SECTION 1.8 METEOROLOGY (MT)

Unit 1.8.1 RMTC: RPL meteorology – all aircraft categories

1. Reserved

2. Basic meteorology

2.1 Knowledge of local weather

2.1.1 Demonstrate a basic knowledge of local weather, in particular the likely occurrence of the following phenomena and how they may affect the safety of a flight:

(a) thunderstorms;

(b) low cloud;

(c) poor visibility;

(d) turbulence.

2.2 Knowledge of forecasts and reports

2.2.1 Demonstrate an understanding of weather forecasts, reports and broadcasts that are pertinent to the area of operation.

2.3 Understand significance of observations

2.3.1 Recognise signs, including forecast condition and pilot observations, which may indicate the presence of:

(a) turbulence, thermals, dust devils; and

(b) wind gradient, wind shear and describe the effect of these phenomena on flight characteristics.

Unit 1.8.2 PMTC: PPL meteorology – all aircraft categories

1. Reserved

2. General meteorology

2.1 Composition of the atmosphere

2.1.1 Describe the International Standard Atmosphere (ISA) sea level temperature and pressure.

2.1.2 State the ISA temperature and pressure lapse rates in the troposphere.

2.1.3 Describe the vertical division of the atmosphere:

(a) troposphere;

(b) tropopause;

(c) stratosphere.

2.1.4 Explain why most weather effects occur below the stratosphere.

2.2 Heat, temperature pressure and humidity

2.2.1 State the method of measuring surface air temperature, and relate that to actual temperatures above the runway.

2.2.2 Explain the meaning of the following terms:

(a) temperature inversion;

(b) saturated air, relative humidity, dew point;

(c) evaporation, condensation, freezing.

2.2.3 List the effect of changes in temperature, pressure and humidity on air density.

2.2.4 Calculate ISA temperature and pressure height.

2.2.5 Explain the meaning of the following terms:

(a) height;

(b) elevation;

(c) altitude;

(d) QNH;

(e) QFE.

2.3 Clouds and precipitation

2.3.1 Identify and classify clouds according to height and the 10 genera forms.

2.3.2 Recall the standard abbreviation for each cloud type, and the method used to report cloud amount.

2.3.3 Describe the weather associated with each cloud type.

2.4 Visibility

2.4.1 Determine visibility from either visual sighting or met forecast.

2.4.2 List meteorological factors that will reduce inflight visibility.

2.5 Winds – general

2.5.1 Describe the relationship between pressure and wind and apply Buys Ballot’s law to assess the approximate location of high and low pressure systems.

2.5.2 Differentiate between:

(a) squalls and gusts; and

(b) backing and veering.

2.5.3 Compare surface and gradient winds in terms of direction and strength.

2.5.4 List the ‘factors’ that effect the diurnal variation of wind and describe typical ‘variations’ in surface wind strength during a 24-hour period.

2.6 Air masses and fronts

2.6.1 Describe typical ‘flying weather’ associated with the following using the factors described in subclause 2.6.2:

(a) cold fronts;

(b) warm fronts;

(c) wave depressions;

(d) occluded fronts;

(e) tropical cyclones;

(f) the equatorial trough.

2.6.2 For subclause 2.6.1, ‘flying weather’ embraces the following:

(a) temperature (warmer/colder);

(b) wind changes (back/veer, stronger/weaker);

(c) stability and turbulence;

(d) cloud type and approximate amount, precipitation.

2.7 Flight considerations

2.7.1 With respect to the phenomena listed below (i) – (vi):

(a) state the conditions favourable to their development and, where applicable, their dispersal;

(b) recognise signs which may indicate their presence;

(c) describe their effect on flight characteristics where applicable, state the pilot actions required to minimise their effect on an aircraft in flight:

(i) turbulence;

(ii) windshear;

(iii) mountain waves;

(iv) land and sea breezes;

(v) thunderstorms;

(vi) downdrafts associated with terrain and cloud.

2.7.2 State/select the conditions under which it is mandatory to obtain a forecast.

2.7.3 For information contained in an ARFOR, TAF, TTF, METAR, SPECI, AIRMET or SIGMET, do the following:

(a) explain the coded information in plain language;

(b) decide whether a particular forecast is valid for a flight;

(c) apply the information to planning and conducting a flight.

2.7.4 List the conditions that require a pilot to submit a short AIREP.

Unit 1.8.3 CMTC: CPL meteorology – all aircraft categories

1. Reserved

2. Meteorology

2.1 Composition of the atmosphere

2.1.1 Describe the process of incoming solar radiation and outgoing terrestrial radiation and the factors that affect them.

2.1.2 Explain the processes by which the sun's energy is redistributed within the atmosphere and explain:

(a) conduction;

(b) advection;

(c) convection;

(d) latent heat;

(e) radiation.

2.2 Heat, temperature, pressure and humidity

2.2.1 A student should:

(a) describe the method of measuring surface air temperature and know that actual temperatures may be much higher, for example, above a runway; and

(b) know the meaning of the following terms:

(i) isotherm;

(ii) radiation, advection, convection, conduction;

(iii) isobar, horizontal pressure gradient;

(iv) saturated air, relative humidity, dew point;

(v) evaporation, condensation, freezing.

2.2.2 List the effect of changes in temperature, pressure and humidity on air density.

2.2.3 List factors that influence the diurnal variation of surface air temperature and explain the temperature gradient between land and sea surfaces.

2.3 Atmospheric stability

2.3.1 Differentiate between stable, unstable and conditionally atmospheric conditions.

2.3.2 Understanding of adiabatic process and the parcel method of assessing stability.

2.4 Clouds and precipitation

2.4.1 Identify and classify cloud 'types':

(a) classifications required are:

(i) high, medium, low; and

(ii) cumuliform, stratiform:

(A) examples of 'type' are Cu, Ci etc.

2.4.2 State the standard abbreviation for each cloud type, and the method used to report cloud amount.

2.4.3 Describe the weather associated with each cloud type.

2.4.4 Differentiate between drizzle, rain, showers and virga.

2.4.5 Select statements that describe the conditions necessary for the formation/dispersal of various types of cloud.

2.5 Visibility

2.5.1 Know the method used in meteorological forecasts and reports to determine visibility.

2.5.2 Describe the term 'runway visual range'.

2.5.3 Give reasons for differences between ‘inflight’ and ‘reported’ visibility.

2.5.4 List meteorological factors that will reduce inflight visibility.

2.6 Winds – general

2.6.1 Describe the relationship between pressure and wind and apply Buys Ballot’s law to assess the approximate location of high and low pressure systems.

2.6.2 Differentiate between:

(a) squalls and gusts; and

(b) backing and veering.

2.6.3 Compare surface and gradient winds in terms of direction and strength.

2.6.4 List the ‘factors’ that effect the diurnal variation of wind and describe typical ‘variations’ in surface wind strength during a 24-hour period.

2.7 Air masses and fronts

2.7.1 Describe typical ‘flying weather’ associated with the following:

(a) cold fronts;

(b) warm fronts;

(c) wave depressions;

(d) occluded fronts;

(e) tropical cyclones;

(f) the equatorial trough.

2.7.2 For subsection 2.7.1 above, ‘flying weather’ embraces the following:

(a) temperature (warmer/colder);

(b) wind changes (back/veer, stronger/weaker);

(c) stability and turbulence;

(d) cloud type and approximate amount, precipitation.

2.8 Flight considerations

2.8.1 With respect to the phenomena listed below in subclause 2.8.2, do the following:

(a) state the conditions that are favourable to the development of the phenomenon and, where applicable, its dispersal;

(b) recognise signs which may indicate the presence of each phenomenon;

(c) describe the effect of the phenomenon on flight characteristics;

(d) where applicable, state the pilot actions required to minimise the effect of the phenomenon on an aircraft in flight.

2.8.2 The following is a list of meteorological phenomena that is for the purposes of subclause 2.8.1:

(i) thermals, turbulence;

(ii) dust devils and dust storms;

(iii) wind gradient, wind shear and low-level jetstreams;

(iv) anabatic and katabatic winds;

(v) mountain waves and fohn winds;

(vi) land and sea breezes;

(vii) inversions and fog;

(viii) thunderstorms and microbursts;

(ix) downdrafts associated with terrain/cloud;

(x) atmospheric stability and instability;

(xi) hoar frost, rime, and clear airframe ice;

(xii) tropical cyclones, tornadoes.

2.9 Synoptic meteorology

2.9.1 Given a MSL analysis chart, identify:

(a) high and low pressure systems; and

(b) a trough, a ridge, a col; and

(c) warm, cold and occluded fronts; and

(d) a tropical cyclone; and

(e) approximate wind direction.

2.9.2 Describe typical weather characteristics associated with the items listed in 2.9.1 (a) and (b) above in the following terms:

(a) approximate wind direction;

(b) moisture content (dry or humid);

(c) cloud: stratiform and cumuliform;

(d) clear skies;

(e) turbulent or smooth air;

(f) good or poor visibility.

2.10 Weather services

2.10.1 For given locations, determine from CASA documents the availability of aviation forecasts, meteorological reports and weather briefing and state the method of obtaining this information.

2.10.2 State/select the conditions under which it is mandatory to obtain a forecast.

2.10.3 For information contained in an ARFOR, TAF, TTF, METAR, SPECI, AIRMET or SIGMET, do the following:

(a) explain the coded information in plain language;

(b) decide whether a particular forecast is valid for a flight;

(c) apply the information to planning and conducting a flight.

2.10.4 Given a typical weather briefing, evaluate weather information applicable to a flight, and:

(a) assess likely changes (both improving and deteriorating) in weather during the flight; and

(b) list phenomena which may adversely affect the flight.

2.10.5 List the conditions that require a pilot to submit a short AIREP.

2.10.6 State the purpose of VOLMET and ATIS broadcasts indicate how this information is obtained and apply this information to practical scenarios.

2.10.7 State what is meant by a Hazard Alert service.

2.11 Climatology

2.11.1 Describe typical seasonal weather conditions in different regions of Australia with reference to:

(a) visibility (good/poor); and

(b) prevailing winds; and

(c) typical cloud patterns and precipitation; and

(d) seasonal pressure and frontal systems, including the ITCZ and equatorial trough; and

(e) tropical cyclones.

Unit 1.8.4 AMTC: ATPL meteorology – all aircraft categories

1. Reserved

2. Advanced meteorology

2.1 Composition of the atmosphere

2.1.1 Student should know the following vertical divisions in the atmosphere:

(a) troposphere, tropopause, stratosphere;

(b) that most weather effects occur below the stratosphere.

2.2 Heat, temperature, pressure and humidity

2.2.1 Describe the method of measuring surface air temperature, and explain how the actual temperatures may be much higher, for example, above a runway.

2.2.2 Describe the meaning of the following terms:

(a) isotherm, temperature inversion;

(b) radiation, advection, convection, conduction;

(c) isobar, horizontal pressure gradient;

(d) saturated air, relative humidity, dew point;

(e) evaporation, condensation, freezing.

2.2.3 Describe the effect of changes in temperature, pressure and humidity on air density.

2.2.4 Explain the factors that influence the diurnal variation of surface air temperature and explain the temperature gradient between land and sea surfaces.

2.3 Atmospheric stability

2.3.1 Differentiate between stable, unstable and conditionally atmospheric conditions.

2.3.2 Describe the adiabatic process and the parcel method of assessing stability.

2.4 Clouds and precipitation

2.4.1 Identify and classify cloud ‘types’ as cumuliform or stratform for the following:

(a) high level;

(b) medium level;

(c) low level.

2.4.2 State the standard abbreviation for each cloud type, and the method used to report cloud amount.

2.4.3 Describe the weather associated with each cloud type.

2.4.4 Differentiate between drizzle, rain, showers and virga, however, actual droplet size is NOT required.

2.4.5 Select statements that describe the conditions necessary for the formation/dispersal of various types of cloud.

2.5 Visibility

2.5.1 Know the method used in meteorological forecasts and reports to determine visibility.

2.5.2 Describe the term ‘runway visual range’.

2.5.3 Give reasons for differences between ‘inflight’ and ‘reported’ visibility.

2.5.4 List meteorological factors that will reduce inflight visibility.

2.6 Winds – general

2.6.1 Describe the relationship between pressure and wind and apply Buys Ballot’s law to assess the approximate location of high and low pressure systems.

2.6.2 Differentiate between:

(a) squalls and gusts; and

(b) backing and veering.

2.6.3 Compare surface and gradient winds in terms of direction and strength.

2.6.4 List the 'factors' that effect the diurnal variation of wind and describe typical 'variations' in surface wind strength during a 24-hour period.

2.7 Air masses and fronts

2.7.1 Describe typical 'flying weather' associated with the following, with reference to the parameters mentioned in subsection 2.7.2:

(a) cold fronts; and

(b) warm fronts; and

(c) wave depressions; and

(d) occluded fronts; and

(e) tropical cyclones; and

(f) the equatorial trough.

2.7.2 For subsection 2.7.1, the following are the parameters:

(a) temperature (warmer/colder);

(b) wind changes (back/veer, stronger/weaker);

(c) stability and turbulence;

(d) cloud type and approximate amount, precipitation.

2.8 Flight considerations

2.8.1 With respect to the phenomena listed below from (i) to (xii)

(a) state the conditions favourable to their development and, where applicable, their dispersal;

(b) recognise signs which may indicate their presence;

(c) describe their effect on flight characteristics;

(d) where applicable, state the pilot actions required to minimise their effect on an aircraft in flight:

(i) thermals, turbulence; and

(ii) dust devils and dust storms; and

(iii) wind gradient, wind shear and low-level jetstreams; and

(iv) anabatic and katabatic winds; and

(v) mountain waves and fohn winds; and

(vi) land and sea breezes; and

(vii) inversions and fog; and

(viii) thunderstorms and microbursts; and

(ix) downdrafts associated with terrain/cloud; and

(x) atmospheric stability and instability; and

(xi) hoar frost, rime, and clear airframe ice; and

(xii) tropical cyclones, tornadoes.

2.9 Synoptic meteorology

2.9.1 Given a MSL analysis chart, identify:

(a) high and low pressure systems; and

(b) a trough, a ridge, a col; and

(c) warm, cold and occluded fronts; and

(d) a tropical cyclone; and

(e) approximate wind direction.

2.9.2 Describe typical weather characteristics associated with the items listed in 2.9.1 (a) and (b) above.

2.9.3 For subclause 2.9.2, weather characteristics means the following:

(a) approx wind direction;

(b) moisture content (dry/humid);

(c) cloud: stratiform and cumuliform;

(d) clear skies;

(e) turbulent or smooth air;

(f) good or poor visibility.

2.10 Weather services

2.10.1 For given locations, determine from CASA documents the availability of aviation forecasts, meteorological reports and weather briefing and state the method of obtaining this information.

2.10.2 State/select the conditions under which it is mandatory to obtain a forecast.

2.10.3 For information contained in an ARFOR, TAF, TTF, METAR, SPECI, AIRMET or SIGMET, do the following:

(a) explain the coded information in plain language;

(b) decide whether a particular forecast is valid for a flight;

(c) apply the information to planning for and conducting a flight.

2.10.4 Given typical weather briefing, evaluate weather information applicable to a flight, and:

(a) assess likely changes in weather during the flight (both improving and deteriorating); and

(b) list phenomena which may adversely affect the flight.

2.10.5 List the conditions that require a pilot to submit a short AIREP.

2.10.6 State the purpose of VOLMET and ATIS broadcasts indicate how this information is obtained and apply this information to practical scenarios.

2.10.7 State what is meant by a Hazard Alert service.

2.11 Climatology

2.11.1 Explain typical seasonal weather conditions in different regions of Australia with reference to:

(a) visibility (good/poor); and

(b) prevailing winds; and

(c) typical cloud patterns and precipitation; and

(d) seasonal pressure and frontal systems, including the ITCZ and equatorial trough; and

(e) tropical cyclones.

2.12 Met observations

2.12.1 Standard observation methods:

(a) knowledge of the standard methods of measuring the following (however, knowledge of the mechanics of the various instruments used is not required):

(i) visibility;

(ii) cloud height;

(iii) pressure;

(iv) temperature;

(v) humidity;

(vi) surface wind;

(vii) upper winds.

2.12.2 Q codes:

(a) understand the code groups QFE and QNH, and understand the meaning of area QNH.

2.12.3 Inflight observations:

(a) requirement for inflight observations by crew members;

(b) reporting criteria;

(c) form and circumstances in which observations are made and reported:

(i) refer AIP for full position report format.

2.12.4 Satellite observations:

(a) use of satellite photographs (visual and infra-red) to recognise and describe weather systems and air masses.

2.12.5 Australian flight weather documentation:

(a) comprehension and interpretation of all weather forecasts or reports in common use in Australia for aviation purposes;

(b) decoding of TAF, METAR and SIGMET messages;

(c) understand the function of TREND type forecasts and the criteria for their use.

Unit 1.8.5 AMTA: ATPL meteorology – aeroplane

1. Reserved

2. Advanced meteorology

2.1 The atmosphere

2.1.1 Structure of the atmosphere:

(a) composition and extent;

(b) vertical division (to lower stratosphere only).

2.1.2 Pressure, temperature and density:

(a) interrelationship of pressure, temperature and density;

(b) barometric pressure, isobars;

(c) pressure, temperature and density variation with height;

(d) temperature near earth's surface:

(i) lapse rate;

(ii) surface effects;

(iii) diurnal variation;

(iv) effect of clouds;

(e) adiabatic processes:

(i) meaning of adiabatic;

(ii) dry air;

(iii) evaporation;

(iv) condensation;

(v) latent heat;

(vi) saturated air;

(f) temperature inversions:

(i) development;

(ii) types;

(iii) influence on the weather;

(g) stability and instability:

(i) DALR, SALR, ELR;

(ii) stable and unstable conditions;

(iii) conditional instability;

(iv) stability changes caused by:

(A) radiation;

(B) turbulence;

(C) convection;

(D) advection;

(E) subsidence;

(F) convergence;

(G) divergence;

(H) precipitation.

2.1.3 Humidity:

(a) water vapour in the atmosphere;

(b) vapour pressure, effect on density;

(c) dry/wet bulb temperature:

(i) dewpoint;

(ii) relative humidity.

2.2 Clouds and precipitation

2.2.1 Cloud:

(a) types of cloud and level at which found:

(i) stratus;

(ii) cumulus;

(iii) cirrus;

(b) variations of basic types:

(i) strato-;

(ii) cumulo-;

(iii) nimbo-;

(iv) alto-;

(c) hazards (if any) presented by different types.

2.2.2 Formation of cloud:

(a) methods/mechanisms by which clouds form;

(b) conditions favourable to formation:

(i) atmospheric;

(ii) topographic.

2.2.3 Precipitation:

(a) cause of precipitation;

(b) types:

(i) drizzle, rain, snow, hail;

(ii) distinction between showers and rain;

(c) characteristics of precipitation:

(i) orographic;

(ii) frontal;

(iii) showers;

(d) hazards presented by precipitation:

(i) reduced visibility (for example, landing);

(ii) icing;

(iii) radar masking (water layer on radome);

(iv) weight and impact (severe rain on large aircraft).

2.2.4 Thunderstorms:

(a) development of a single cell:

(i) prerequisite conditions;

(ii) stages of development;

(iii) structure of mature cell;

(b) hazards presented by a thunderstorm:

(i) down-draught (near ground);

(ii) turbulence;

(iii) icing;

(iv) lightning;

(c) flight in or near thunderstorms:

(i) hazards in flight close to thunderstorms:

(ii) optimum flight paths/flight levels if penetration of a thunderstorm is necessary.

2.3 Motion of the atmosphere

2.3.1 Wind and pressure:

(a) relationship between isobars and wind:

(i) Buys Ballot's Law;

(b) primary cause of wind:

(i) pressure gradient;

(ii) coriolis force;

(iii) gradient wind;

(iv) convergence and divergence;

(c) diurnal variation of wind;

(d) turbulence and gustiness:

(i) factors affecting turbulence;

(ii) effect of turbulence on lapse rate.

2.3.2 Local winds:

(a) land and sea breezes;

(b) anabatic, katabatic and fohn winds;

(c) low-level jet.

2.3.3 Mountain effects:

(a) standing waves, rotors;

(b) conditions favourable to development;

(c) hazards presented by mountain effects.

2.3.4 Microbursts:

(a) structure of a microburst;

(b) meteorological conditions conducive to microburst formation;

(c) visual identifying features;

(d) hazards presented by microbursts:

(i) windshear;

(ii) effect on IAS and groundspeed;

(iii) sink rate;

(iv) turbulence;

(e) windshear reporting procedures.

2.3.5 Variation of wind with height:

(a) general/common characteristics:

(i) loss of mechanical turbulence;

(ii) tends to increase speed;

(iii) tends westerly;

(b) elementary knowledge of contour charts.

2.4 Visibility

2.4.1 Measurement of visibility:

(a) brief outline of difficulties:

(i) practical measurement of visibility;

(ii) visibility versus RVR;

(iii) visibility at night;

(b) reduced visibility:

(i) distinction between fog, mist and haze;

(c) hazards presented by reduced visibility:

(i) in flight;
(ii) on take-off or landing;
(iii) unseen obstacles on runway;
(iv) directional control, especially asymmetric roll control;
(v) obstacle avoidance if direction deviates;

(d) difference between horizontal and vertical visibility;

(e) effects of vertical visibility being greater than horizontal visibility on final approach:
(i) impression of greater visibility below aircraft's present height;
(ii) tendency to duck under glide path;
(iii) tendency to allow sink rate to increase;
(iv) reduction of visibility after flaring.

2.4.2 Fog:

(a) formation of fog:
(i) mechanism;
(ii) prerequisite conditions;

(b) synoptic conditions favourable to the formation and clearing of:
(i) radiation fog;
(ii) advection fog;
(iii) steam fog;
(iv) frontal fog.

2.4.3 Other causes of reduced visibility:

(a) effects of mist, smoke, dust, sand and sea spray;

(b) conditions favourable for such effects to develop.

2.5 Ice accretion

2.5.1 Airframe icing

(a) mechanism by which airframe ice is formed:

(b) types of icing:
(i) atmospheric conditions associated with each type;

(c) airframe areas most susceptible to icing:
(i) factors affecting type, rate and severity of icing;

(d) hazards presented by airframe icing;

(e) environmental conditions presenting an icing hazard:
(i) concept of visible moisture;
(ii) maximum and minimum air temperatures.

2.5.2 Engine icing (turbine engines only):

(a) conditions conducive to engine icing:
(i) atmospheric conditions;
(ii) aircraft conditions;

(b) sections of engine most susceptible to icing:
(i) factors affecting type, rate and severity of icing;

(c) hazards presented by engine icing.

2.5.3 Reports of icing:

(a) requirement to report;

(b) classification of degree of icing.

2.6 Air masses and fronts

2.6.1 Properties of an air mass:

(a) concept of an air mass;
(b) factors affecting the properties of an air mass:
(i) description of an air mass.

2.6.2 Classification of air masses:
(a) classification on basis of area of origin;
(b) modifications due to advection.

2.6.3 Basic synoptic analysis:
(a) high and low pressure areas:
(i) relationship with air masses;
(b) boundaries between air masses:
(i) non-frontal boundaries;
(ii) general/common situations;
(iii) ridges;
(iv) cols.

2.6.4 Fronts:
(a) warm fronts:
(i) formation/mechanism of warm front;
(ii) associated clouds and weather;
(iii) hazards presented by warm fronts;
(b) cold fronts:
(i) formation/mechanism of cold front;
(ii) associated clouds and weather;
(iii) hazards presented by cold fronts;
(c) occluded fronts:
(i) formation/mechanism of occluded front;
(ii) associated clouds and weather;
(iii) hazards presented by occluded fronts;
(d) quasi-stationary fronts:
(i) formation/mechanism of quasi-stationary front;
(ii) associated clouds and weather;
(iii) hazards presented by quasi-stationary fronts.

2.7 Air masses and frontal analysis

2.7.1 Frontal depressions:
(a) formation of frontal depressions;
(b) warm and cold fronts:
(i) occlusion process;
(c) distribution of weather;
(d) depression families and troughs;
(e) flight conditions in and over depressions.

2.7.2 Non-frontal depressions:
(a) associated weather and flying conditions;
(b) thermal, orographic and secondary depressions.

2.7.3 Anticyclones:
(a) general properties of anticyclones;
(b) cold and warm anticyclones.

2.7.4 Stream weather:

(a) general properties of streams;

(b) weather to be expected in typical stream situations.

2.8 Synoptic charts

2.8.1 Presentation of synoptic charts:

(a) common symbology and presentation of data;

(b) interpretation of data.

2.8.2 Basic analysis and prognostic rules:

(a) movement of pressure systems and development of pressure systems in the Australian region;

(b) movement of fronts and development of fronts;

(c) general prognosis of situations represented on synoptic charts:

(i) in the next 1 to 2 hours;

(ii) in the next 24 hours.

2.8.3 Aviation significance of synoptic chart:

(a) apply data from a synoptic chart to the selection of a route and destination/alternate;

(b) interpret data from a synoptic chart to estimate the surface weather expected at a selected point, at the time represented by the chart or at a time shortly later:

(i) surface wind;

(ii) type, amount and base of lowest cloud;

(iii) probability of rain;

(iv) probability of other features significant to aviation (for example, dust, fog, etc.).

2.9 Upper level weather

2.9.1 The tropopause:

(a) atmospheric division represented by the tropopause:

(i) temperature profile below and above the tropopause;

(b) variation in height of tropopause:

(i) at different latitudes;

(ii) in different seasons;

(c) variation in wind in the vicinity of the tropopause;

(d) temperature profile above the tropical and polar tropopause.

2.9.2 Upper level jet streams and CAT:

(a) recognise statements which define a jet stream;

(b) compare the strengths of typical tropical and polar jets;

(c) state conditions which may affect the strength and location of jet streams;

(d) recall that wind shear is usually greater on the polar side of the jet than on the equatorial side;

(e) list/identify signs which would suggest the presence of a jet stream and/or CAT;

(f) state pilot actions which would minimise the effect of CAT whilst flying:

(i) in the vicinity of a jet core;

(ii) in CAT not associated with a jet stream.

2.9.3 Flight conditions associated with:

(a) dense jet stream cirrus and cirrus haze;

(b) flight at high level in the vicinity of well-developed thunderstorm tops.

2.10 Upper level weather charts

2.10.1 Presentation of charts:

(a) types of charts:

(i) upper level prognostic charts (brief general discussion only);
(ii) SIGWX charts;
(iii) gridpoint wind and temperature forecasts;
(b) presentation of data and symbology used in the different charts;
(c) altitudes/mb levels commonly charted.

2.10.2 Application of upper level charts:
(a) apply data from an upper level chart to the selection of a route and destination/alternate;
(b) interpret data from an upper level chart in terms of its aviation significance;

2.11 Climatology

2.11.1 Global pressure distribution:
(a) average surface pressure and temperature distribution over the world;
(b) global circulation:
(i) average circulation patterns in the troposphere and low stratosphere and their seasonal variation;
(ii) upper winds, stream lines and seasonal variation;
(c) ITCZ and its associated weather in different areas.

2.11.2 Monsoonal weather:
(a) wet and dry seasons;
(b) typical wet and dry weather conditions;
(c) hazards presented by monsoonal weather;
(d) application of monsoonal conditions to Australia and near neighbours.

2.11.3 Tropical storms:
(a) prerequisites for development:
(i) climatic;
(ii) equatorial latitudes;
(b) global breeding grounds:
(i) understand that different areas have different local names for the same phenomenon;
(c) typical life history of storm;
(d) hazards presented by tropical storms:
(i) location of severest weather in relation to storm centre;
(e) application of tropical storms to Australia and near neighbours.

2.12 Met observations

2.12.1 Standard observation methods:
(a) knowledge of standard methods of measuring, not including knowledge of the mechanics of the various instruments:
(i) visibility;
(ii) cloud height;
(iii) pressure;
(iv) temperature;
(v) humidity;
(vi) surface wind;
(vii) upper winds.

2.12.2 Q Codes:
(a) understand the code groups QFE and QNH and understand the meaning of ‘area QNH’;:

2.12.3 Inflight observations:

(a) requirement for inflight observations by crew members;

(b) reporting criteria;

(c) form and circumstances in which observations are made and reported:

(i) AIP format for full position report.

2.12.4 Satellite observations:

(a) use of satellite photographs (visual and infra-red) to recognise and describe weather systems and air masses.