



The physical world: helicopters

Controlling a helicopter

V/O: For a novice it's hard enough to control a helicopter at the best of times, but as any keen-eyed would-be pilot might have noticed, there is more than one set of rotors to master. So what's this one for?

TUTOR: The tail rotor's job in life is to counteract the torque effect of pushing rotors around. Our engine is pushing these blades around and that is with an equal and opposite force pushing us around in the other way, in the other direction. So we need some force generator to cancel that, to counteract that, and that's what the tiller is for, it pushes back against the tail and stops the helicopter rotating.

TRACY: So one's pushing one way and one's pushing that way.

TUTOR: Yes, the helicopter would want to rotate and the tail rotor pushes against that to stop it rotating.

(CONVERSATION IN HELICOPTER)

TUTOR 2: You're putting a lot of torque into the main rotor to turn it round and the helicopter fuselage will try and turn the other way, and you need to stop that somehow. So most helicopters have a small rotor at the back, and the purpose of that is to stop the fuselage rotating when you pull on this lever on the left, and you have some pedals on the floor to control sideways lift being generated by the tail rotor.

(CONVERSATION IN HELICOPTER)

ANGELA: Just when you thought all this was starting to look a little easy, now comes the hard bit. You see it's not too difficult to get one of these things in the air, but what do you do with it then? Moving a helicopter forward, turning it left and right, or even taking it backwards can be a little tricky at first.

(CONVERSATION IN HELICOPTER)

TUTOR 2: To then to make the aircraft move, usually forwards, but left, right or backwards if you want to, you then use the other stick, which is in your right hand, and that's called the cyclic.

PETE CUMMINGS: When you're a novice helicopter pilot, the cyclic is the one that gives you the most anxious moments, definitely. It gives the instructor a few anxious moments as well, but certainly it's the hardest one to get to grips with. Basically, where you point it, you will go but we always teach people that it's your speed control, because it sets the altitude of the helicopter, and the way it does that is by changing the way in which the rotor disc is pointing, so if you want to fly forward, you push forward on the cyclic, the rotor disc tilts forward, and the helicopter moves forward. If you keep pushing, and you don't do anything else with any other control, the helicopter will start to go down.

(CONVERSATION IN HELICOPTER)

COLIN HAGUE: Whenever you move one control in a helicopter, it affects the other three, so you're always moving one control, you're moving another control, but it's still a very particular technique which, when you start, you can't believe that you'll ever master.

PETE CUMMINGS: Students will always try and grip the cyclic very hard, and then they end up with a very stiff arm, and the key really is to take a relaxed grip and steer the helicopter with your fingertips.

V/O: Hours of practice have to go into perfecting the basic skills before they become second nature.

The naval version is designed specifically to land on the back of a frigate-sized ship, which is really quite small; that's quite a challenge because of course the deck is going up and down quite a lot, you need two things for a helicopter to do that: one is a great deal of manoeuvrability so it must be able to manoeuvre to match the ship at the moment of landing and take off; and the other is a reasonable excess of power so you can go up and down with the ship as well. It has a harpoon to hold you down after you've landed because actually that is the most difficult time for the aircraft, not the landing itself, it's after you've landed.

PETE CUMMINGS: What the helicopter brings to the air ambulance role is speed and flexibility. We can access areas that land ambulances couldn't get to, or could only get to with great difficulty, and we can move paramedics and patients, and quickly to the right hospital first time. We have had people who don't want to ride in a helicopter. A lot of the times, of course, they're not in a position to argue with us, but if they do then we take that into consideration because we don't want to bring along more problems than we're trying to solve by having a helicopter assist at the scene.