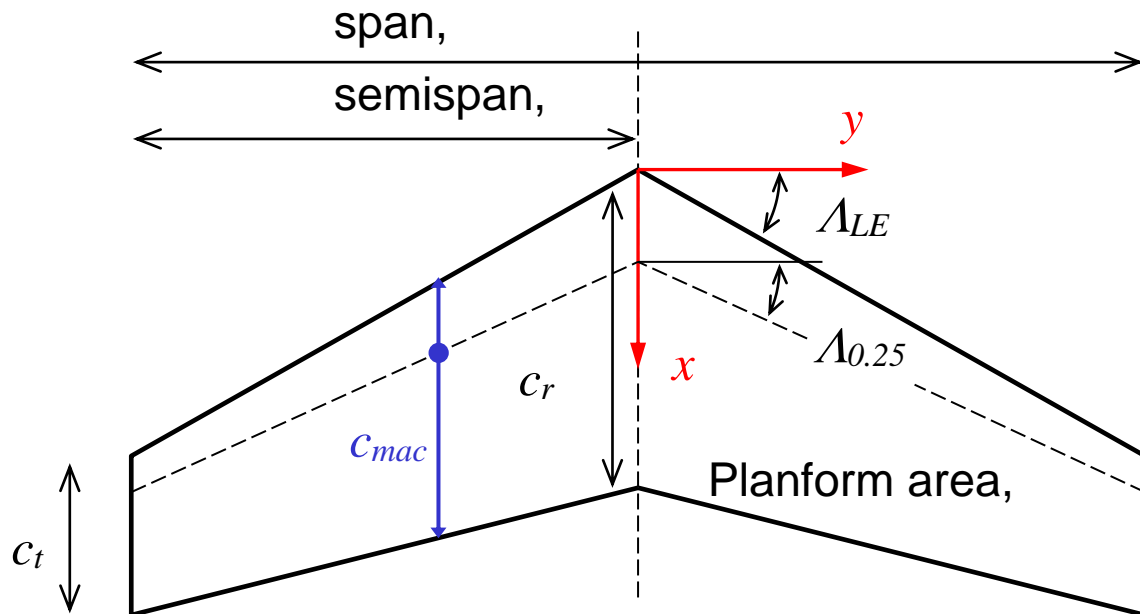


WING GEOMETRY PARAMETERS

AIMS

- To introduce wing planform geometry parameters

WING PLANFORM



DEFINITIONS

The *wing area*, S , is the plan surface area of the wing including the continuation within the fuselage, it is sometimes called the gross wing area S_G . The plan area of the exposed wing, i.e. excluding the continuation within the fuselage is the net wing area S_N .

The *wing span*, b , is measured from tip to tip.

The *geometric average chord* \bar{c} is such that the product of the span and \bar{c} equals the wing area i.e. $S = \bar{c} \times b$

Aspect ratio, AR , is the ratio of span and the average chord.

For a rectangular wing $AR = b/c$

For a non-rectangular wing $AR = b^2/S$

Root chord, c_r , is the chord at the wing centre line and the *tip chord*, c_t , is the chord at the wing tip

The *taper ratio*, λ , is the ratio of the tip chord to the root chord assuming that the leading and trailing edges are straight lines i.e.

$$\lambda = \frac{c_t}{c_r}$$

The *sweep angle* Λ is usually measured between the 25% chord line and a perpendicular to the root chord, but sweep angles for the leading and trailing edges are also presented.

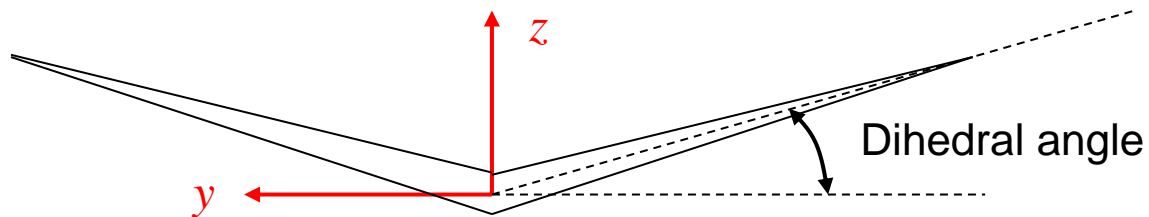
The *mean aerodynamic chord* is used with S to non-dimensionalise pitching moments

$$c_{mac} = \frac{1}{S} \int_{-s}^{+s} c^2(y) dy$$

Geometric twist defines the situation where the geometric angles of incidence for sectional chord lines are not the same. If the incidence increases towards the tip the wing has wash-in while if the incidence decreases towards the tip the wing has wash-out.

Aerodynamic twist defines the situation where the aerofoil section varies in the spanwise direction, which leads to a spanwise variation in the zero lift angle of attack or incidence.

The *dihedral angle* is the angle between a horizontal plane containing the root chord and a plane midway between the upper and lower surfaces of the wing. If the wing lies below the horizontal plane it is called an *anhedral angle*.



REVISION OBJECTIVES

You should be able to:

- Label a wing planform diagram – span, root and tip chords, sweep
- Give definitions of all wing quantities