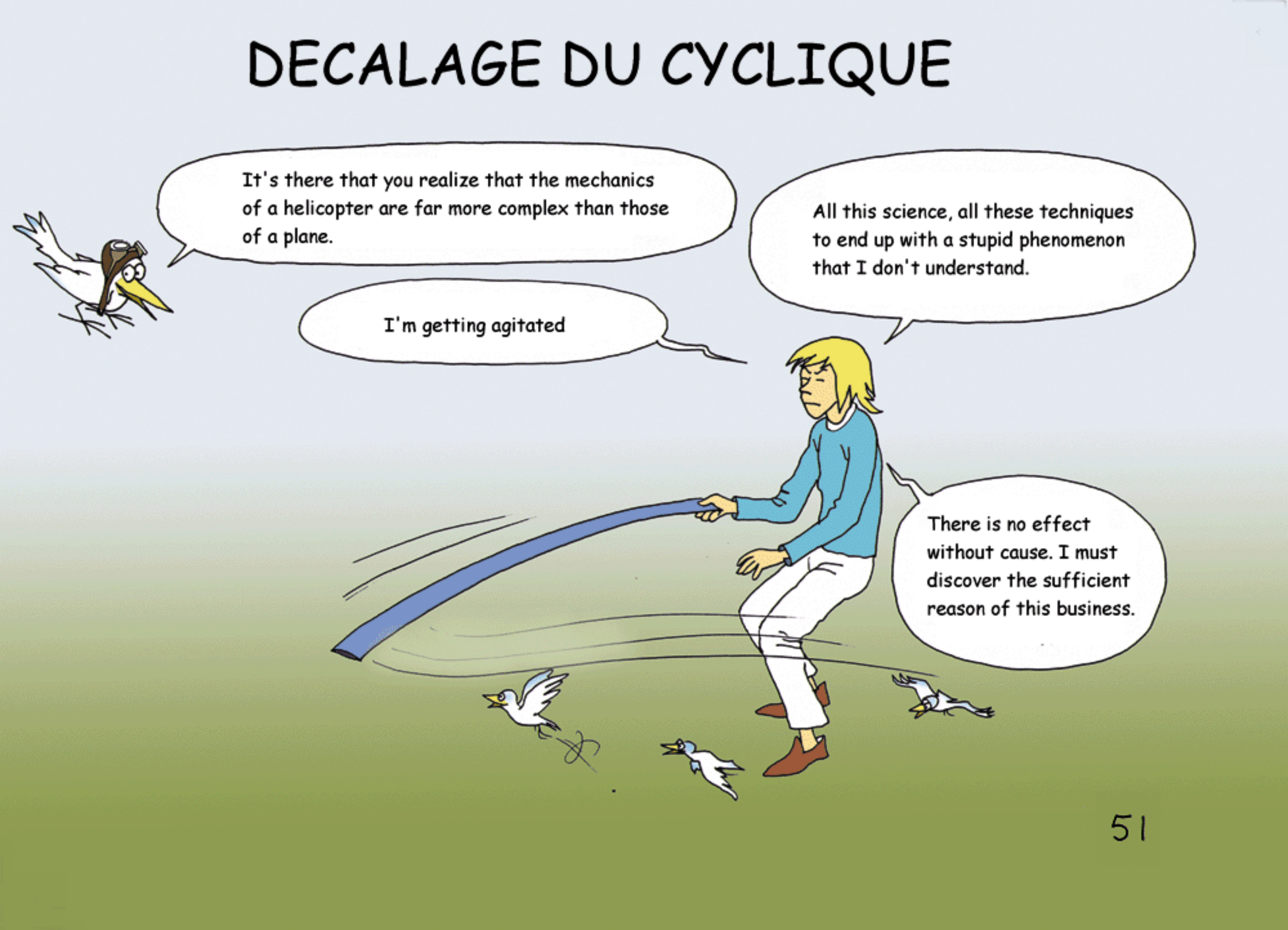


# DECALAGE DU CYCLIQUE



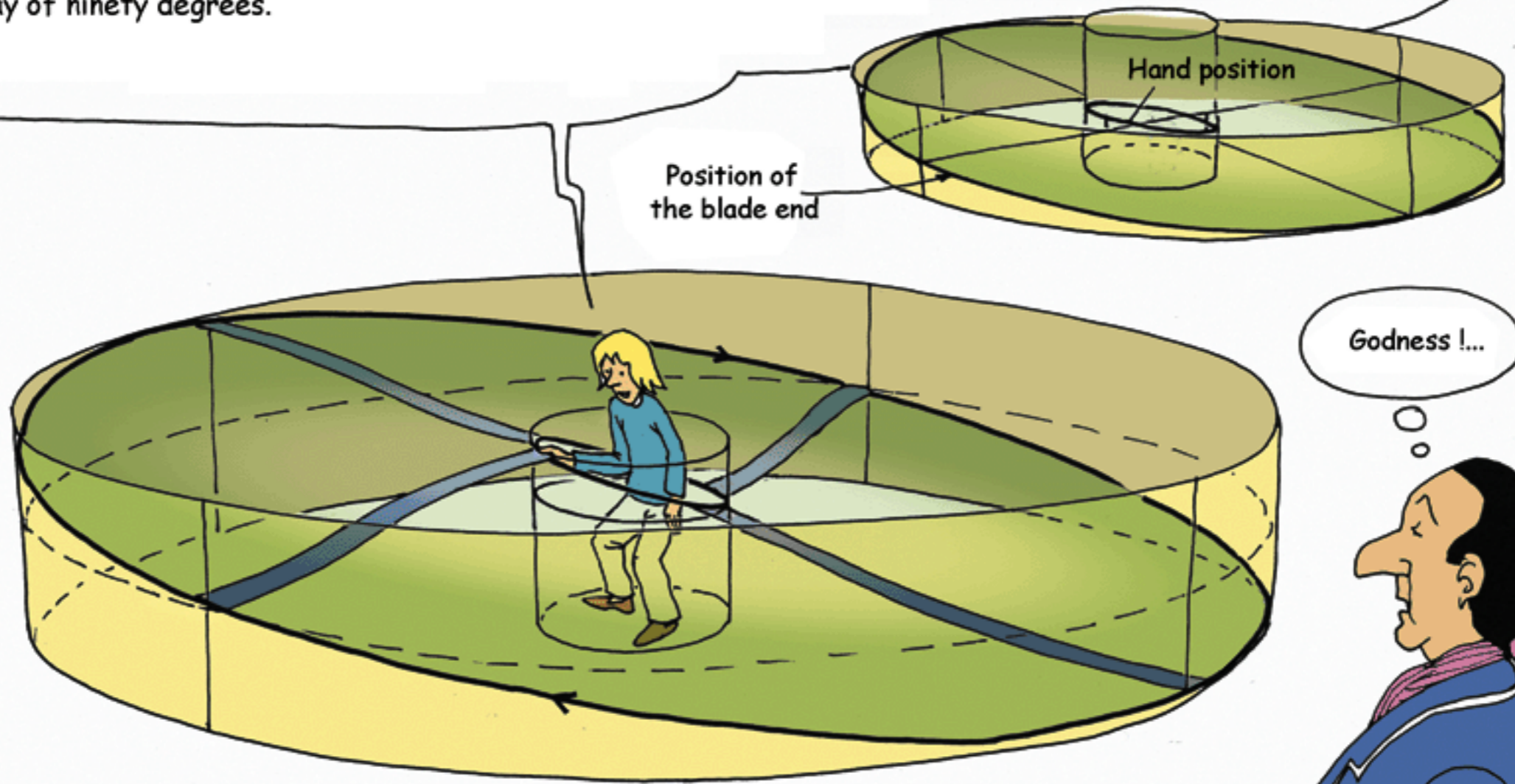
It's there that you realize that the mechanics of a helicopter are far more complex than those of a plane.

All this science, all these techniques to end up with a stupid phenomenon that I don't understand.

I'm getting agitated

There is no effect without cause. I must discover the sufficient reason of this business.

Pangloss, I think I've understood. When I move the blade downwards while turning on myself and making it that the oscillation period that I impose on the blade is the same as the period of rotation, because the combination of inertia and its elasticity, it follows the movement with a delay of ninety degrees.



Godness !...

In scientific terms it translates the behaviour of a second order system.

It seems to me that this sufficient, I admit, is beyond my understanding.

You'll understand Master thanks to this apparatus that we call an elastotron.

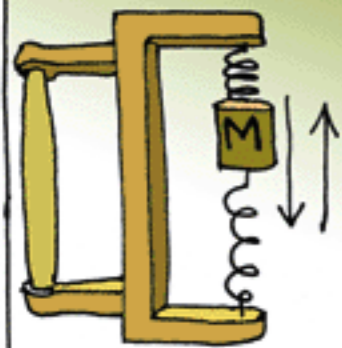
Don't bother looking for a practical use for this apparatus; its function is to explain the singular behaviour of the helicopter's blades.

I thought that we were in fluid mechanics.

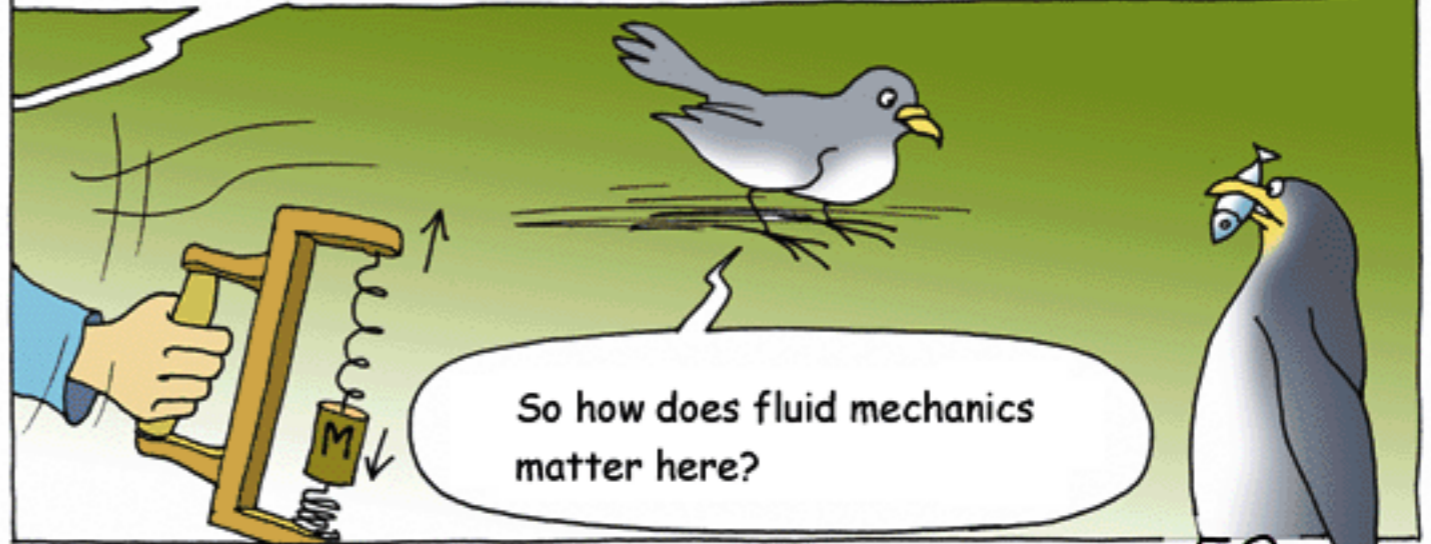
Let me explain: If I remove the mass  $M$  from its position in equilibrium, it will oscillate with a certain period which we call a **specific period to the system**.

If we make demands by shaking it from top to bottom with the same period  $T$ , the bob weight  $M$  will respond in "opposite synch"

So how does fluid mechanics matter here?



T

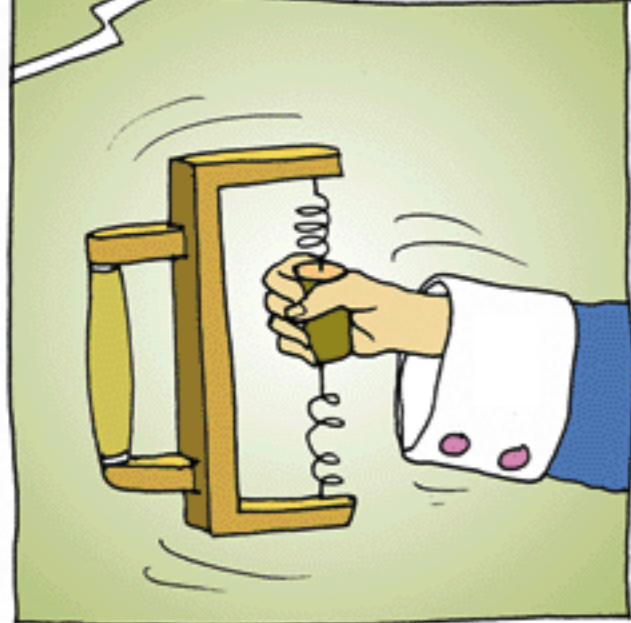


I'm sure you're a terrible swimmer



Let it drop, dear. We don't want to start an argument with this penguin. The book is complicated enough already.

The structure responds also ... in opposite synch

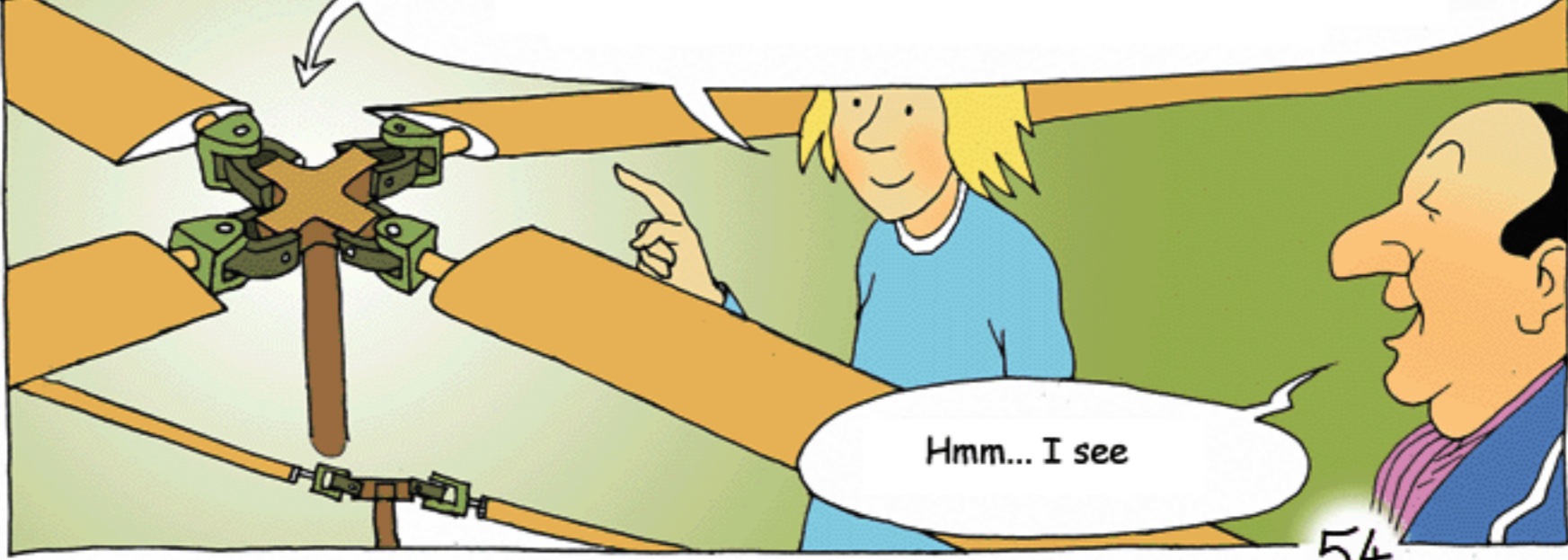


Take the elastrotron, not it's bob weight and shake it according to its system eigen mode T

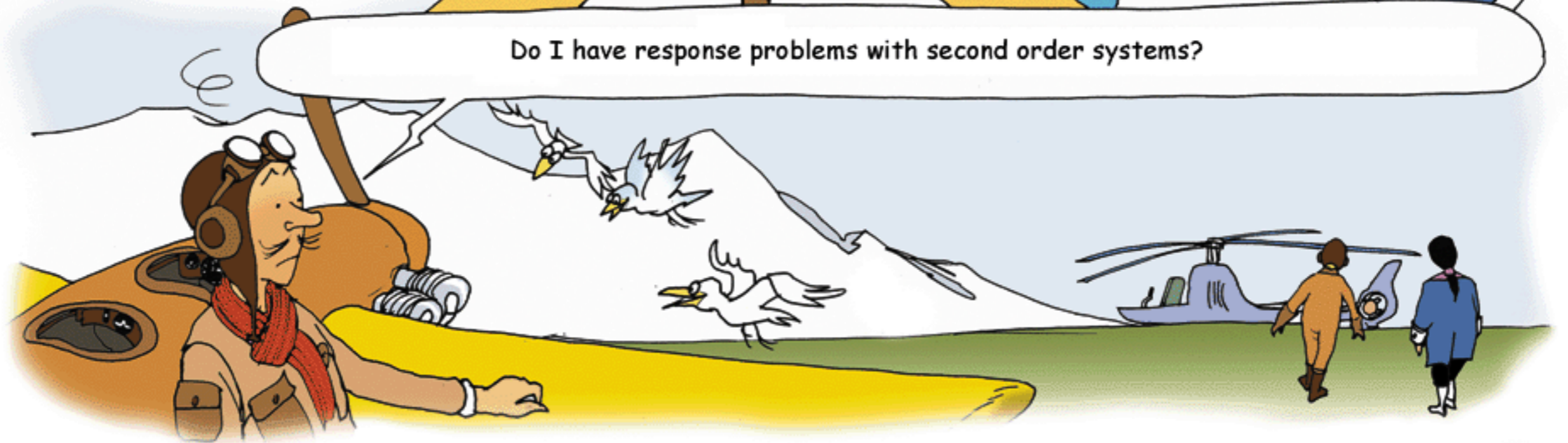
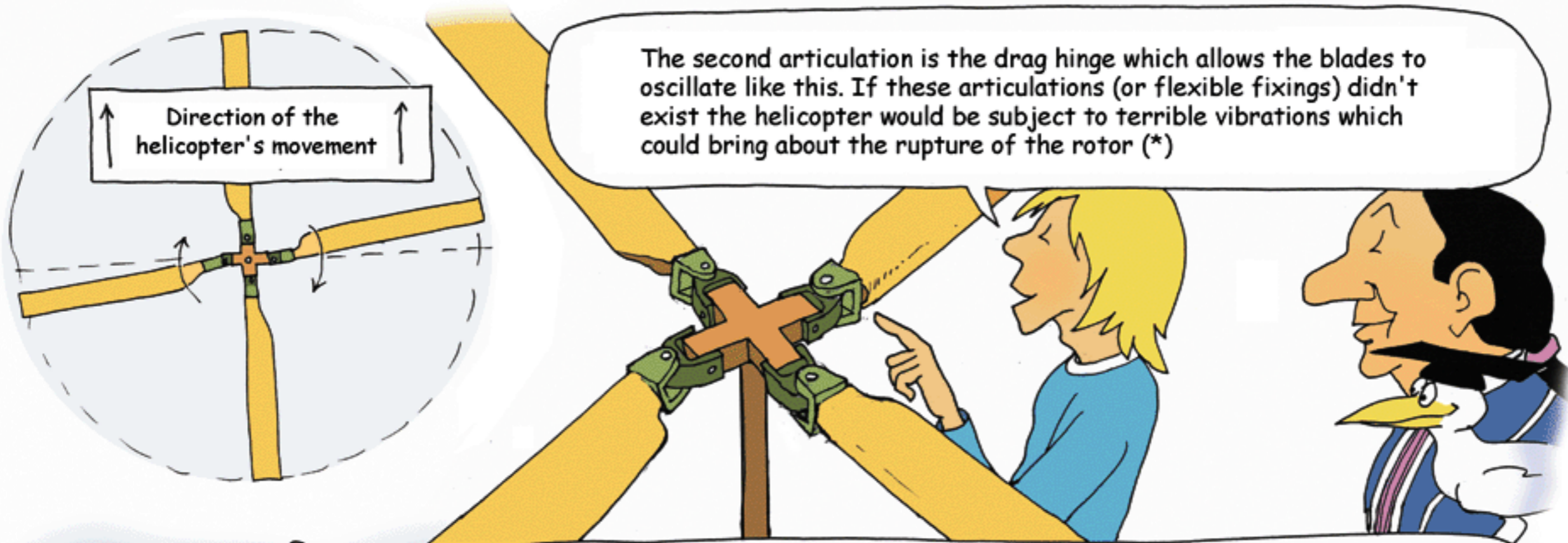


OK. I grab it like this and I shake it according to its ... eigen mode

Let's transpose to the helicopter. Previously, I shook the blades in phase with my rotation movement on myself. In flight, it's the blades that 'shake' the machine. That is why each one needs to have a flapping hinge.



Hmm... I see



(\*) Because of the problems he encountered during his experiments with his autogiro, the Spaniard de la Cierva had to hurriedly introduce a system of "articulated blades plus shock absorbers" or else his rotor would have broken.

