NAVIGATION

The general objective is:

Students shall explain the basic principles of navigation and use this knowledge in ATS operations.

Topic T5 NAVIGATION

Sub-topic T5.1 Introduction

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------|
| T5.1/1.1.1 Apply the units of measurement appropriate to navigation | | MATS Part 1 Section 7 – Glossary |
| T5.1/1.2.1 Explain the need for navigation in aviation T5.1/1.2.2 Characterise navigation methods | | e.g. Historical overview, celestial, on-board, radio, satellites |

Topic T5 NAVIGATION

Sub-topic T5.2 The Earth

| Performance Objectives | Conditions | Essential Knowledge |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T5.2/2.1.1 Explain the Earth's properties and their effects | | e.g. Form, size, rotation, revolution in space, seasons, day, night, twilight, units of time, time zones, UTC |
| T5.2/2.2.1 Characterise the general principles of a grid system T5.2/2.2.2 Explain direction and distance on a globe T5.2/2.2.3 Estimate position on the Earth's surface T5.2/2.2.4 Estimate distance and direction between two points | | e.g. Degrees, minutes, seconds, WGS-84, latitude/longitude e.g. Great circle, small circle, rhumb line, cardinal points, inter-cardinal points e.g. Latitude/longitude |
| T5.2/2.3.1 Explain the general principles of the Earth's magnetism T5.2/2.3.2 Calculate conversions between the three north designations | | True north, magnetic north, variation, deviation, inclination True north, magnetic north, compass north |

Topic T5 NAVIGATION
Sub-topic T5.3 Maps and Aeronautical Charts

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------|
| T5.3/3.1.1 Demonstrate how the Earth is projected to create a map T5.3/3.1.2 Describe the properties of an ideal map T5.3/3.1.3 Explain the properties and uses of different projections | | Types of projections e.g. Conformality, constant scale, true azimuth, rhumb lines, great circles e.g. Lambert, Mercator |
| T5.3/3.2.1 Differentiate between the various maps and charts and state their specific use | | e.g. AIP maps and charts, National and military maps and charts |
| T5.3/3.3.1 Decode symbols and information found on maps and charts | | |

Topic T5 NAVIGATION
Sub-topic T5.4 Applied Navigation

| Performance Objectives | Conditions | Essential Knowledge |
|---------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------------------------------------------------------|
| T5.4/4.1.1 Measure the distance between two points | | |
| T5.4/4.2.1 Appreciate the wind influence on the flight-path | | Heading, track, drift, wind vector |
| T5.4/4.3.1 Explain the relationship between various speeds used in aviation T5.4/4.3.2 Appreciate the use of various speeds in ATC | | True air speed, ground speed, indicated air speed (including Mach number) |

Topic T5 NAVIGATION
Sub-topic T5.5 Radio Navigation

| Performance Objectives | Conditions | Essential Knowledge |
|-------------------------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------|
| T5.5/5.1.1 Explain the working principles of ground-based systems | | e.g. NDB, VOR, TACAN, DME, ILS and marker beacons, MLS, VLF |
| T5.5/5.1.2 Describe the use, precision and limitations of ground-based systems | | e.g. NDB (ADF), VOR (TACAN) DME, ILS and marker beacons MLS, VLF |
| T5.5/5.2.1 Explain the working principles and use of on-board systems | | e.g. INS, FMS and navigational computers (area navigation) |
| T5.5/5.3.1 Explain the working principles and use of satellite-based navigational systems | | GNSS, GPS, GLONASS |

SUBJECT 6 AIRCRAFT

The general objective is:

Students shall describe the basic principles of the theory of flight and aircraft characteristics and how these influence ATS operations.

Topic T6 AIRCRAFT**Sub-topic T6.1 Introduction**

| Performance Objectives | Conditions | Essential Knowledge |
|-----------------------------------------------------------------------------------------------------|------------|-----------------------------------------|
| T6.1/1.1.1 Apply the units of measurement appropriate to aircraft and principles of flight | | MATS Part 1 Section 7 – Glossary |
| T6.1/1.2.1 Explain the relevance of theory of flight and aircraft characteristics on ATS operations | | |

Topic T6 AIRCRAFT**Sub-topic T6.2 Principles of Flight**

| Performance Objectives | Conditions | Essential Knowledge |
|--------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------|
| T6.2/2.1.1 Explain the forces acting on an aircraft in flight | | Lift, thrust, drag, weight |
| T6.2/2.2.1 List the main structural components of an aircraft | | Wing (anhedral, dihedral, delta), tail plane, fuselage, flap, aileron, elevator, rudder, airfoil shape, landing gear |
| T6.2/2.2.2 Explain how the pilot controls the movements of an aircraft | | e.g. Rudder, aileron, elevator, throttle, rotary wing controls |
| T6.2/2.3.1 Characterise the critical factors which affect aircraft performance | | Maximum speeds, stall speeds, ceiling, streamline flow, turbulent flow, angle of attack |

Topic T6 AIRCRAFT
Sub-topic T6.3 Aircraft Engines

| Performance Objectives | Conditions | Essential Knowledge |
|----------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------------------------------------------|
| T6.3/3.1.1 Explain the operating principles, advantages and disadvantages of the piston engine and propeller | | Piston engines, fixed pitch, variable pitch, number of blades |
| T6.3/3.2.1 Explain the operating principles, advantages and disadvantages of the jet engine T6.3/3.2.2. List the different types of jet engines | | |
| T6.3/3.3.1 Explain the operating principles, advantages and disadvantages of the turboprop engine and propeller | | |

Topic T6 AIRCRAFT
Sub-topic T6.4 Aircraft Instruments

| Performance Objectives | Conditions | Essential Knowledge |
|-----------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------|
| T6.4/4.1.1 Explain the basic operating principles and interpretation of cockpit instruments | | Altimeter, air speed indicator, vertical speed indicator, turn and bank indicator, artificial horizon, gyrosyn compass |
| T6.4/4.2.1 Explain the basic on-board operating principles and interpretation of radio aids to navigation | | e.g. Displays for NDB (ADF), VOR (TACAN), DME, ILS, MLS, VLF based systems, satellite-based systems |
| T6.4/4.3.1 List the vital engine monitoring parameters and their associated instruments | | e.g. Oil pressure and temperature, engine temperature, rpm, fuel state and flow |
| T6.4/4.4.1 Explain the use of other cockpit instruments | | e.g. SSR transponder, head up display, GPWS, wind shear indicator, weather radar, autopilot, FMS, EFIS, TCAS indication |
| T6.4/4.5.1 Explain the impact of abnormal indications of instruments on the operation of aircraft | | |

Topic T6 AIRCRAFT**Sub-topic T6.5 Aircraft Categories**

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------|------------|----------------------------------------------------------------------------|
| T6.5/5.1.1 List the different categories of aircraft | | e.g. Fixed wing, rotary wing, balloon, glider |
| T6.5/5.2.1 List the wake turbulence categories | | ICAO wake turbulence categories, National categories MATS Part 1 |
| T6.5/5.3.1 List the ICAO approach categories | | ICAO Doc 8168 |

Topic T6 AIRCRAFT**Sub-topic T6.6 Factors Affecting Aircraft Performance**

| Performance Objectives | Conditions | Essential Knowledge |
|--------------------------------------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------|
| T6.6/6.1.1 Explain the factors affecting aircraft during takeoff | | Runway conditions, wind, temperature, air density, aircraft weight |
| T6.6/6.2.1 Explain the factors affecting aircraft during climb | | Speed, weight, altitude, wind and temperature, cabin pressurisation, air density |
| T6.6/6.3.1 Explain the factors affecting an aircraft during cruise | | Level, cruising speed, wind, weight, air density, cabin pressurisation |
| T6.6/6.4.1 Explain the factors affecting an aircraft during descent | | Wind, speed, rate of descent, aircraft configuration, cabin pressurisation, air density |
| T6.6/6.5.1 Explain the factors affecting an aircraft during final approach and landing | | Aircraft configuration, weight, wind, wind shear, air density, runway conditions |
| T6.6/6.6.1 Explain the economic consequences of ATC changes on the flight profile of an aircraft | | Routing, flight level, speed, rates of climb or descent |
| T6.6/6.7.1 Explain performance restrictions due to ecological constraints | | e.g. Fuel dumping, noise abatement procedures, minimum flight levels |
| T6.6/6.8.1 Explain special operational requirements which affect aircraft performance | | e.g. Military flying, calibration flights, aerial photography |

Topic T6 AIRCRAFT
Sub-topic T6.7 Aircraft Data

| Performance Objectives | Conditions | Essential Knowledge |
|-----------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------------|
| T6.7/7.1.1 Recognise the 50 most commonly used aircraft | | e.g. Fixed wing, rotary wing, balloon, glider |
| T6.7/7.2.1 State the ICAO aircraft type designators and categories for the 50 most commonly used aircraft | | Type designators, approach and wake turbulence categories |
| T6.7/7.2.2 State the standard average performance data of the most commonly used aircraft | | Rate of climb/descent, cruising speed, ceiling |

SUBJECT 7 HUMAN FACTORS

The general objective is:

Students shall characterise factors which affect personal and team performance.

Topic T7 HUMAN FACTORS

Sub-topic T7.1 Introduction to Human Factors

| Performance Objectives | Conditions | Essential Knowledge |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T7.1/1.1.1 List the topics that will be covered in the course T7.1/1.1.2 List the reference documents used | | Why human factors, human performance, safety and error, communication, work environment e.g. ICAO Human Factors Training Manual, EATCHIP/EATMP publications, Air Traffic Control - Human Performance Factors (Isaac, 1999), Human Factors in Air Traffic Control (Hopkin, 1995) |
| T7.1/1.2.1 Explain why human factors is a subject in this course T7.1/1.2.2 Define human factors T7.1/1.2.3 Explain the concept of systems T7.1/1.2.4 Define ATM in systems terms T7.1/1.2.5 Recognise the consequences of a systems failure in the ATS T7.1/1.2.6 Explain the need for matching human and machine | | Historical background, developments in ATC, ICAO regulations, licensing requirements ICAO Human Factors Training manual Systems definition ATS, ASM, ATFM e.g. ICAO Human Factors Training Manual |
| T7.1/1.2.7 Explain the use and be T7.1/1.2.8 Explain the information requirement of ATC T7.1/1.2.9 Describe the evolution of ATC | | ICAO Human Factors Training Manual Relevant, timely, accurate e.g. History of ATC, airspace, communications, radar, the future of ATC, role of the human |

Topic T7 HUMAN FACTORS
Sub-topic T7.2 Human Performance

| Performance Objectives | Conditions | Essential Knowledge |
|----------------------------------------------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T7.2/2.1.1 Explain the differences and commonalities that exist between people | | Why human factors, human performance, safety and error, communication, work environment |
| T7.2/2.1.2 Explain the dangers of boredom | | e.g. ICAO Human Factors Training Manual, EATCHIP/EATMP publications, Air Traffic Control - Human Performance Factors (Isaac, 1999), Human Factors in Air Traffic Control (Hopkin, 1995) |
| T7.2/2.1.3 Explain the dangers of over-confidence and complacency | | |
| T7.2/2.1.4 Explain the dangers of fatigue | | Sleep disturbance, heavy workload |
| T7.2/2.1.5 Describe the positive effect of working and learning together with fellow course participants | | How the influence of interactive studies can lead to success |
| T7.2/2.1.6 Appreciate appropriate learning techniques | | |
| T7.2/2.2.1 Describe the need for professional standards in ATC | | e.g. Adherence to rules and regulations, etc. |
| T7.2/2.3.1 Consider the effect of health on performance | | e.g. Fitness, diet, drugs, alcohol |
| T7.2/2.4.1 Characterise the factors involved in human relations | | |
| T7.2/2.4.2 Characterise the factors of work satisfaction | | |
| T7.2/2.4.3 Describe the principles of teamwork | | e.g. team membership, group dynamics, advantages/ disadvantages of teamwork, conflicts and their solutions |
| T7.2/2.4.4 Describe leader style and group interaction | | |
| T7.2/2.5.1 List the basic needs of people at work | | ICAO Human Factors Training Manual |
| T7.2/2.6.1 Define stress | | Stress definition, main causes of stress, EATCHIP Human Factors Module – Stress |
| T7.2/2.6.2 Recognise stress symptoms and sources | | Behavioural changes, lifestyle changes, physical symptoms, crisis events, EATCHIP Human Factors Module – Stress |
| T7.2/2.6.3 Describe the stages of stress | | Stress performance curve, EATCHIP Human Factors Module – Stress |
| T7.2/2.6.4 Describe techniques for stress management | | Relaxation techniques, diet and lifestyle, exercise, EATCHIP Human Factors Module - Stress |

Topic T7 HUMAN FACTORS**Sub-topic T7.3 Human Error**

| Performance Objectives | Conditions | Essential Knowledge |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------|
| T7.2/3.1.1 Recognise the dangers of error in ATC T7.2/3.1.2 Take account of the factors of work satisfaction | | e.g. Air Traffic Control - Human Performance Factors (Isaac, 1999), Human Factors in Air Traffic Control (Hopkin, 1995) |
| T7.2/3.2.1 Define human error T7.2/3.2.2 Describe the factors which help to cause error | | e.g. Fatigue, lack of skill, misunderstanding, lack of information, distraction |
| T7.3/3.3.1 State the types of errors T7.3/3.3.2 Explain the dangers of violations becoming accepted as a practice T7.3/3.3.3 Describe the three levels of performance according to the Rasmussen Model | | e.g. Slips, lapses, mistakes, violations |
| T7.3/3.4.1 Describe the Reason Model T7.3/3.4.2 Apply the reason principles on error during a case study | | Active and latent failures e.g. Herald of Free Enterprise accident |

Topic T7 HUMAN FACTORS**Sub-topic T7.4 Communication**

| Performance Objectives | Conditions | Essential Knowledge |
|--------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------|
| T7.4/4.1.1 Demonstrate the importance of good communications in ATC | | |
| T7.4/4.2.1 Define communication T7.4/4.2.2 Define the communication process | | Sender, encoder, transmitter, signal, interference, reception, decoder, receiver |
| T7.4/4.3.1 Demonstrate a communications model | | |
| T7.4/4.4.1 Describe the factors which affect verbal communication | | e.g. Word choice, intonation, speed, tone, distortion, load, expectation, noise, interruption |
| T7.4/4.4.2 Describe the factors which affect non-verbal communication | | e.g. Touch, choice, intonation, speed, tone, distortion, load, expectation, noise, interruption |
| T7.4/4.4.3 Characterise good communication practices | | Speaking and listening |

Topic T7 HUMAN FACTORS
Sub-topic T7.5 The Work Environment

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------------------------------------|
| T7.5/5.1.1 Define ergonomics T7.5/5.1.2 Explain the need for good building design T7.5/5.1.3 Explain the need for good work position design | | e.g. Light, insulation, decor, space, facilities e.g. Anthropometry |
| T7.5/5.2.1 Characterise the equipment and tools that will be used in simulation T7.5/5.2.2 Apply the SHEL Model principles during a visit to the simulator | | The physical environment, visual displays, suites, input devices, communication equipment, console profile and layout |
| T7.5/5.3.1 Explain the reasons for automation T7.5/5.3.2 Describe the constraints of automation T7.5/5.3.3 Take account of the implications of team functions and automation | | |

SUBJECT 8 EQUIPMENT AND SYSTEMS

The general objective is:

Students shall:

- a) explain the basic working principles of equipment that is in general use in ATC;
- b) appreciate how this equipment aids the controller in providing a safe and efficient ATS;
- c) use computer equipment in order to successfully complete CBT and to handle electronic data displays.

Topic T8 EQUIPMENT AND SYSTEMS

Sub-topic T8.1 General

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------------|------------|---------------------|
| T8.1/1.1.1 Characterise the main items of ATC equipment | | |

Topic T8 EQUIPMENT AND SYSTEMS**Sub-topic T8.2 Radio**

| Performance Objectives | Conditions | Essential Knowledge |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| T8.2/2.1.1 State principles of radio T8.2/2.1.2 Recognise the characteristics of radio waves T8.2/2.1.3 State the use, characteristics and limitations of frequency bands | | Propagation, limitations Use in ATC, navigation and communications, use and application in the Aeronautical Mobile Service, HF, VHF, UHF |
| T8.2/2.2.1 State the use of the radio in ATC T8.2/2.2.2 Describe the working principles of a transmitting and receiving system T8.2/2.2.3 Recognise, on a basic block diagram, the components of a transmitter/receiver system | | |
| T8.2/2.3.1 State the principles and use of VDF/UDF T8.2/2.3.2 State the precision of VDF/UDF used in the State system | | VDF/UDF, QDM, QDR, QTF |

Topic T8 EQUIPMENT AND SYSTEMS**Sub-topic T8.3 Other Systems and Communications**

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------------------------------|-------------------|--------------------------------------|
| T8.3/3.1.1 Describe the use of other voice communications in ATC | | e.g. Telephone, interphone, intercom |
| T8.3/3.2.1 State the use of SELCAL | | |
| T8.3/3.3.1 State the use of controller pilot datalink communications (CPDLC) | | |

Topic T8 EQUIPMENT AND SYSTEMS**Sub-topic T8.4 Radar**

| Performance Objectives | Conditions | Essential Knowledge |
|----------------------------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------|
| T8.4/4.1.1 State the principles of radar | | e.g. Frequency bands, long- and short-range radar, weather radar, high-resolution radar |
| T8.4/4.1.2 Recognise the characteristics of radar wavelengths | | |
| T8.4/4.1.3 Recognise the use, characteristics and limitations of different radar types | | |
| T8.4/4.2.1 Explain the working principles of PSR | | |
| T8.4/4.3.1 Explain the working principles of SSR | | Mode A, Mode C |
| T8.4/4.4.1 Explain the use of PSR/SSR in ATC | | Area, approach, aerodrome, surface movement radar, DFTI |
| T8.4/4.4.2 Explain the link between PSR/SSR with automated systems | | |
| T8.4/4.4.3 Explain the advantages and disadvantages of PSR/SSR | | |
| T8.4/4.5.1 State the principles of Mode S | | |
| T8.4/4.5.2 Explain the use of Mode S in ATC systems | | |
| T8.4/4.6.1 State the principles of PAR | | |

Topic T8 EQUIPMENT AND SYSTEMS**Sub-topic T8.5 Automatic Dependent Surveillance**

| Performance Objectives | Conditions | Essential Knowledge |
|----------------------------------------------------------------------------------------|------------|----------------------------|
| T8.5/5.1.1 State the working principles of ADS | | Satellites, datalinks, GPS |
| T8.5/5.1.2 Explain the use and limitations of ADS | | |
| T8.4/4.1.3 Recognise the use, characteristics and limitations of different radar types | | |

Topic T8 EQUIPMENT AND SYSTEMS**Sub-topic T8.6 Future Equipment**

| Performance Objectives | Conditions | Essential Knowledge |
|------------------------------------------------------------|-------------------|---------------------------------------------------|
| T8.6/6.1.1 Be aware of developments in the equipment field | | Equipment to be introduced beyond training period |

Topic T8 EQUIPMENT AND SYSTEMS**Sub-topic T8.7 Computerisation**

| Performance Objectives | Conditions | Essential Knowledge |
|--------------------------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------|
| T8.7/7.1.1 Explain the working principles of a computer | | |
| T8.7/7.1.2 Describe the way information is compiled, processed and distributed | | |
| T8.7/7.2.1 State the difference between hardware and software | | e.g. Terminal, printer, keyboard, monitor, modem, network e.g. Programmes and applications, operating systems, files |
| T8.7/7.2.2 Recognise the hardware components | | |
| T8.7/7.2.3 Recognise the software components | | |
| T8.7/7.3.1 Describe operating systems in general use | | Mouse, keyboard, voice, TID Text processors File system, hard and floppy disks |
| T8.7/7.3.2 Use input devices | | |
| T8.7/7.3.3 Use text processing application | | |
| T8.7/7.3.4 Use storage devices | | |

Topic T8 EQUIPMENT AND SYSTEMS**Sub-topic T8.8 Automation in ATS**

| Performance Objectives | Conditions | Essential Knowledge |
|----------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------------------|
| T8.8/8.1.1 Describe the principles of automation in communication and datalinks in ATS | | |
| T8.8/8.2.1 Describe the principles of AFTN | | |
| T8.8/8.3.1 Recognise the benefits of automatic exchange of ATS data in coordination and transfer processes | | Accuracy, speed and safety, non-verbal communications |
| T8.8/8.3.2 Recognise the limitations of automatic exchange of ATS data in coordination | | Non-recognition of a systems failure |
| T8.8/8.4.1 State the principles of Closed Circuit Information System (CCIS) | | |
| T8.8/8.4.2 Explain the use of CCIS in ATS | | Data carried on CCIS |
| T8.8/8.5.1 State the working principles of broadcasting systems for the automatic dissemination of information | | e.g. ATIS, VOLMET |
| T8.8/8.5.2 Explain the use of ATIS and VOLMET in the ATS | | |

Topic T8 EQUIPMENT AND SYSTEMS**Sub-topic T8.9 Working Positions**

| Performance Objectives | Conditions | Essential Knowledge |
|---------------------------------------------------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T8.9/9.1.1 Recognise equipment in a working position | | e.g. FPB, radio, telephone and other communication equipment, relevant maps and charts, strip printer, teleprinter, clock, information monitors, radars/displays |
| T8.9/9.2.1 Recognise equipment to be found specifically in an aerodrome control tower | | e.g. Wind indicator, DFTI, SMR, crash alarm, signalling lamp, lighting control panel, runway-in-use indicator, binoculars, signalling/flare gun, IRVR and altimeter setting indicators, CCIS |
| T8.9/9.3.1 Recognise equipment to be found specifically in an approach control unit | | e.g. Sequencing system, PAR, RVR indicators |
| T8.9/9.4.1 Recognise equipment to be found specifically in an area control unit | | |

SUBJECT 9 PROFESSIONAL ENVIRONMENT

The general objective is:

Students shall recognise the need for close co-operation with other parties concerning ATM operations and the importance of environmental protection.

Topic T9 PROFESSIONAL ENVIRONMENT

Sub-topic T9.1 Familiarisation

| Performance Objectives | Conditions | Essential Knowledge |
|--------------------------------------------------------------------|------------|-------------------------------------------------------------|
| T9.1/1.1.1 Familiarise with civil and military ATS facilities | | e.g. TWR, APP, ACC, AIS, RCC, Radar, Air Defence Unit |
| T9.1/1.1.2 Familiarise with airport facilities and local operators | | e.g. Fire and emergency services, airline operations office |

Topic T9 PROFESSIONAL ENVIRONMENT

Sub-topic T9.2 Airspace Users

| Performance Objectives | Conditions | Essential Knowledge |
|----------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------|
| T9.2/2.1.1 Be aware of the different airspace requirements for civil aircraft | | e.g. Commercial flying, recreational flying, gliders, balloons |
| T9.2/2.2.1 Be aware of the different airspace requirements for military aircraft | | e.g. Low-level flying, in-flight refuelling, test flights, special military operations |
| T9.2/2.3.1 Be aware of the expectations and requirements of pilots | | |

Topic T9 PROFESSIONAL ENVIRONMENT**Sub-topic T9.3 Customer Relations**

| Performance Objectives | Conditions | Essential Knowledge |
|-----------------------------------------------------------------------------------------------------------------|-------------------|----------------------------|
| T9.3/3.1.1 State the role of ATC as a service provider T9.3/3.1.2 Recognise the means by which ATC is funded | | |

Topic T9 PROFESSIONAL ENVIRONMENT**Sub-topic T9.4 Environmental Protection**

| Performance Objectives | Conditions | Essential Knowledge |
|-----------------------------------------------------------------|-------------------|----------------------------|
| T9.4/4.1.1 Recognise the importance of environmental protection | | |