



Exercise 4

Effects of Controls

Aim

- To learn the effects of Helicopter Controls in **Forward Flight**

Airmanship

- Maintain a good Lookout throughout
- Fuel
- Radio
- Engine
- Direction
- Altitude



The Collective Lever



Controls Height and Power



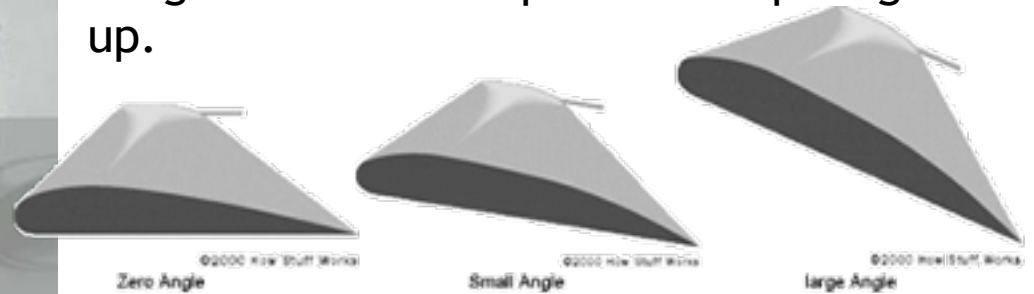
Lever Up
Increases the
'Pitch Angle' on
the Main Rotor
Blades
'Collectively' (al
together)...

The Collective Lever



Controls Height and Power

...creating more thrust to overcome the weight of the helicopter. Helicopter goes up.



A mechanical linkage between the Collective and the Engine increases power to stop the blades slowing down from the effect of drag, maintaining a constant Rotor and Engine RPM.



Lever DOWN
DECREASES the
'Pitch Angle' on
the Main Rotor
Blades
'Collectively' (al
together)...

The Collective Lever



Controls Height and Power

...reducing the amount of thrust
until weight overcomes the thrust.
Helicopter goes down.



A mechanical linkage between the
Collective and the Engine DECREASES
power to stop the blades SPEEDING UP,
maintaining a constant Rotor and
Engine RPM.

SUMMARY...



Raise Lever.
More Thrust.
Aircraft Up.

It is also possible to 'tilt' Main Rotor Thrust in different directions. More on this later.



The Throttle

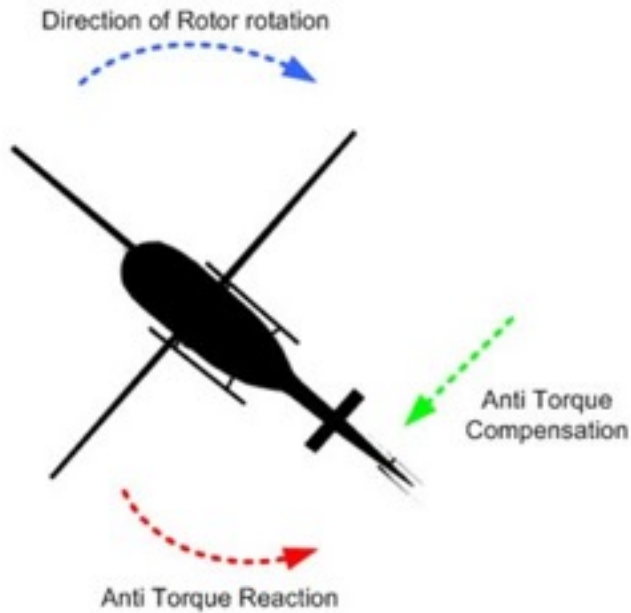
As previously mentioned a mechanical linkage between the collective and the engine increases or decreases power as necessary. This mechanical linkage is known as the **Correlator**.



The Throttle marked by the yellow arrow is manipulated by the pilot to change the RPM setting during start-up and shutdown

The **Correlator** is a little crude and can over or under compensate, so we have an electric motor known as a **Governor** to make tiny throttle movements during flight. This maintains the ERPM and RRPM in a very small band.

Collective Secondary Effects



When the collective is raised, air from above is Induced by the Main Rotor and forced down onto the Horizontal Stabilizer...

...the nose therefore 'itches up'.

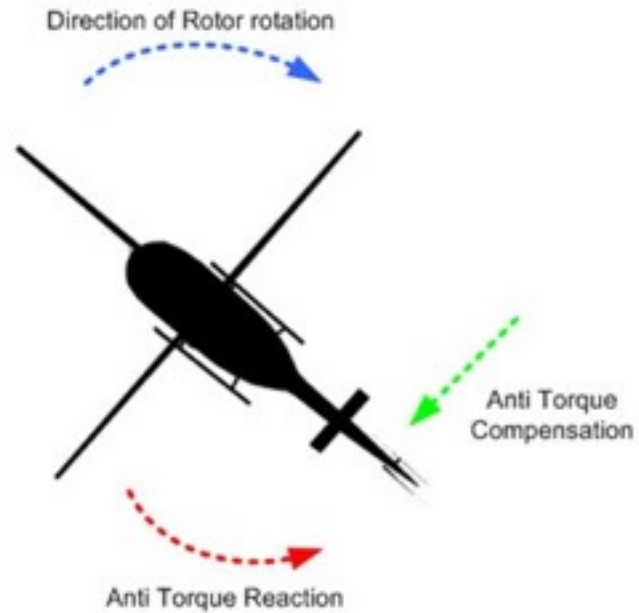


When the collective is lowered...

...the nose 'itches down'.



TORQUE REACTION



Torque Reaction is overcome by...

The Anti-torque or 'Yaw' Pedals.

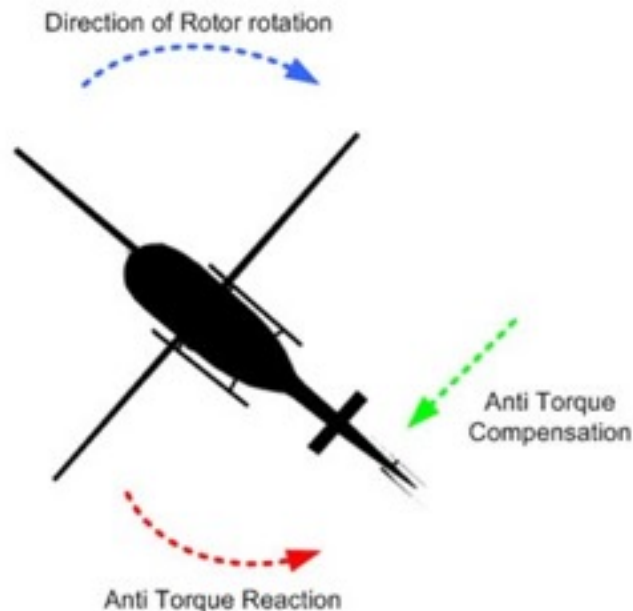


The Anti-torque or 'Yaw' Pedals counteract main rotor torque.

They do this by altering the 'Pitch Angle' on the Tail Rotor Blades, and therefore changing the amount of air moving through the Tail Rotor System.



When the Lever is raised, more LEFT Pedal is required, inducing more airflow through the Tail Rotor and Countering the Increased Main Rotor Torque.



Left Pedal makes the nose go left. Right Pedal makes the nose go right. You cannot apply both at the same time, i.e. if you apply left pedal the right pedal moves backwards.

The Cyclic Stick

It is extremely sensitive



And not self centering

Controls Speed and Direction

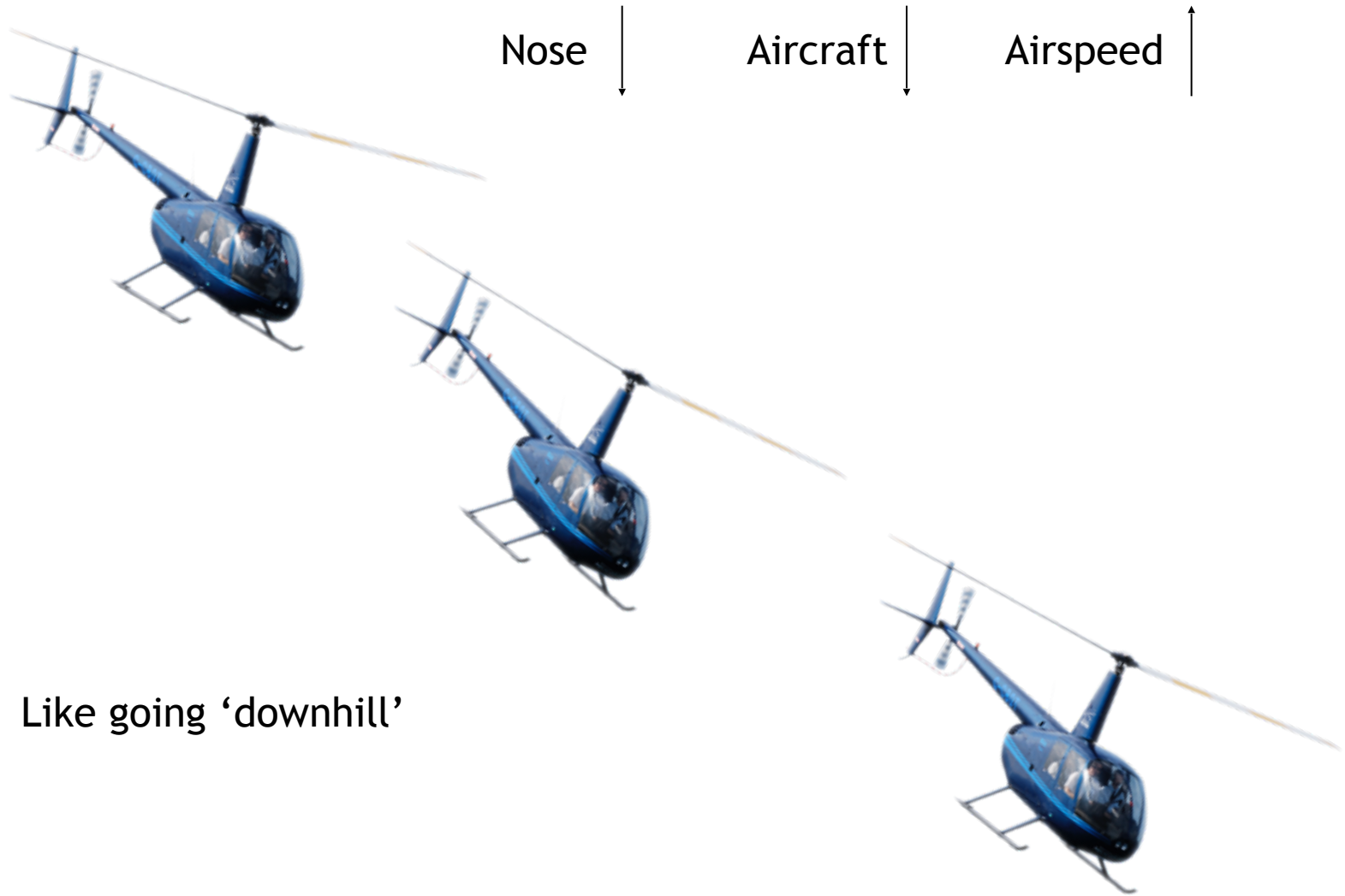


The Cyclic can move in any direction

And is used to point the Thrust (created by the main rotor) in the desired direction. Usually forwards, backwards, left, and right.



Let's first look at forward cyclic



Now backwards (which we refer to as rearward, or 'aft' cyclic.

Like going 'uphill'



Nose ↑ Aircraft ↑ Airspeed ↓

Left and Right Cyclic.



Cyclic ←

Bank ←

Turn ←



Cyclic →

Bank →

Turn →