

Syllabus reference	Syllabus details and associated Learning Objectives	CB-IR (A) and EIR
050 00 00 00	METEOROLOGY	
050 01 00 00	THE ATMOSPHERE	
050 01 02 00	Air temperature	
050 01 02 04	Lapse rates	
	LO Describe qualitatively and quantitatively the temperature lapse rates of the troposphere (mean value 0.65°C/100 m or 2°C/1 000 ft and actual values)	x
050 01 02 05	Development of inversions, types of inversions	
	LO Describe development and types of inversions	x
	LO Explain the characteristics of inversions and of an isothermal layer	x
	LO Explain the reasons for the formation of the following inversions: – ground inversion (nocturnal radiation/advection), subsidence inversion, frontal inversion, inversion above friction layer, valley inversion – tropopause inversion	x
050 01 02 06	Temperature near the earth's surface, surface effects, diurnal and seasonal variation, effect of clouds, effect of wind	
	LO Describe how the temperature near the earth's surface is influenced by seasonal variations	x
	LO Explain the cooling and warming of the air on the earth or sea surfaces	x
	LO Sketch the diurnal variation of the temperature of the air in relation to the radiation of the sun and of the earth	x
	LO Describe qualitatively the influence of the clouds on the cooling and warming of the surface and the air near the surface	x

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LO	Distinguish between the influence of low or high clouds, thick or thin clouds	x
LO	Explain the influence of the wind on the cooling and warming of the air near the surfaces	x
050 01 03 00	Atmospheric pressure	
050 01 03 01	Barometric pressure, isobars	
LO	Define atmospheric pressure	x
LO	List the units of measurement of the atmospheric pressure used in aviation (hPa, inches) (<i>Refer to 050 10 01 01</i>)	x
LO	Describe isobars on the surface weather charts	x
LO	Define high, low, trough, ridge, wedge, col	x
050 01 03 02	Pressure variation with height, contours (isohypses)	
LO	Explain the pressure variation with height	x
LO	Describe qualitatively the variation of the barometric lapse rate <i>Note: The average value for the barometric lapse rate near mean sea level is 27 ft (8 m) per 1 hPa, at about 5500 m/AMSL is 50 ft (15 m) per 1 hPa</i>	x
LO	Describe and interpret contour lines (isohypses) on a constant pressure chart (<i>Refer to 050 10 02 03</i>)	x
050 01 03 03	Reduction of pressure to mean sea level, QFF	
LO	Define QFF	x
LO	Explain the reduction of measured pressure to mean sea level, QFF	x
LO	Mention the use of QFF for surface weather charts	x
050 01 03 04	Relationship between surface pressure centres and pressure centres aloft	
LO	Illustrate with a vertical cross section of isobaric surfaces the relationship between surface pressure systems and upper air pressure systems	x
050 01 04 00	Air density	
050 01 04 01	Relationship between pressure, temperature and density	
LO	Describe the relationship between pressure, temperature and density	x

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LO	Describe the vertical variation of the air density in the atmosphere	x
LO	Describe the effect of humidity changes on the density of air	x
050 01 05 00	ICAO Standard Atmosphere (ISA)	
050 01 05 01	ICAO Standard Atmosphere	
LO	Explain the use of standardised values for the atmosphere	x
LO	List the main values of the ISA (mean sea level pressure, mean sea level temperature, the vertical temperature lapse rate up to 20 km, height and temperature of the tropopause)	x
LO	Calculate the standard temperature in degree Celsius for a given flight level	x
LO	Determine a standard temperature deviation by the difference between the given outside air temperature and the standard temperature	x
050 01 06 00	Altimetry	
050 01 06 01	Terminology and definitions	
LO	Define the following terms and abbreviations and explain how they are related to each other: height, altitude, pressure altitude, flight level, level, true altitude, true height, elevation, QNH, QFE and standard altimeter setting	x
LO	Describe the terms transition altitude, transition level, transition layer, terrain clearance, lowest usable flight level	x
050 01 06 03	Calculations	
LO	Calculate the different readings on the altimeter when the pilot changes the altimeter setting	x
LO	Illustrate with a numbered example the changes of altimeter setting and the associated changes in reading when the pilot climbs through the transition altitude or descends through the transition level	x
LO	Derive the reading of the altimeter of an aircraft on the ground when the pilot uses the different settings	x
LO	Explain the influence of the air temperature on the distance between the ground and the level read on the altimeter and between two flight levels	x
LO	Explain the influence of pressure areas on the true altitude	x
LO	Determine the true altitude/height for a given altitude/height and a given ISA temperature deviation	x

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LO	Calculate the terrain clearance and the lowest usable flight level for given atmospheric temperature and pressure conditions	x
	<p><i>Note: The following rules shall be considered for altimetry calculations:</i></p> <ul style="list-style-type: none"> <i>a. All calculations are based on rounded pressure values to the nearest lower hPa</i> <i>b. The value for the barometric lapse rate near mean sea level is 27 ft (8 m) per 1 hPa</i> <i>c. To determine the true altitude/height the following rule of thumb, called the '4 %-rule', shall be used: the altitude/height changes by 4 % for each 10°C temperature deviation from ISA</i> <i>d. If no further information is given, the deviation of outside air temperature from ISA is considered to be constantly the same given value in the whole layer</i> <i>e. The elevation of the airport has to be taken into account. The temperature correction has to be considered for the layer between ground and the position of the aircraft</i> 	
050 01 06 04	Effect of accelerated airflow due to topography	
LO	Describe qualitatively how the effect of accelerated airflow due to topography (Bernoulli effect) affects altimetry	x
050 02 00 00	WIND	
050 02 02 00	Primary cause of wind	
050 02 02 02	Variation of wind in the friction layer	
LO	Describe why and how the wind changes direction and speed with height in the friction layer in the northern and in the southern hemisphere (rule of thumb)	x
LO	Explain the relationship between isobars and wind (direction and speed)	x

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	<p><i>Note: Approximate value for variation of wind in the friction layer (values to be used in examinations):</i></p> <table border="0"> <tr> <td><i>Type of landscape</i></td> <td><i>Wind speed in friction layer in % of the geostrophic wind</i></td> <td><i>The wind in the friction layer blows across the isobars towards the low pressure. Angle between wind direction and isobars</i></td> </tr> <tr> <td><i>over water</i></td> <td><i>ca 70 %</i></td> <td><i>ca 10°</i></td> </tr> <tr> <td><i>over land</i></td> <td><i>ca 50 %</i></td> <td><i>ca 30°</i></td> </tr> </table> <p><i>WMO-NO. 266</i></p>	<i>Type of landscape</i>	<i>Wind speed in friction layer in % of the geostrophic wind</i>	<i>The wind in the friction layer blows across the isobars towards the low pressure. Angle between wind direction and isobars</i>	<i>over water</i>	<i>ca 70 %</i>	<i>ca 10°</i>	<i>over land</i>	<i>ca 50 %</i>	<i>ca 30°</i>	
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050 02 02 03	Effects of convergence and divergence										
LO	Describe atmospheric convergence and divergence	x									
LO	Explain the effect of convergence and divergence on the following: pressure systems at the surface and aloft; wind speed; vertical motion and cloud formation (relationship between upper air conditions and surface pressure systems)	x									
050 02 04 00	Local winds										
050 02 04 01	Anabatic and katabatic winds, mountain and valley winds, venturi effects, land and sea breezes										
LO	Describe and explain anabatic and katabatic winds	x									
LO	Describe and explain mountain and valley winds	x									
LO	Describe and explain the venturi effect, convergence in valleys and mountain areas	x									
LO	Describe and explain land and sea breezes, sea breeze front	x									
050 02 05 00	Mountain waves (standing waves, lee waves)										
050 02 05 01	Origin and characteristics										
LO	Describe and explain the origin and formation of mountain waves	x									
LO	State the conditions necessary for the formation of mountain waves	x									
LO	Describe the structure and properties of mountain waves	x									
LO	Explain how mountain waves may be identified by their associated meteorological phenomena	x									

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050 02 06 00	Turbulence	
050 02 06 01	Description and types of turbulence	
	LO Describe turbulence and gustiness	x
	LO List common types of turbulence (convective, mechanical, orographic, frontal, clear air turbulence)	x
050 02 06 02	Formation and location of turbulence	
	LO Explain the formation of convective turbulence, mechanical and orographic turbulence, frontal turbulence, clear air turbulence (<i>Refer to 050 02 06 03</i>)	x
	LO State where turbulence will normally be found (rough ground surfaces, relief, inversion layers, CB, TS zones, unstable layers)	x
050 03 00 00	THERMODYNAMICS	
050 03 01 00	Humidity	
050 03 01 01	Water vapour in the atmosphere	
	LO Describe humid air	x
	LO Describe the significance of water vapour in the atmosphere for meteorology	x
	LO Indicate the sources of atmospheric humidity	x
050 03 01 03	Temperature/dew point, relative humidity	
	LO Define dew point	x
	LO Recognise the dew point curve on a simplified diagram (T,P)	x
	LO Define relative humidity	x
	LO Explain the factors influencing the relative humidity at constant pressure	x
	LO Explain the diurnal variation of the relative humidity	x
	LO Describe the relationship between relative humidity, the amount of water vapour and the temperature	x
	LO Describe the relationship between temperature and dew point	x
	LO Estimate the relative humidity of the air from the difference between dew point and temperature	x
050 04 00 00	CLOUDS AND FOG	

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050 04 01 00	Cloud formation and description	
050 04 01 01	Cloud formation	
	LO Explain cloud formation by adiabatic cooling, conduction, advection and radiation	x
	LO Describe the cloud formation based on the following lifting processes: unorganised lifting in thin layers and turbulent mixing; forced lifting at fronts or over mountains; free convection	x
	LO Determine the cloud base and top in a simplified diagram (temperature, pressure, humidity)	x
	LO Explain the influence of relative humidity on the height of the cloud base	x
	LO Illustrate in a thermodynamic diagram the meaning of convective temperature (temperature at which formation of cumulus starts)	x
	LO List cloud types typical for stable and unstable air conditions	x
	LO Summarise the conditions for the dissipation of clouds	x
050 04 01 02	Cloud types and cloud classification	
	LO Describe cloud types and cloud classification	x
	LO Identify by shape cirriform, cumuliform and stratiform clouds	x
	LO Identify by shape and typical level the ten cloud types (genera)	x
	LO Describe and identify by shape the following species and supplementary feature: castellanus, lenticularis, fractus, humilis, mediocris, congestus, calvus, capillatus and virga	x
	LO Distinguish between low, medium and high level clouds according to the WMO cloud étage (including heights) – for mid-latitudes – for all latitudes	x
	LO Distinguish between ice clouds, mixed clouds and pure water clouds	x
050 04 01 03	Influence of inversions on cloud development	
	LO Explain the influence of inversions on vertical movements in the atmosphere	x
	LO Explain the influence of an inversion on the formation of stratus clouds	x

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LO	Explain the influence of ground inversion on the formation of fog	x
LO	Determine the top of a cumulus cloud caused by an inversion on a simplified diagram	x
050 04 01 04	Flying conditions in each cloud type	
LO	Assess the ten cloud types for icing and turbulence	x
050 04 02 00	Fog, mist, haze	
050 04 02 01	General aspects	
LO	Define fog, mist and haze with reference to WMO standards of visibility range	x
LO	Explain the formation of fog, mist and haze in general	x
LO	Name the factors contributing in general to the formation of fog and mist	x
LO	Name the factors contributing to the formation of haze	x
LO	Describe freezing fog and ice fog	x
050 04 02 02	Radiation fog	
LO	Explain the formation of radiation fog	x
LO	Explain the conditions for the development of radiation fog	x
LO	Describe the significant characteristics of radiation fog, and its vertical extent	x
LO	Summarise the conditions for the dissipation of radiation fog	x
050 04 02 03	Advection fog	
LO	Explain the formation of advection fog	x
LO	Explain the conditions for the development of advection fog	x
LO	Describe the different possibilities of advection fog formation (over land, sea and coastal regions)	x
LO	Describe significant characteristics of advection fog	x
LO	Summarise the conditions for the dissipation of advection fog	x
050 04 02 04	Steam fog	
LO	Explain the formation of steam fog	x

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	LO Explain the conditions for the development of steam fog	x
	LO Describe significant characteristics of steam fog	x
	LO Summarise the conditions for the dissipation of steam fog	x
050 04 02 05	Frontal fog	
	LO Explain the formation of frontal fog	x
	LO Explain the conditions for the development of frontal fog	x
	LO Describe significant characteristics of frontal fog	x
	LO Summarise the conditions for the dissipation of frontal fog	x
050 04 02 06	Orographic fog (hill fog)	
	LO Summarise the features of orographic fog	x
	LO Explain the conditions for the development of orographic fog	x
	LO Describe significant characteristics of orographic fog	x
	LO Summarise the conditions for the dissipation of orographic fog	x
050 05 00 00	PRECIPITATION	
050 05 01 00	Development of precipitation	
050 05 01 01	Process of development of precipitation	
	LO Distinguish between the two following processes by which precipitation is formed	x
	LO – Summarise the outlines of the ice crystal process (Bergeron-Findeisen)	x
	LO – Summarise the outlines of the coalescence process	x
	LO Describe the atmospheric conditions that favour either process	x
	LO Explain the development of snow, rain, drizzle and hail	x
050 05 02 00	Types of precipitation	
050 05 02 01	Types of precipitation, relationship with cloud types	

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LO	List and describe the types of precipitation given in the TAF and METAR codes (drizzle, rain, snow, snow grains, ice pellets, hail, small hail, snow pellets, ice crystals, freezing drizzle, freezing rain)	x
LO	State ICAO/WMO approximate diameters for cloud, drizzle and rain drops	x
LO	State approximate weights and diameters for hailstones	x
LO	Explain the mechanism for the formation of freezing precipitation	x
LO	Describe the weather conditions that give rise to freezing precipitation	x
LO	Distinguish between the types of precipitation generated in convective and stratiform cloud	x
LO	Assign typical precipitation types and intensities to different clouds	x
050 06 00 00	AIR MASSES AND FRONTS	
050 06 01 00	Air masses	
050 06 01 01	Description, classification and source regions of air masses	
LO	Define the term air mass	x
LO	Describe the properties of the source regions	x
LO	Summarise the classification of air masses by source regions	x
LO	State the classifications of air masses by temperature and humidity at source	x
LO	State the characteristic weather in each of the air masses	x
LO	Name the three main air masses that affect Europe	x
LO	Classify air masses on a surface weather chart	x

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	<p><i>Note: Names and abbreviations of air masses used in examinations:</i></p> <ul style="list-style-type: none"> — <i>first letter:</i> <i>humidity</i> <i>continental (c),</i> <i>maritime (m)</i> — <i>second letter:</i> <i>type of air mass</i> <i>Arctic (A),</i> <i>Polar (P),</i> <i>Tropical (T),</i> <i>Equatorial (E)</i> — <i>third letter:</i> <i>temperature</i> <i>cold (c),</i> <i>warm (w)</i> 	
050 06 01 02	Modifications of air masses	
	LO List the environmental factors that affect the final properties of an air mass	x
	LO Explain how maritime and continental tracks modify air masses	x
	LO Explain the effect of passage over cold or warm surfaces	x
	LO Explain how air mass weather is affected by the season, the air mass track and by orographic and thermal effects over land	x
	LO Assess the tendencies of the stability for an air mass and describe the typical resulting air mass weather including the hazards for aviation	x
050 06 02 00	Fronts	
050 06 02 01	General aspects	
	LO Describe the boundaries between air masses (fronts)	x
	LO Define front and frontal surface (frontal zone)	x
050 06 02 02	Warm front, associated clouds and weather	
	LO Define a warm front	x

Syllabus reference	Syllabus details and associated Learning Objectives	CB-IR (A) and EIR
	LO Describe the cloud, weather, ground visibility and aviation hazards at a warm front depending on the stability of the warm air	x
	LO Explain the seasonal differences in the weather at warm fronts	x
	LO Describe the structure, slope and dimensions of a warm front	x
	LO Sketch a cross-section of a warm front, showing weather, cloud and aviation hazards	x
050 06 02 03	Cold front, associated clouds and weather	
	LO Define a cold front	x
	LO Describe the cloud, weather, ground visibility and aviation hazards at a cold front depending on the stability of the warm air	x
	LO Explain the seasonal differences in the weather at cold fronts	x
	LO Describe the structure, slope and dimensions of a cold front	x
	LO Sketch a cross-section of a cold front, showing weather, cloud and aviation hazards	x
050 06 02 04	Warm sector, associated clouds and weather	
	LO Define fronts and air masses associated with the warm sector	x
	LO Describe the cloud, weather, ground visibility and aviation hazards in a warm sector	x
	LO Explain the seasonal differences in the weather in the warm sector	x
	LO Sketch a cross-section of a warm sector, showing weather, cloud and aviation hazards	x
050 06 02 05	Weather behind the cold front	
	LO Describe the cloud, weather, ground visibility and aviation hazards behind the cold front	x
	LO Explain the seasonal differences in the weather behind the cold front	x
050 06 02 06	Occlusions, associated clouds and weather	
	LO Define the term occlusion	x
	LO Define a cold occlusion	x
	LO Define a warm occlusion	x
	LO Describe the cloud, weather, ground visibility and aviation hazards in a cold occlusion	x

Syllabus reference	Syllabus details and associated Learning Objectives	CB-IR (A) and EIR
LO	Describe the cloud, weather, ground visibility and aviation hazards in a warm occlusion	x
LO	Explain the seasonal differences in the weather at occlusions	x
LO	Sketch a cross-section of cold and warm occlusions, showing weather, cloud and aviation hazards	x
LO	In a sketch plan illustrate the development of an occlusion and the movement of the occlusion point	x
050 06 02 07	Stationary front, associated clouds and weather	
LO	Define a stationary or quasi-stationary front	x
LO	Describe the cloud, weather, ground visibility and aviation hazards in a stationary or quasi-stationary front	x
050 06 02 08	Movement of fronts and pressure systems, life cycle	
LO	Describe the movements of fronts and pressure systems and the life cycle of a mid-latitude depression	x
LO	State the rules for predicting the direction and the speed of movement of fronts	x
LO	Explain the difference between the speed of movement of cold and warm fronts	x
LO	State the rules for predicting the direction and the speed of movement of frontal depressions	x
LO	Describe, with a sketch if required, the genesis, development and life cycle of a frontal depression with associated cloud and rain belts	x
050 06 02 09	Changes of meteorological elements at a frontal wave	
LO	Sketch a plan and a cross-section of a frontal wave (warm front, warm sector and cold front) and illustrate the changes of pressure, temperature, surface wind and wind in the vertical axis	x
050 07 00 00	PRESSURE SYSTEMS	
050 07 02 00	Anticyclone	
050 07 02 01	Anticyclones, types, general properties, cold and warm anticyclones, ridges and wedges, subsidence	
LO	List the different types of anticyclones	x
LO	Describe the effect of high level convergence in producing areas of high pressure at ground level	x
LO	Describe air mass subsidence, its effect on the environmental lapse rate, and the associated weather	x
LO	Describe the formation of warm and cold anticyclones	x

Syllabus reference	Syllabus details and associated Learning Objectives	CB-IR (A) and EIR
LO	Describe the formation of ridges and wedges (<i>Refer to 050 08 03 02</i>)	x
LO	Describe the properties of and the weather associated with warm and cold anticyclones	x
LO	Describe the properties of and the weather associated with ridges and wedges	x
LO	Describe the blocking anticyclone and its effects	x
050 07 03 00	Non frontal depressions	
050 07 03 01	Thermal-, orographic-, polar- and secondary depressions, troughs	
LO	Describe the effect of high level divergence in producing areas of low pressure at ground level	x
LO	Describe the formation and properties of thermal-, orographic- (lee lows), polar- and secondary depressions	x
LO	Describe the formation, the properties and the associated weather of troughs	x
050 08 00 00	CLIMATOLOGY	
050 08 03 00	Typical weather situations in the mid-latitudes	
050 08 03 01	Westerly situation (westerlies)	
LO	Identify on a weather chart the typical westerly situation with travelling polar front waves	x
LO	Describe the typical weather in the region of the travelling polar front waves including the seasonal variations	x
050 08 03 02	High pressure area	
LO	Describe the high pressure zones with the associated weather	x
LO	Identify on a weather chart high pressure regions	x
LO	Describe the weather associated with wedges in the polar air (<i>Refer to 050 07 02 01</i>)	x
050 08 03 03	Flat pressure pattern	
LO	Identify on a surface weather chart the typical flat pressure pattern	x
LO	Describe the weather associated with a flat pressure pattern	x
050 09 00 00	FLIGHT HAZARDS	
050 09 01 00	Icing	

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050 09 01 01	Conditions for ice accretion	
LO	Summarise the general conditions under which ice accretion occurs on aircraft (temperatures of outside air; temperature of the airframe; presence of supercooled water in clouds, fog, rain and drizzle; possibility of sublimation)	x
LO	Indicate the general weather conditions under which ice accretion in venturi carburettor occurs	x
LO	Explain the general weather conditions under which ice accretion on airframe occurs	x
LO	Explain the formation of supercooled water in clouds, rain and drizzle (<i>Refer to 050 03 02 01</i>)	x
LO	Explain qualitatively the relationship between the air temperature and the amount of supercooled water	x
LO	Explain qualitatively the relationship between the type of cloud and the size and number of the droplets, in cumuliform and stratiform clouds	x
LO	Indicate in which circumstances ice can form on an aircraft on the ground: air temperature, humidity, precipitation	x
LO	Explain in which circumstances ice can form on an aircraft in flight: inside clouds, in precipitation, outside clouds and precipitation	x
LO	Describe the different factors influencing the intensity of icing: air temperature, amount of supercooled water in a cloud or in precipitation, amount of ice crystals in the air, speed of the aircraft, shape (thickness) of the airframe parts (wings, antennas, etc)	x
LO	Explain the effects of topography on icing	x
LO	Explain the higher concentration of water drops in stratiform orographic clouds	x
050 09 01 02	Types of ice accretion	
LO	Define clear ice	x
LO	Describe the conditions for the formation of clear ice	x
LO	Explain the formation of the structure of clear ice with the release of latent heat during the freezing process	x
LO	Describe the aspect of clear ice: appearance, weight, solidity	x
LO	Define rime ice	x
LO	Describe the conditions for the formation of rime ice	x

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	LO Describe the aspect of rime ice: appearance, weight, solidity	x
	LO Define mixed ice	x
	LO Describe the conditions for the formation of mixed ice	x
	LO Describe the aspect of mixed ice: appearance, weight, solidity	x
	LO Describe the possible process of ice formation in snow conditions	x
	LO Define hoar frost	x
	LO Describe the conditions for the formation of hoar frost	x
	LO Describe the aspect of hoar frost: appearance, solidity	x
050 09 01 03	Hazards of ice accretion, avoidance	
	LO State the ICAO qualifying terms for the intensity of icing (<i>See ICAO ATM Doc 4444</i>)	x
	LO Describe, in general, the hazards of icing	x
	LO Assess the dangers of the different types of ice accretion	x
	LO Describe the position of the dangerous zones of icing in fronts, in stratiform and cumuliform clouds and in the different precipitation types	x
	LO Indicate the possibilities of avoidance – in the flight planning: weather briefing, choice of track and altitude – during flight: recognition of the dangerous zones, choice of appropriate track and altitude	x
050 09 02 00	Turbulence	
050 09 02 01	Effects on flight, avoidance	
	LO State the ICAO qualifying terms for the intensity of turbulence (<i>See ICAO ATM Doc 4444</i>)	x
	LO Describe the effects of turbulence on an aircraft in flight	x
	LO Indicate the possibilities of avoidance – in the flight planning: weather briefing, choice of track and altitude – during flight: choice of appropriate track and altitude	x
050 09 03 00	Wind shear	

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050 09 03 01	Definition of wind shear	
	LO Define wind shear (vertical and horizontal)	x
	LO Define low level wind shear	x
050 09 03 02	Weather conditions for wind shear	
	LO Describe conditions where and how wind shear can form (e.g. thunderstorms, squall lines, fronts, inversions, land and sea breeze, friction layer, relief)	x
050 09 03 03	Effects on flight, avoidance	
	LO Describe the effects on flight caused by wind shear	x
	LO Indicate the possibilities of avoidance – in the flight planning – during flight	x
050 09 04 00	Thunderstorms	
050 09 04 01	Conditions for and process of development, forecast, location, type specification	
	LO Name the cloud types which indicate the development of thunderstorms	x
	LO Describe the different types of thunderstorms, their location, the conditions for and the process of development and list their properties (air mass thunderstorms, frontal thunderstorms, squall lines, supercell storms, orographic thunderstorms)	x
050 09 04 02	Structure of thunderstorms, life history	
	LO Describe and sketch the stages of the life history of a thunderstorm: initial, mature and dissipating stage	x
	LO Assess the average duration of thunderstorms and their different stages	x
	LO Describe supercell storm: initial, supercell, tornado and dissipating stage	x
	LO Summarise the flight hazards of a fully developed thunderstorm	x
	LO Indicate on a sketch the most dangerous zones in and around a thunderstorm	x
050 09 04 03	Electrical discharges	
	LO Describe the basic outline of the electric field in the atmosphere	x

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	LO Describe the electrical potential differences in and around a thunderstorm	x
	LO Describe and asses 'St. Elmo's fire'	x
	LO Describe the development of lightning discharges	x
	LO Describe the effect of lightning strike on aircraft and flight execution	x
050 09 04 04	Development and effects of downbursts	
	LO Define the term downburst	x
	LO Distinguish between macroburst and microburst	x
	LO State the weather situations leading to the formation of downbursts	x
	LO Describe the process of development of a downburst	x
	LO Give the typical duration of a downburst	x
	LO Describe the effects of downbursts	x
050 09 04 05	Thunderstorm avoidance	
	LO Explain how the pilot can anticipate each type of thunderstorms: pre-flight weather briefing, observation in flight, use of specific meteorological information, use of information given by ground weather radar and by airborne weather radar (<i>Refer to 050 10 01 04</i>), use of the stormscope (lightning detector)	x
	LO Describe practical examples of flight techniques used to avoid the hazards of thunderstorms	x
050 09 05 00	Tornadoes	
050 09 05 01	Properties and occurrence	
	LO Define the tornado	x
050 09 06 00	Inversions	
050 09 06 01	Influence on aircraft performance	
	LO Explain the influence of inversions on the aircraft performance	x
	LO Compare the flight hazards during take-off and approach associated to a strong inversion alone and to a strong inversion combined with marked wind shear	x
050 09 08 00	Hazards in mountainous areas	

Syllabus reference	Syllabus details and associated Learning Objectives	CB-IR (A) and EIR
050 09 08 01	Influence of terrain on clouds and precipitation, frontal passage	
	LO Describe the influence of a mountainous terrain on cloud and precipitation	x
	LO Describe the effects of the Foehn	x
	LO Describe the influence of a mountainous area on a frontal passage	x
050 09 08 02	Vertical movements, mountain waves, wind shear, turbulence, ice accretion	
	LO Describe the vertical movements, wind shear and turbulence typical of mountain areas	x
	LO Indicate in a sketch of a chain of mountains the turbulent zones (mountain waves, rotors)	x
	LO Explain the influence of relief on ice accretion	x
050 09 08 03	Development and effect of valley inversions	
	LO Describe the formation of valley inversion due to the katabatic winds	x
	LO Describe the valley inversion formed by warm winds aloft	x
	LO Describe the effects of a valley inversion for an aircraft in flight	x
050 09 09 00	Visibility reducing phenomena	
050 09 09 01	Reduction of visibility caused by precipitation and obscurations	
	LO Describe the reduction of visibility caused by precipitation: drizzle, rain, snow	x
	LO Describe the reduction of visibility caused by obscurations: – fog, mist, haze, smoke, volcanic ash – sand (SA), dust (DU)	x
	LO Describe the differences between the ground visibility, flight visibility, slant visibility and vertical visibility when an aircraft is above or within a layer of haze or fog	x
050 09 09 02	Reduction of visibility caused by other phenomena	
	LO Describe the reduction of visibility caused by – low drifting and blowing snow – low drifting and blowing dust and sand	x

Syllabus reference	Syllabus details and associated Learning Objectives	CB-IR (A) and EIR
	LO Explain briefly how and when the vertical visibility is measured	x
	LO Name the unit used for vertical visibility (ft)	x
050 10 01 04	Weather radar observations	
	LO Interpret ground weather radar images	x
	LO Describe the basic principle and the type of information given by airborne weather radar	x
	LO Describe the limits and the errors of airborne weather radar information	x
	LO Interpret typical airborne weather radar images	x
050 10 02 00	Weather charts	
050 10 02 01	Significant weather charts	
	LO Decode and interpret significant weather charts (low, medium and high level)	x
	LO Describe from a significant weather chart the flight conditions at designated locations and/or along a defined flight route at a given flight level	x
050 10 02 02	Surface charts	
	LO Recognize the following weather systems on a surface weather chart (analysed and forecast): ridges, cols and troughs; fronts; frontal side, warm sector and rear side of mid-latitude frontal lows; high and low pressure areas	x
050 10 03 00	Information for flight planning	
050 10 03 01	Aviation weather messages	
	LO Describe, decode and interpret the following aviation weather messages (given in written and/or graphical format): METAR, SPECI, TREND, TAF, SIGMET, AIRMET, GAMET, special air-report, volcanic ash advisory information	x
	LO Describe the general meaning of MET REPORT and SPECIAL	x
	LO List, in general, the cases when a SIGMET and an AIRMET are issued	x
	LO Describe, decode (by using a code table) and interpret the following messages: Runway State Message (as written in a METAR), GAFOR	x
	<i>Note: For Runway State Message and GAFOR refer to Air Navigation Plan European Region ICAO Doc 7754</i>	

Syllabus reference	Syllabus details and associated Learning Objectives	CB-IR (A) and EIR
050 10 03 02	Meteorological broadcasts for aviation	
LO	Describe the meteorological content of broadcasts for aviation: – VOLMET, ATIS – HF-VOLMET	x
050 10 03 03	Use of meteorological documents	
LO	Describe meteorological briefing and advice	x
LO	List the information that a flight crew can receive from meteorological services for pre-flight planning and apply the content of these information on a designated flight route	x
LO	List the meteorological information that a flight crew can receive from services during flight and apply the content of these information for the continuation of the flight	x
050 10 03 04	Meteorological warnings	
LO	Describe and interpret aerodrome warnings and wind shear warnings and alerts	x