# Syllabus for BGA Bronze 'C' theory

**Air Law and Recommended Practices**
**Airmanship**
**Principles of flight 1 - lift, drag and performance**
**Principles of Flight 2 - glider design and stability**
**Navigation 1 - map reading and airspace**
**Navigation 2 – flying cross country**
**Instrumentation and RT procedures**
**Meteorology 1 - macro weather systems**
**Meteorology 2 - micro weather systems**
**Human performance and limitations**

## 1. Air Law and Recommended Practices

**Syllabus:** Content of BGA Laws and Rules except for airspace

**Aim:** The student will refer to the Laws and Rules publication as the main resource for legal and operational aspects of gliding and memorize sufficient of its content to ensure safe and legal conduct.

Specifically the student should be able to:

- state that all references to Aviation Law are taken from the current Air Navigation Order and Rules of the Air Regulations,
- state the age requirements for flying gliders,
- list the objects which may be dropped from a glider,
- define 'night time' and 'hours of daylight',
- define the period during which a glider is in flight,
- describe BGA approved identification markings,
- state the requirements for a glider pilot to undertake cross-country flight,
- state the requirements for medical certification of glider pilots,
- state the requirements for keeping a glider pilot's log book,
- describe the reporting procedure for faults in gliders, damage, actual or suspected and hazardous incidents.
- explain the need for daily inspection of all operational equipment,
- describe the construction and operation of winch launching equipment,
- state regulations governing heights of glider launches,
- describe the construction and operation of aero-towing equipment,
- describe operational regulations and procedures for aero-towing,
- describe launch signaling methods,
- describe signals using lights and pyrotechnics,
- describe common airfield markings,
- describe basic hazard and collision avoidance measures, including aerobatics (HASSLL), thermalling, ridge soaring, cloud flying, newly rigged club gliders, launching procedures and defect reporting,
- state the low flying rules,
- describe accident reporting procedures,
- describe glider radio licencing requirements and frequencies used,
- describe best practice for ground handling of gliders,

- describe best practice for launching gliders by winch and aero-tow,
- describe pre-flight control checks,
- describe basic care and inspection of emergency parachutes,
- state that gliders should not be launched with ice, snow, or water on wings,
- state the requirements for using oxygen,
- describe code of conduct for landing in fields.

**2. Airmanship**

**Syllabus**: Elements of airmanship as discussed in BGA Instructors' Manual

**Aim:** The student will apply the processes and disciplines associated with good airmanship.

Specifically the student should be able to:

- Describe what constitutes responsible conduct on the airfield,
- state the individual's responsibility for safety of him/herself and others,
- describe the limitations of vision and technique for maintaining a good lookout,
- describe acceptable and unacceptable conduct in thermals and on ridges,
- describe collision avoidance techniques,
- describe the personal attributes of good airmanship,
- describe the processes of keeping a good lookout in various phases of flight,
- make sensible decisions concerning currency,
- describe requisite allowances for landing in various type of extreme weather,
- describe decisions to be made in conditions of where canopy misting may occur.

**3. Principles of flight1 - lift and drag, polar and performance, airflow**

**Syllabus**: Aerodynamic theory as it applies to gliders.

**Aim:** The student will understand the principles of flight as they apply to gliders.

Specifically the student should be able to:

- Describe the basic fluid properties of air,
- describe lift and drag as mutually perpendicular vector quantities,
- describe the forces which act on a glider in a turn,
- describe the basic geometry of aero foils and how lift is produced,
- describe movement of centre of lift and its effect on pitching moment,
- describe the mechanism of the stall of an aerofoil,
- describe how wing loading affects stall speed,
- describe laminar and turbulent airflow,
- describe airflow round an aerofoil,
- describe and name the causes of drag,
- describe mechanisms for reduction of drag,
- sketch a graphical relationship between lift and airspeed at constant angle of attack,
- sketch a graphical relationship between induced drag and airspeed,

- sketch a graphical relationship between profile drag and airspeed,
- sketch a graph illustrating total drag for a range of airspeeds,
- describe the lift/drag ratio in terms of glide angle,
- interpret data from a typical 'polar curve' for still air, lift, sink, headwind, tailwind and different wing loading.

**4. Principles of flight 2 - glider design and effect of controls, stability.**

**Syllabus**: Glider nomenclature, effects of controls, stability, stalling and spinning, flight envelope and placard.

**Aim:** The student will use correct nomenclature and understand the effects of glider airframe design and control surfaces on the three axes of rotation and the resultant airframe loading.

Specifically the student should be able to:

- Name the parts of a glider and state their functions and effects,
- state considerations for preventing physical damage to gliders and deleterious effects of exposure to weather,
- describe aspect ratio and its affect on performance,
- state the purpose of 'washout',
- describe the effects of controls,
- describe further effects of controls,
- describe the effect of flaps,
- list the factors that determine stability in roll, pitch and yaw,
- explain the importance of and factors affecting C of G position,
- describe and compare the relative merits of the various mechanical / aerodynamic methods of trimming,
- describe states of stalled flight and spinning and correct recovery procedures,
- interpret a basic flight envelope diagram and how the flight limitations placard is derived from it.

**5. Navigation 1 – Map reading and Airspace**

**Syllabus**: Airspace regulations as they apply to gliders in UK, interpretation of ICAO Aeronautical charts, definition of track and heading, vertical navigation, magnetic compass, altimetry.

**Aim:** The student will understand the relevance of the various types of airspace to glider navigation in the UK and the requirements for three-dimensional navigation.

Specifically the student should be able to:

- State the types (and dimensions where appropriate) of UK airspace and associated IFR and VFR flight regulations and procedures for gliders,
- interpret the legends on quarter million and half million scale ICAO aeronautical charts,
- describe atmospheric pressure and its measurement in millibars,
- state the value of the ICAO Standard Atmosphere as 1013.2 mB,
- describe use of QFE, QNH and flight level pressure settings,

- describe the construction of a 'wet' compass,
- describe the advantages and limitations of a 'wet' compass,
- describe angle of dip and acceleration errors,
- describe magnetic variation and the use of isogonal lines on air charts,
- explain the limited use of a 'wet' compass and describe 'acceleration/dip free' design.

## 6. Navigation 2 - practical cross country flying

**Syllabus**: Speed to fly, glide calculations, visibility of ground features, maps, field selection, preparation for a navigational exercise.

**Aim:** The student will acquire the requisite knowledge for the safe and expeditious conduct of a cross-country flight in a glider.

Specifically the student should be able to:

- Interpret speed to fly data from a polar curve and relate it to the practical Macready theory
- mentally approximate the glide distance from any given height,
- describe the techniques and considerations for selecting, preparing, marking-up and using maps for cross-country navigation,
- describe the difference in appearance of visual features under varying flight conditions,
- describe approximation of position, 'dead reckoning' methods of navigation and actions when lost,
- describe procedures for use when uncertain of position,
- identify likely sources of 'lift' and describe techniques for their optimal use,
- list the factors to be considered when preparing for a field landing, including identifying wind direction and effects of obstructions on field boundaries,
- prepare a cross-country flight plan taking into consideration such factors as local weather conditions, airspace, condition of fields, NOTAMs, TNWs, etc.

## 7. Instrumentation and communications

**Syllabus**: General operation of flight instruments including radio.

**Aim:** The student will understand:

1. The principles of operation glider instrumentation and their modes of failure.
2. The law as it applies to the use of radios in gliders and the correct use of VHF glider frequencies.

Specifically the student should be able to:

- Describe the construction, markings, and method of operation of an airspeed indicator,
- describe the construction, method of operation, limitations and setting of an altimeter,
- describe the construction and method of operation of mechanical and electric variometers,

- describe the construction and method of operation of gyroscopic glider instruments,
- describe symptoms and modes of instrument failure,
- describe the construction and function of a magnetic (Cook) compass and method of correction for deviation,
- describe IAS and TAS and position error for ASIs,
- state the legal conditions and limitations under which VHF radios may be used in gliders and on gliding sites,
- describe basic CAP 413 procedures and protocols for initiating and continuing RT communications as they apply to glider pilots,
- demonstrate the correct format for distress and urgency calls,
- list the glider radio frequencies and their preferred uses,
- describe the characteristics and limitations of VHF radio communications,
- urgency and distress calls.

**8. Weather 1 - macro weather systems**

**Syllabus:** Air masses, pressure systems, Coreolis effect, frontal systems, cloud types, visibility and flight conditions,

**Aim:** The student will be able to relate soaring weather to the behavior of global weather systems.

Specifically the student should be able to:

- List the types of air mass, their origins and characteristics,
- interpret the legend for synoptic charts,
- describe the Coreolis effect and Buys Ballots' law
- describe the formation of high and low pressure systems, ridges, troughs and cols and their effects on gliding conditions,
- describe the causes and effects of inversions,
- describe the formation and characteristics of warm, cold and occluded fronts and explain the associated weather,
- list the types of cloud associated with frontal systems,
- list the factors that effect flight visibility and conditions.

**9. Weather 2 - micro weather systems**

**Syllabus**: Stability and instability, lapse rates, convection, advection (fog), inversion. Interpretation of pressure gradients, tephigrams, dew point, etc. Formation of cloud, rain, hail. Local weather variation including development of Cb. Geostrophic wind & wind gradient. Diurnal variation, anabatic and katabatic winds. Fohn effect. Wave soaring and rotor. Sea breezes and convergences.

**Aim:** The student will be able to relate soaring weather to local topology and forecast conditions and make decisions leading to safe and successful soaring.

Specifically the student should be able to:

- Describe the 'wet' and dry adiabatic properties of air,
- Explain the meaning of 'dew point',

- describe the effect of lapse rates on parcels of air,
- describe an inversion,
- explain the formation of convective cloud and the precipitation of rain and hail,
- describe the formation of orographic cloud,
- describe the dangers associated with deep convection and the formation of Cb,
- define 'fog' and 'mist' and describe the mechanisms that can produce poor visibility,
- describe the formation of rime ice, hoar frost and mixed ice and the modes of ice accretion.
- describe the effect of geostrophic wind,
- list the factors that cause wind shear and wind gradient,
- describe the measurement of wind speed,
- describe the measurement of cloud cover,
- describe the effects of diurnal variation including anabatic and katabatic winds,
- describe the Fohn effect,
- describe conditions favourable to the formation of lee waves,
- describe potential hazards associated with lee wave,
- describe the formation of sea breezes and convergences.

**10. Human performance and limitations**

Syllabus: Fitness considerations, ocular theory, visual acuity, pressure changes, hypoxia, hyperventilation, CO poisoning, hypothermia, nausea.

Specifically the student should be able to:

- state medical considerations for aviators using the I'M SAFE acronym,
- describe the basic function and limitations of the human eye,
- describe the limits of visual acuity in conditions of flight and appropriate measures to minimize their shortfalls,
- describe effects of pressure changes and sensible precautions,
- describe the symptoms and remedies for hypoxia and hyperventilation,
- describe the causes, symptoms and precautions against carbon monoxide poisoning,
- describe the causes, symptoms and effects of hypothermia,
- list the causes of nausea and possible remedies.

**Publications:**

Gliding - A Handbook of Soaring Flight: Derek Piggot
Understanding Gliding: Derek Piggot
The Glider Pilot's Manual: Ken Stewart
Gliding From Passenger to Pilot: Steve Longland
The Soaring Pilot's Manual: Ken Stewart
Bronze and Beyond: John McCullagh
Weather Photo Guide: Collins Gem
Meteorology and Flight: Tom Bradbury
BGA Gliding Manual: BGA

Also – old, but worth reading:

New Soaring Pilot: Ann and Lorne Welch and Frank Irving
Meteorology for Glider Pilots: C.E Wallington