Soaring by Design

Modeling Flight

Narrator: (Francesca Hunt)

In this video band we'll be looking at the forces which enable a glider to become airborne and then to stay aloft. In particular we'll explore the consequences of energy change and start by applying some of the concepts you've met in mechanics to examine some of the main forces involved. Any object moving through the air experiences a resistance force as a result of its motion. For most objects this force acts backwards along the line of travel, but this needn't be so with an aerofoil. In this case the resistance can be offset to one side. It's convenient to split this into two components: a backwards Drag Force - and Lift, a force acting at right angles to the direction of travel. In modelling the aerodynamic forces on this shape we'll always describe them in terms of this Lift and the Drag, acting in combination. But the forces on a glider aren't just aerodynamic, there's also the weight to be taken into account. For steady unaccelerated flight, no matter what direction of motion, the total forces must be zero. This means that the vertical component of the Lift, combined with the vertical component of the Drag, will balance the weight, and that the horizontal components of Lift and Drag will balance one another. From a knowledge of the relationship between the forces it's possible to derive the energies involved in flying and looking at the energies can be a useful way of modelling the behaviour of a glider in the air.