Forces at work: Drag and lift

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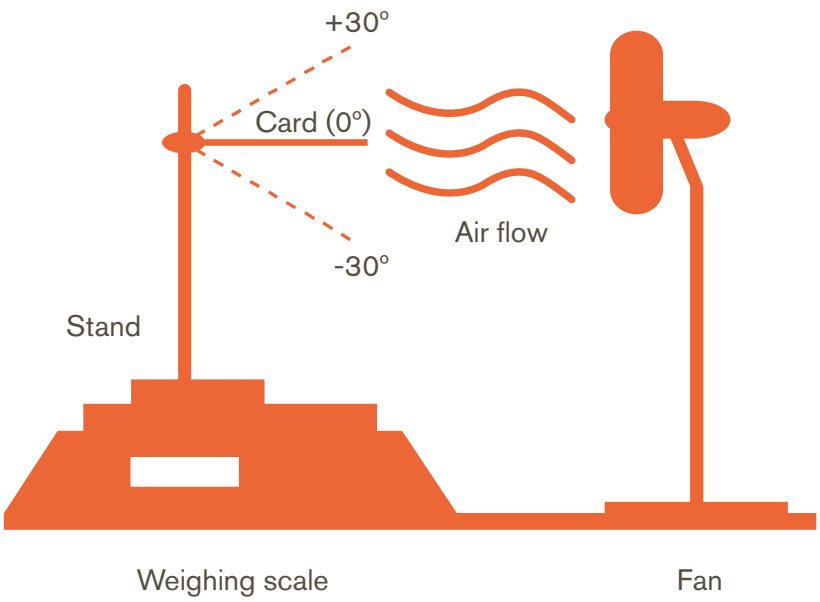
Measuring lift: Student sheet

Method

1. Read the instructions in full before you begin
2. Measure the dimensions of the card and calculate the surface area by multiplying these together
3. Set up the clamp stand, card and fan as shown below
4. Before switching the fan on, take a note of the mass of the stand and card in grams, and make sure that the card is horizontal (level)
5. Switch the fan on to its lowest setting and move it to a sensible distance, so there's a change in reading on the scale without making the card bend a lot or flap about too much
6. Wait until the reading on the scales has settled and record it, then calculate the change in weight and convert into newtons (N), using the equation as shown on the next page
7. Repeat with the fan on its highest setting
8. Use the protractor to adjust the card so that it is sloping upwards by approximately 30° and repeat steps 4-6
9. Next adjust the card to slope downwards by about 30° and repeat steps 4-6



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Results table

Weight with fan off: _____g

Weight and force:

Forces are measured in newtons. On earth, 1kg (1000g) weighs 9.81 newton. To find out the force, you will need to convert your weight in grams into kilograms and multiply by 9.81, as follows:

_____kg x 9.81 = _____N

Card size	Card surface area (cm^2)	Angle (°)	Fan speed	Change from reading with fan off (g)	Change in weight converted to kg	Force (N) Use + for lift and - for downforce
____ cm by ____ cm		0	Low			
		0	High			
		+30	Low			
		+30	High			
		-30	Low			
		-30	High			
____ cm by ____ cm		0	Low			
		0	High			
		+30	Low			
		+30	High			
		-30	Low			
		-30	High			

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Explain your results by answering these questions

- What effect do you think a greater angle of the card would have on lift?

- What effect does the wind speed have on lift?

- Can you explain how ski jumpers can actually travel further if they jump into a headwind?