Come quickly, something's happening in the tower.

What is it now?

I think Cunegonde is smashing everything

Careful, you're walking on my train.

Why the devil do you wear such long things?

You don't understand anything about fashion my dear.

I **WANT** to marry Candide!

You'll do no such thing! My daughter will never marry a simple commoner

But Candide isn't a commoner, he is the son of one of your relations!

... and 80 hunters... or one of them at least

But father, the 80 hunters were all high-born

Hmmm... I think when it comes to diplomacy we aren't quite there yet.

In fact the aeroplane pilot wasn't wrong to want to nose up his machine. The best thing would be to change his tractive propellor into a system of lift. Then, while we're at it, we might as well remove the wings completely.

Well professor, what do you think of that?

You can take the ladder away, I'm going to give it full throttle

WROAAR

NOTHING !?!

Don't hurt yourself. I'll bring the ladder back.

Hmm ...

Wings can also be used for flying ?!?

Come and look

What is induced speed anyway ?

Listen to what he's telling you

Is it true that we're going to be equipped with propellors?

Eh?

Fly? Ridiculous!

Can that thing fly backwards?

If I shorten the wings of an Albatross it won't be able to take off. And if I make penguins' wings longer...

Huh?

Get off me immediately!

Maybe my "penguin" has "wings" that are too short. I can't continue to increase the power of the motor indefinitely so as to increase propellor speed yet lift increases as a square of speed. The solution is to increase the lift surface while keeping the length. An albatross flies better than a pigeon. So I'm going to lengthen the propellor blades. I'll call it a **ROTOR**

IAARHH!!

TORQUE

I could also increase the number of blades (*)

I've checked: with a motor of this power and this rotor, the machine can take off.

This time it should work. Contact!

I took off Pangloss, I took off but my machine with its rotating sails started to turn itself in the opposite direction to the rotor.

!?!?

Oh dear!...

What a terrible experience Master. I had the impression that my brain was revolving inside my head !

(*) but all the following applies to 2,3,4,5,6,7,8...blades

Let's try with this model

Here is an autostable helicopter equipped with two counter-rotating rotors, one of which is fixed to the rotating fuselage

Sheet of thin card
Free moving rudder

ball bearings
washers

piano string, 5/10° steel

square balsa rods 6x6

Elastic

2 square balsa rods, 3x3

+ washers

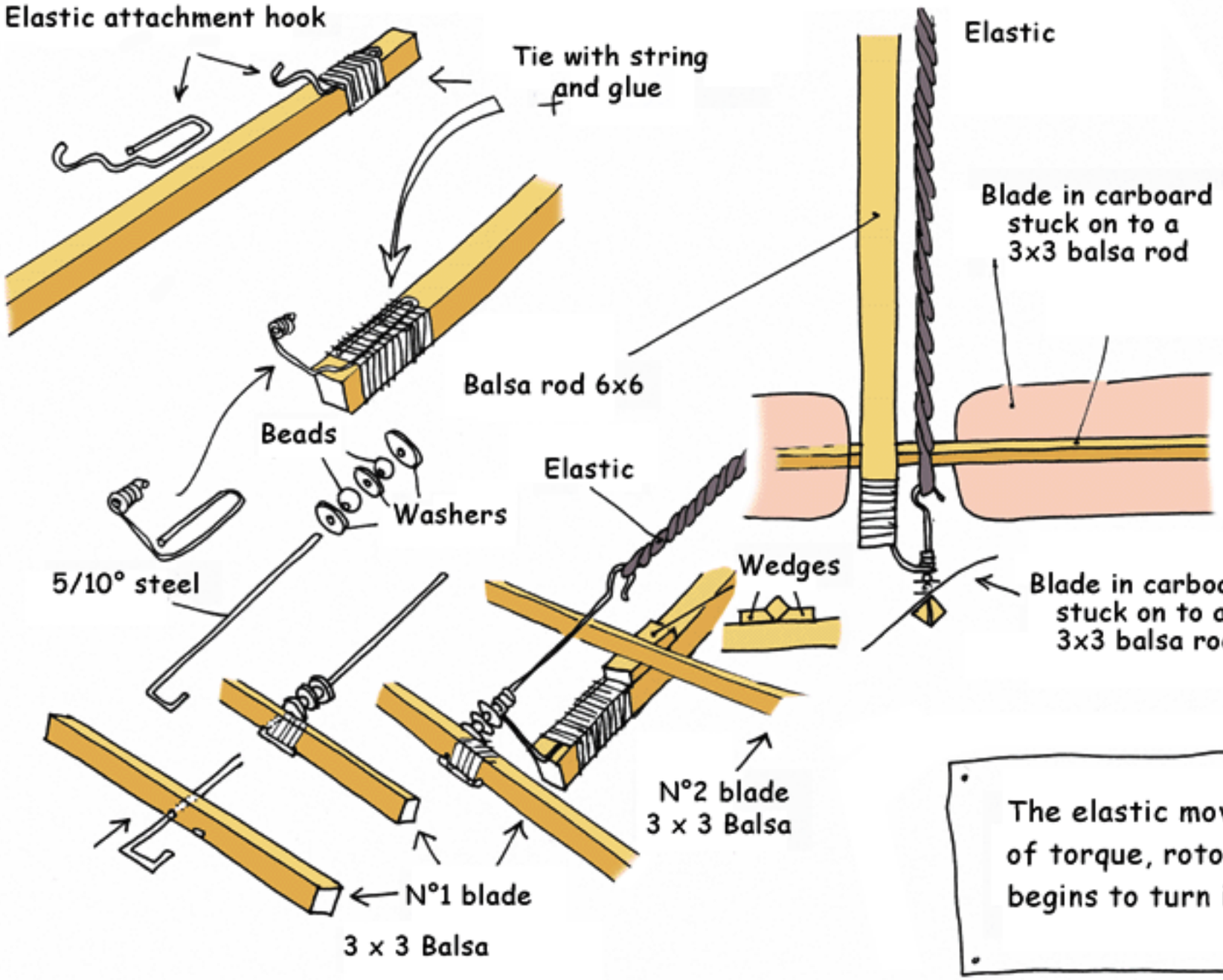
beads

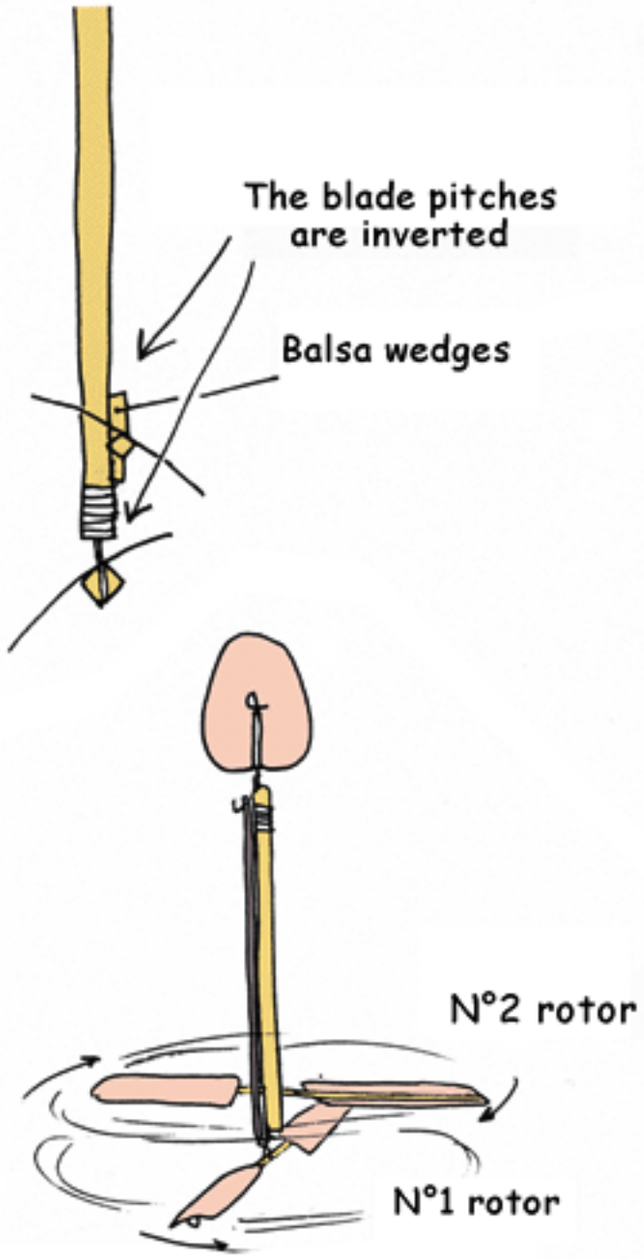
4 blades in thin cardboard

String

Glue

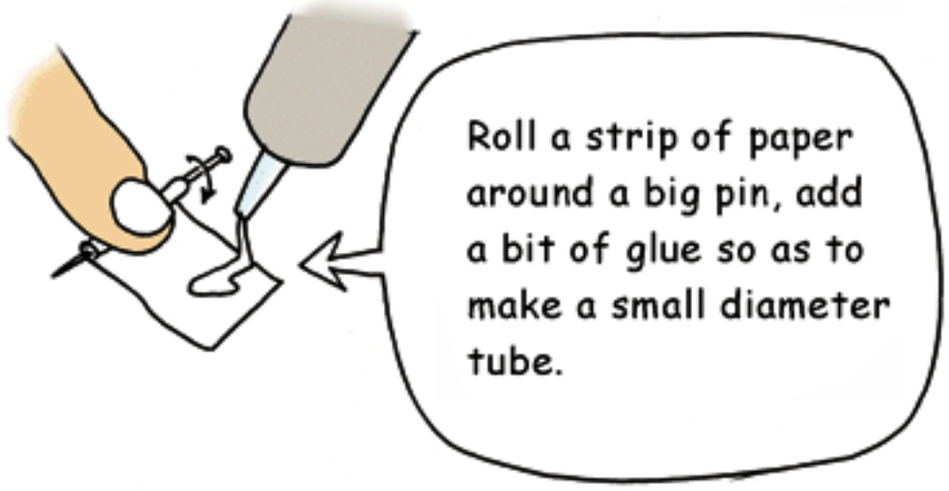
The difficult part is bending the piano string.
Use TWO pairs of pliers to make the following elements:



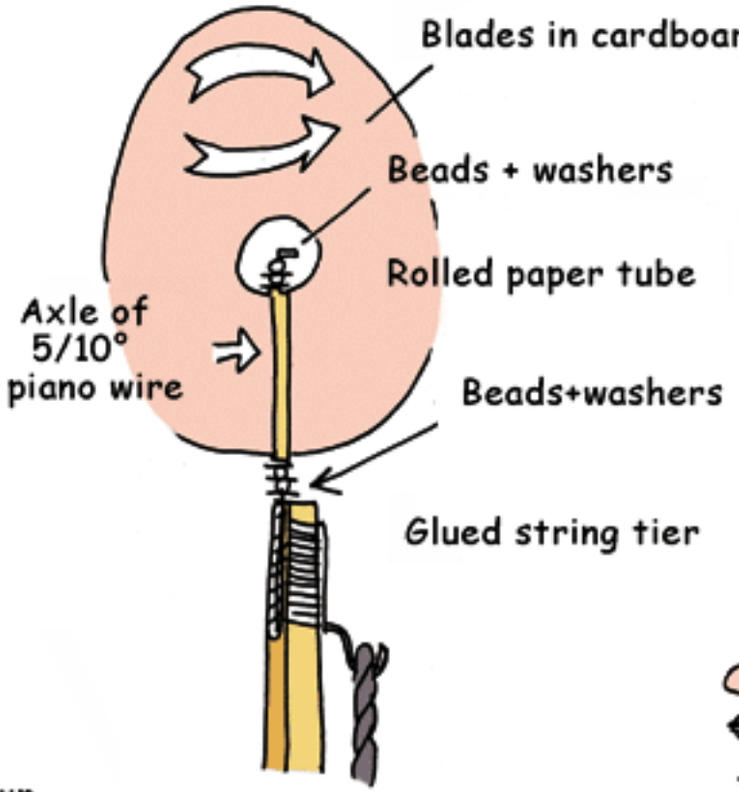


The elastic moves the lower rotor, n°1. Because of torque, rotor n°2, fixed to the rod-fuselage, begins to turn in the opposite direction.

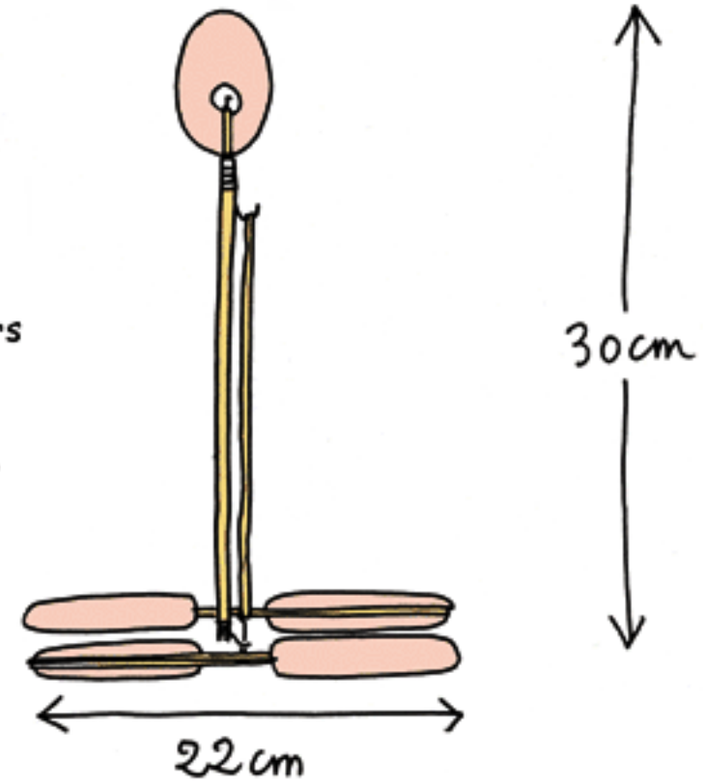
Construction of the upper blade which makes the machine autostable



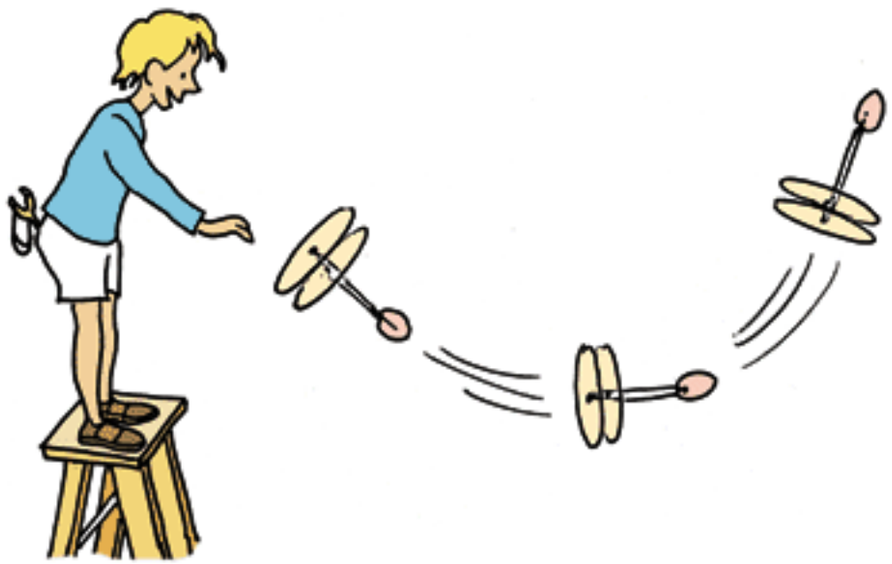
Roll a strip of paper around a big pin, add a bit of glue so as to make a small diameter tube.

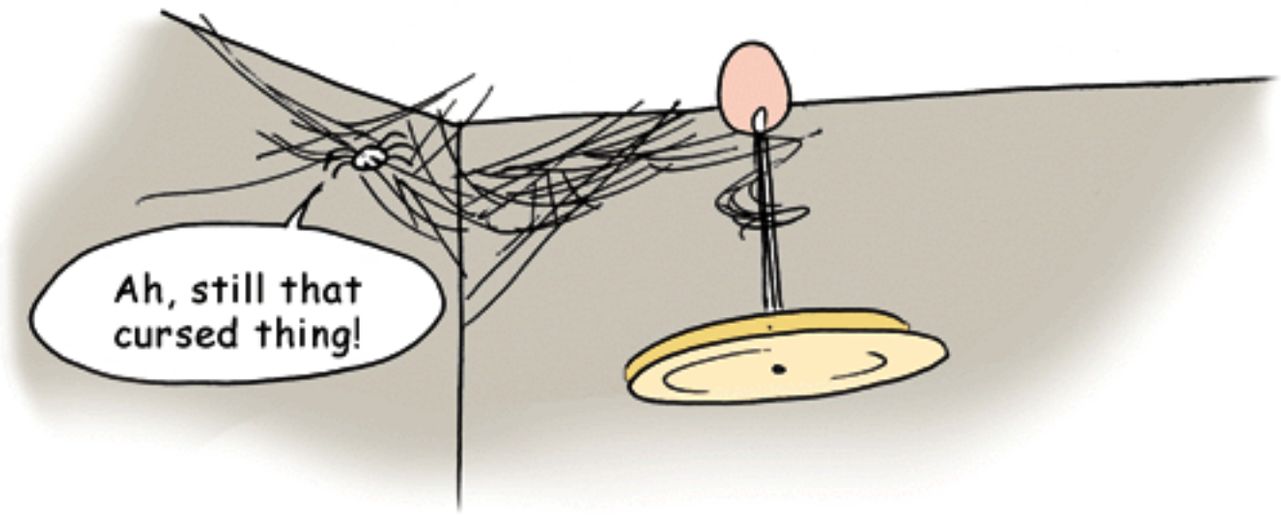


Proportions



When the helicopter tilts it goes off to the side. The effort of the upper blade straightens it immediately. Left on its own, it goes up swaying from side to side (*)





(*) When I was a child I used this to get rid of the spiders' webs on the ceiling of the Château de Thiors, in the Deux-Sevres (France).

No, it's stupid. We aren't going to sit in a cabin that revolves.

Candide thought about various solutions.

Two counter-rotating rotors, invented by the Frenchman Launay and made known by the Russian Kamov.

Lateral rotors

invented by the Englishman Cayley, continued by the German Focke

Tandem rotors

invented by the Frenchman Cornu, developed by Piasecki

Cogged rotors

by the German Fletner, developed by Kaman.

Ejection of gaz at the extremity of the blades

"Djinn"

The Frenchman Morain

Yves le Bec has written a book illustrated with fine drawings entitled « la véritable histoire de l'hélicoptère, de 1486 à 2005", published by Les Editions Jean Ducret S.A. CH-1022 Chavannes-près-Renens. ISBN 2-8399 -0100-5. In it you'll find all the types of helicopter imagined by man.

I'm going to put an anti-torque rotor and the end of a tail. By coupling it mechanically to the main rotor it should work. When I increase motor speed, the tail rotor will follow it and torque compensation will be automatic.

Come back immediately, if not you'll be cut up in a million pieces.

The « Fenestron » (*)

By putting a multiblade propellor inside a carenage, it's efficiency is increased and NOISE is reduced.

Pangloss, I've done it!

The antitorque tail rotor was invented by the Russian Yuriev and developed by Sikorsky.

(*) The "fenestron" was introduced by the Frenchman Mouille.

This shows that all is for the best in the best of all aeronautics.