Martin Sodomka

How to build a plane

TECHNICAL FAIRY TALES EDITION

'Well, here we are, autumn again. Look, your mates are all flying off to warmer climes. How come that you're not flying off anywhere, Bill?'

'They're not my mates, and anyway, we sparrows don't fly anywhere.'

'So, let's build ourselves a plane and next year we can all fly off,' said Arnie.

Bill the sparrow and Arnie the rat were the best of friends. Last year they managed to do something incredible: they succeeded in building a car all under their own steam. So they definitely weren't nincompoops.

'If Christian flies with us too, then we should make a bomber right from the start.'

Christian was the third member of the gang, who ran a scrapyard on the edge of town and was able to track down absolutely anything - almost.

'That was nearly funny Bill. Are you all right? You seem a bit down in the dumps.'

'No, not at all, it doesn't matter. Enough said - let's go! I've still got a lot of work to do today.'

‘I couldn’t get off to sleep at all last night, Bill. Why couldn’t we build a plane though?’

‘Doesn’t it strike you as a bit odd, Arnie, a bird building a plane?’

‘I suppose, just as odd as when we built a car together.’

‘Ah, but that was something different. I know all about cars. I enjoyed that, but I know nothing about planes,’ said Bill.

‘How come? You can fly yourself, can’t you?’

‘Yeah? Well, it’s the same as if I said to you that we’ll build a running machine, when you know how to run, don’t you? Simply, I can fly. It comes to me naturally and I don’t even think about it.’

‘Careful, running isn’t my forte. To be more precise, you should say limping machine,’ replied Arnie, who had had a limp since he was a child. Before it had given him a lot of problems, but recently he hadn’t had to worry about it.

‘Well?’ he asked. ‘Forget it?’

‘We’ll see. I might consider it,’ said Bill, closing the discussion.

‘Hi Christian! Listen, would it be possible to track down some parts for an aeroplane in your rubbish heap?’

‘Well, that would pose a problem, mate. There aren’t many planes lying about here. We might be able to get an engine together though. I’ve also got some aluminium sheet and steel rope, but as far as I know, planes are made of plywood, timber structural members, and canvas. Why do you ask? Do you want to build a plane with Bill?’

‘I don’t know; possibly.’

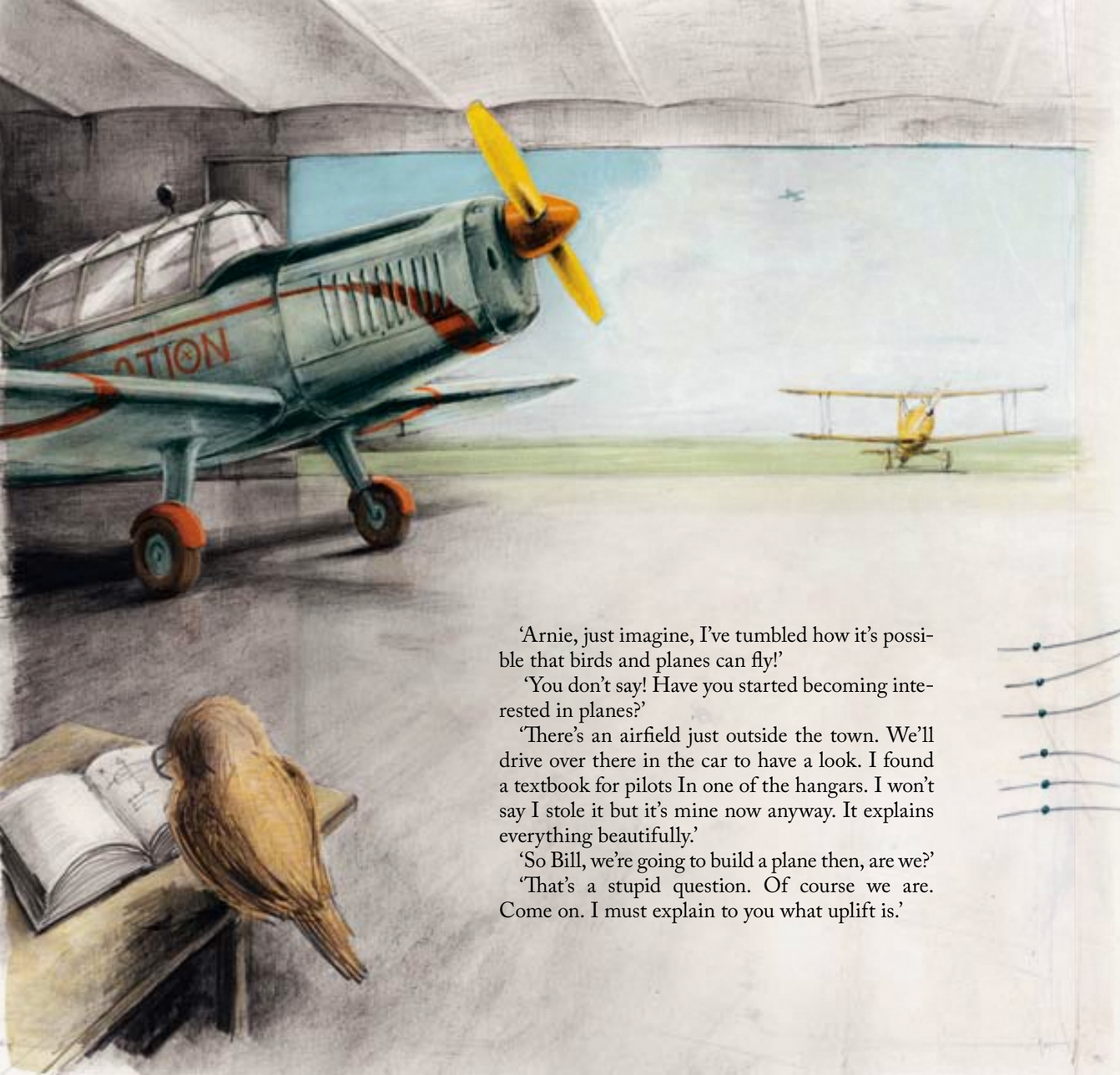
‘Look Arnie, of course I’ll help you, but let’s get one thing straight – if you manage to build a plane, then I’ll never, do you hear, never, get into it!’

‘Why not? I thought that next year in the winter we’d be able to fly off to warmer climes. After half a year we’d all come back, beautifully tanned to dark grey or dark green...’

‘You two are mad. With you anything is possible – but definitely count me out.’

‘That’s a pity. Well, it doesn’t matter. All the best. Oh yeah, and Christian, don’t get started on anything just yet. Bill is still undecided and I don’t know if we’ll even get started at all.’

‘If I know Bill, he’s a scientist and he won’t pass up such an opportunity. I won’t wait for anything. I’ll cast around among the people I know and get cracking on it.’



‘Arnie, just imagine, I’ve tumbled how it’s possible that birds and planes can fly!’

‘You don’t say! Have you started becoming interested in planes?’

‘There’s an airfield just outside the town. We’ll drive over there in the car to have a look. I found a textbook for pilots In one of the hangars. I won’t say I stole it but it’s mine now anyway. It explains everything beautifully.’

‘So Bill, we’re going to build a plane then, are we?’

‘That’s a stupid question. Of course we are. Come on. I must explain to you what uplift is.’

‘Do you know the saying “Still waters run deep”?’ Bill began.

‘You mean when quiet people eventually take you by surprise?’

‘Well, yes that too perhaps. But mainly it’s about how the quicker that water flows, then the less it presses it against its banks. And when it nearly doesn’t flow at all – i.e. still – then it pushes against its banks a lot and might even cause erosion. The same applies to air.’

‘So I can say “still air runs deep” – that’s good!’

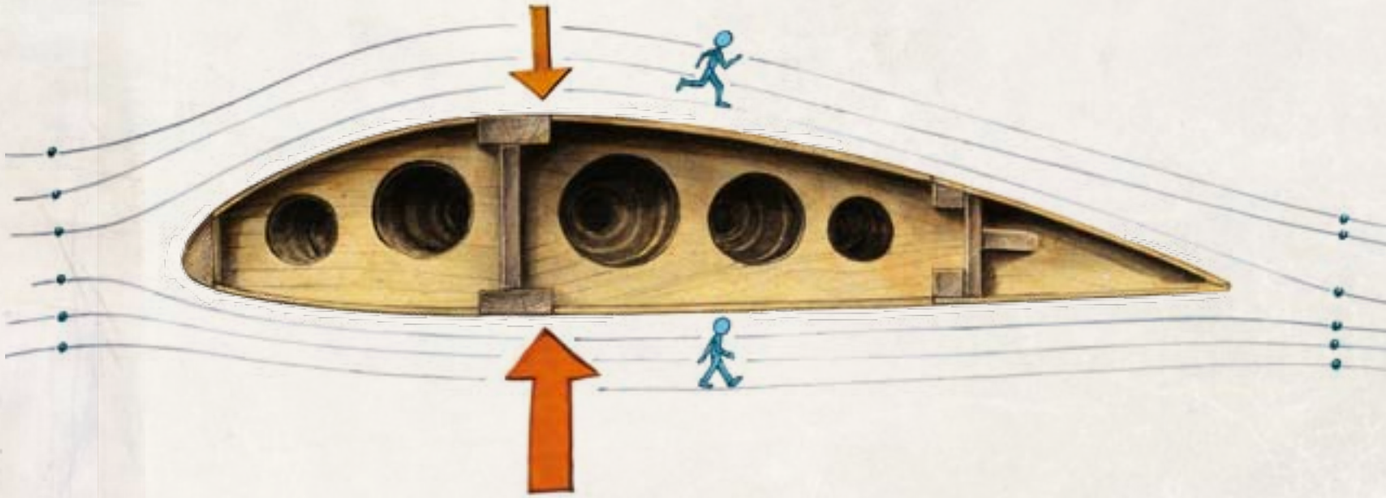
‘No, that’s rubbish, but go ahead and say it if you like. Anyway, listen again. When you cut a wing in half, it’s shaped like a kind of elongated drop, flattened on the bottom. That’s called the profile. The plane flies and the air flows around the wing. The air that flows over the wing has to travel a greater distance than the air under the wing. And in order to meet up with its air colleague under the wing, it has to flow more quickly. And that’s that – get it?’

UPLIFT

‘Get what?’

‘Well, what – the fast air on top pushes less against the wing than the slower air beneath. The result is then a force which pushes against the wing upwards – that’s the uplift! Thanks to that we can fly!’

‘That’s all right then, and when are we going to start building?’



'I'm glad we used ash in the end for the centre of the fuselage. If something has to be really strong, then it is precisely this part. The upper wing struts are mounted here, as well as the lower wing and undercarriage. Oh, yes, and the seats,' said Bill.

'When can we start covering it?' asked Arnie.

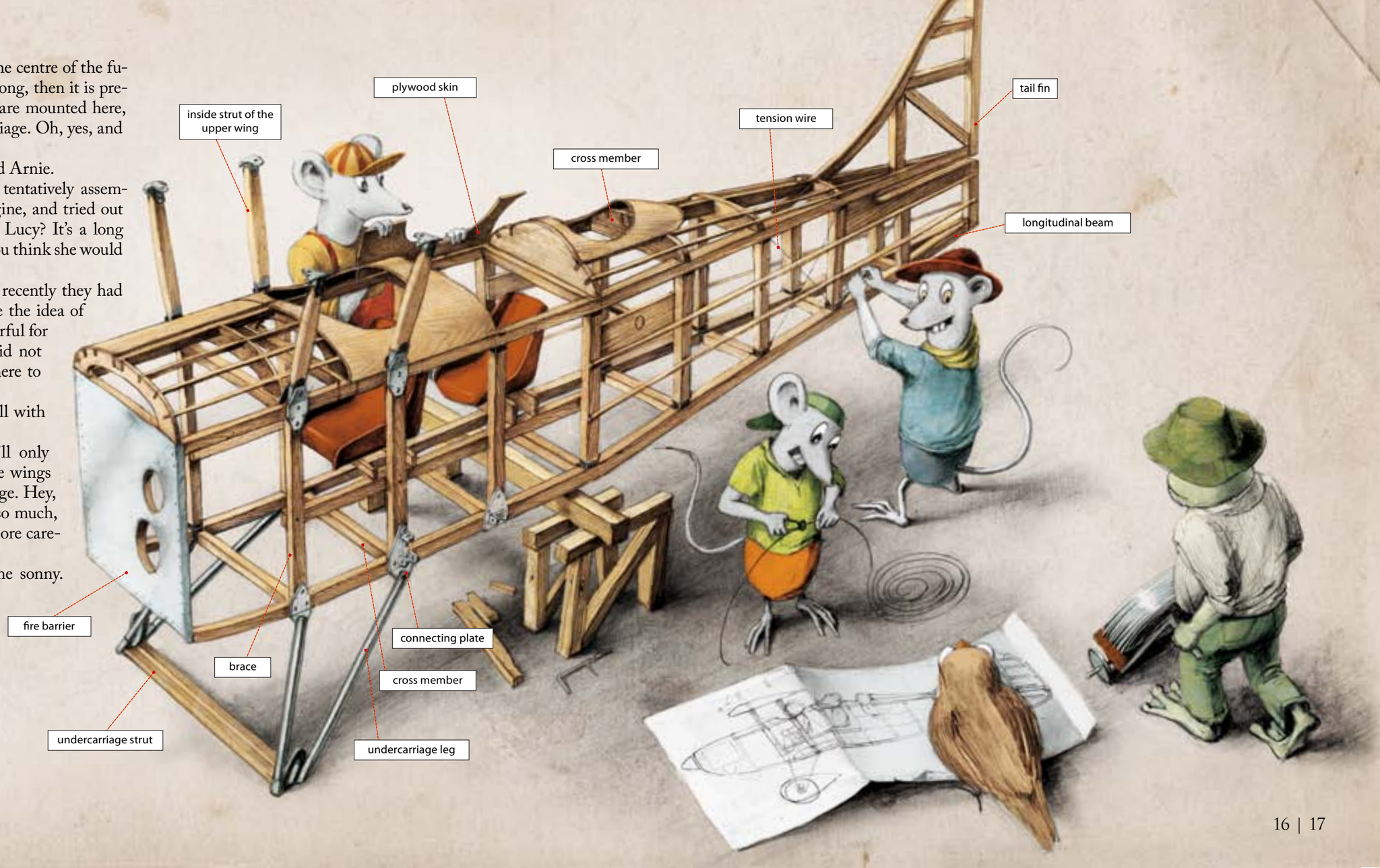
'There's no rush for that until we've tentatively assembled the whole plane, mounted the engine, and tried out the controls. By the way Arnie, how's Lucy? It's a long time since I last saw her with you. Do you think she would help us with the canvas covering?'

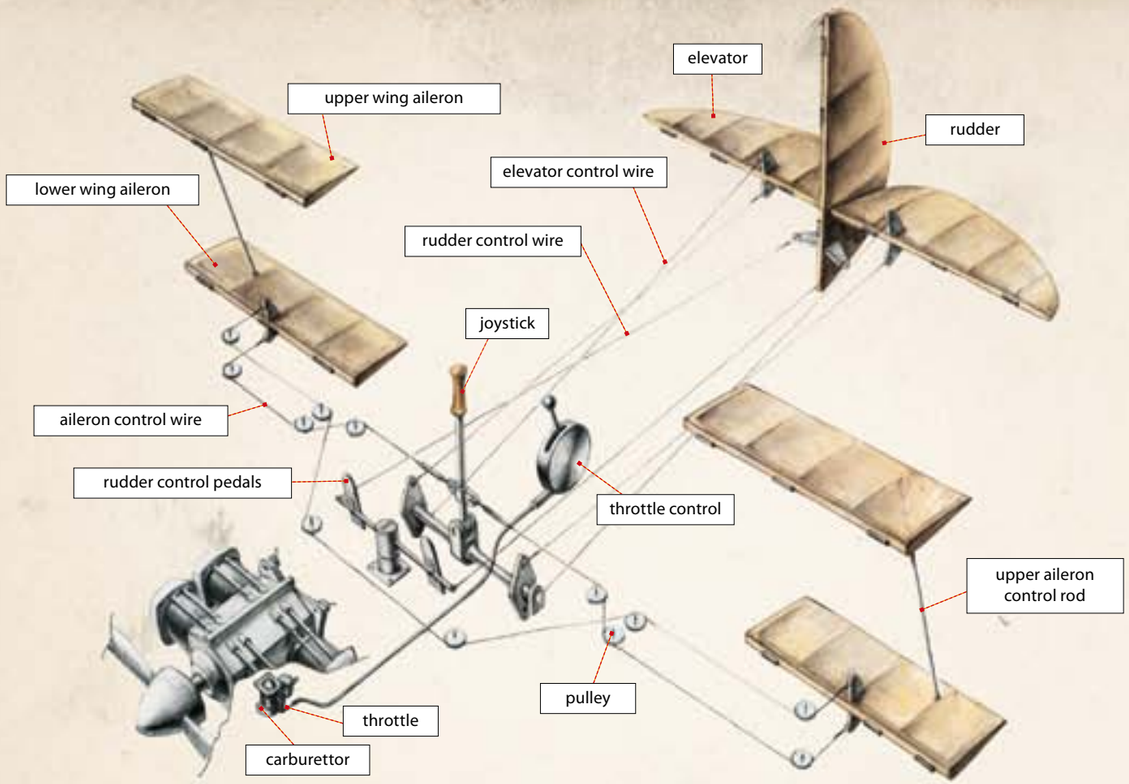
Lucy was Arnie's girlfriend, but just recently they had had a little tiff, since Lucy did not like the idea of building an aeroplane at all. She was fearful for Arnie, and on top of that, she still did not know about the plan to fly off somewhere to warmer climes.

'Possibly, and what if we covered it all with plywood?' said Arnie.

'No, that would be too heavy. We'll only put plywood on the leading part of the wings and the most stressed part of the fuselage. Hey, Fred! Careful! Don't tighten that wire so much, or it will start to distort. You must be more careful with it, sonny!'

'Arnie!' protested Fred. 'He called me sonny. Can I throw something at him?'





'Handling a plane isn't as simple as driving a car,' began Bill. 'With a plane you are moving about in a three-dimensional space. When you want to turn, for instance, to the left, then you move the joystick a little to the left and the plane will bank to the left. At the same time you put your foot lightly on the left pedal moving the rudder slightly to the left, all the while pulling the joystick a bit towards you raising the elevator so that the plane does not start to fall. You must do all these operations more or less simultaneously. Gradually you will learn and it will become as natural as when you ride a bike. You know how to ride a bike surely, or don't you?'

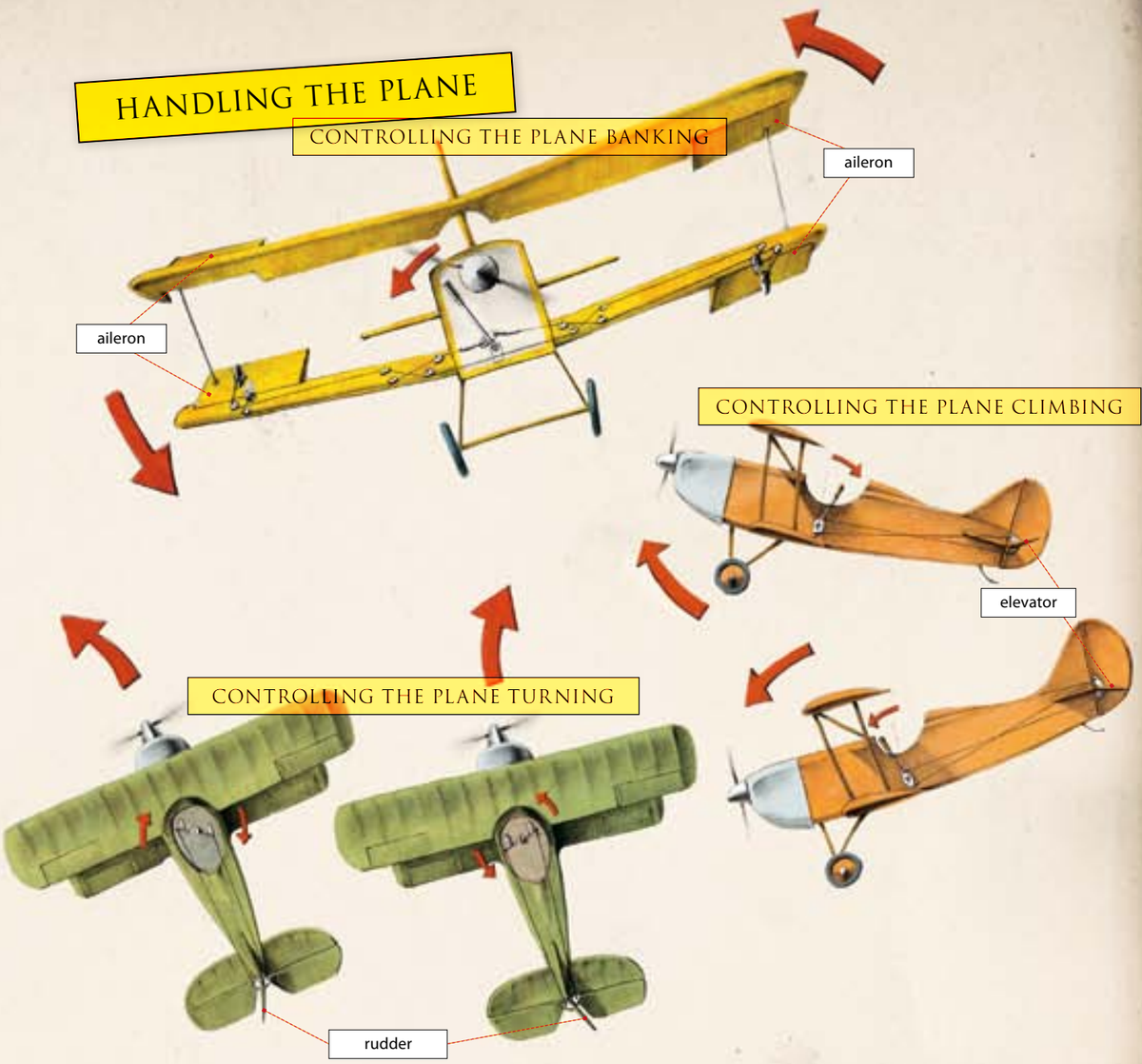
Arnie looked at the ground and muttered something.

'The main thing is, no rash moves,' Bill went on, 'or you will go into a tailspin and that, at a low altitude, would be the end.'

'I'm pleased to hear that,' said Arnie. 'In passing, Bill, some time ago I said that I would no longer comment on your different names but, I'm sorry, joystick is truly an awful word.'

'Go ahead and rename it,' said Bill.

'There's no time for nonsense; tomorrow we're starting the covering.'



‘Hello seamstresses! How’s it going then?’

‘Well, I never! Hi Lucy! Pleased to see you again! It’s good that you’re not cross with Arnie any more,’ said Bill welcoming Arnie’s girlfriend cheerfully.

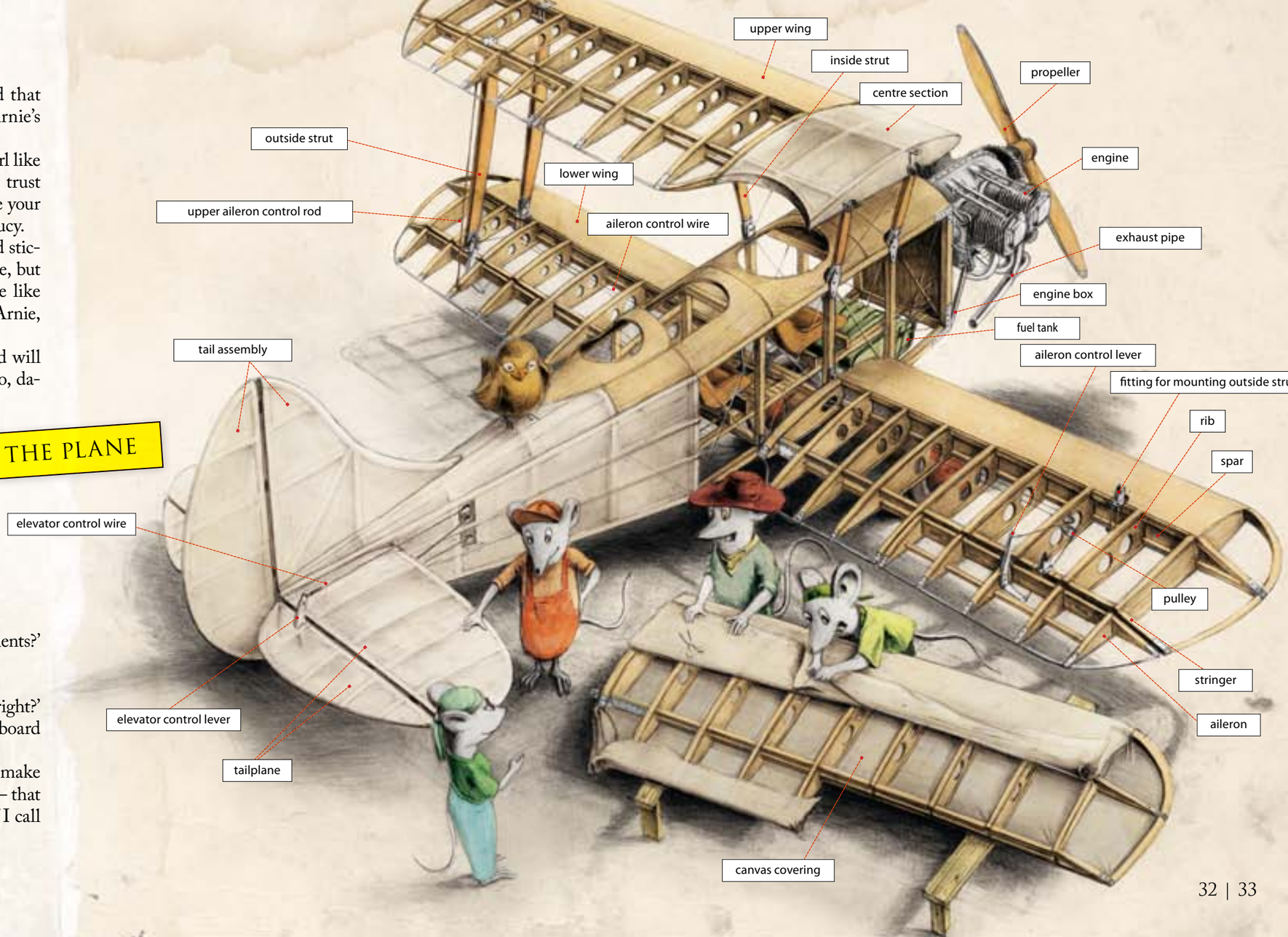
‘Don’t think that I agree with all this but what could a poor girl like me do? I’d grown tired of staying at home in a sulk. I have to trust that you have good sense and know what you’re doing. Show me your masterpiece. Well, I must admit it doesn’t look at all bad,’ said Lucy.

‘We’re covering it just now. Look, we’re cutting the canvas and sticking it to the frame with an adhesive varnish. It’s a bit loose here, but later we’ll coat it with a special varnish and the canvas will be like a drum skin. See how good it looks here on the elevator,’ said Arnie, starting to hold forth enthusiastically.

‘Although I don’t know what an elevator is, I know that Fred will definitely cut something off with those scissors. Let me have a go, dabblers,’ said Lucy, getting started on the work.

AEROPLANE CLOCK

COVERING THE PLANE



‘Titch, have you spoken to your uncle yet about those instruments?’ asked Bill.

‘Yes, of course. He’s already working on them,’ replied Titch.

‘And do you think, as a former watchmaker, he’ll manage it all right?’

‘My uncle? Yes, no problem. He’s already made the control board clock.’

‘Well, that’s put my mind at rest,’ said Bill. ‘He doesn’t have to make a rev counter - we got that from old Puškvorec. Nor a fuel gauge – that will be the same as in the car. Listen Titch, will it be all right if I call in at your uncle’s tomorrow?’

‘Yep, no problem.’

ALTIMETER

Shows the height above sea level, which is generally given in feet. The big hand displays feet in hundreds and the little one feet in thousands. A hatched panel is displayed when the altitude is over 10,000 feet. The instrument illustrated therefore is registering an altitude of 10,140 feet. Before each take-off the pilot must know the current atmospheric pressure and set it on the altimeter.

setting the atmospheric pressure (in the example the instrument is set at 1010 mbar = 29.9 Hg

'Here we have the altimeter. It is actually a barometer that measures the air pressure. The higher the altitude the plane is, the lower the pressure is. The reading is then converted to metres or feet.'

'You keep talking about pressure but I never feel any pressure anywhere,' objected Arnie.

'Well, so now I'm going to perhaps surprise you,' replied Bill, 'since the world tends to be in fact often different to what we think. Imagine a one metre by one metre square drawn on the ground and above that square all the air up to outer space, that's about one hundred kilometres. How much would you say the air above that square weighs?'

'I don't know, about fifteen kilos?'

'No, you're miles out – ten tonnes, when it's fine. To give you an idea, that's about eight saloon cars on top of each other.'

'Well, I'm blowed! I can see that our earth isn't for any softies. And I also see why I'm so worn out every evening. And how is it possible that we can survive here at all?'

'Pressure is spread out in all directions; you even have it inside your body. Somehow it is all evened out. Fish that live six kilometres under water don't complain about anything either, but you wouldn't last down there alive even for one second,' said Bill.

'Do you know all about zoology too then?'

At this point Fred entered the debate: 'The science which is concerned with something that reduces you to a pulp is not zoology but physics.'

ARTIFICIAL HORIZON

Shows the plane's present attitude relative to the horizon. It helps the pilot find his bearings in space in the event of the plane's unexpectedly flying into a cloud or heavy rain, when it is not possible to determine the attitude from looking at the earth's real horizon.

AIR SPEED INDICATOR

Show's the aeroplane's speed relative to the surrounding air. This speed is different to the speed relative to the ground because we have to take the wind's speed into account. The red area denotes the maximum structural speed that the pilot is not permitted to exceed, otherwise it could result in damage to the machinery. Our plane's cruising speed is 100 knots, which is roughly 185 kph.

FLIGHT INSTRUMENTS

COMPASS

Shows the direction of the plane's axis, that is the plane's present course. The compass uses a magnetic needle and that produces many inaccuracies that the pilot has to allow for.

VERTICAL SPEED INDICATOR

The hand of this instrument shows how the plane's speed falls or climbs. If the hand is at zero it means that the plane is flying horizontally. The units of the indicator are in 1000 feet per minute.

TURN AND BANK INDICATOR

The position of the plane in the instrument shows the plane's bank relative to the ground. If the red ball in the curve is between the lines it means that the pilot is flying correctly through the turn (the correct tilt of the plane and the correct position of the rudder).

‘Let’s go for it. We’ll try moving along the aerodrome for a bit - I should say correctly taxiing.’ Can you hear me all right with those headphones?’

‘Yes,’ yelled Arnie.

‘So now we’ll go up to the end of the field; take-off is on principle against the wind. Turn it round slowly... Right, and now, now give it full throttle. It’s a racket isn’t it. Can you hear me?’

‘Yeah.’

‘Right, now it’s rocking, now it’s going..., the rear end’s up already, a bit longer... Right and slowly pull on the joystick, just lightly... and... we’re flying, we’re flying!’

‘Bill, mate, we’re flying!’

WINDSOCK

For determining the wind’s direction and partly also its strength.

TEST FLIGHT

'Well, I thought we could soon plan out a route. We could set off in September - it still isn't too cold and the weather's usually quite calm,' said Bill.

'Just a minute,' protested Arnie, 'what kind of planning do you mean? We don't need any roads and we've got a compass. We'll just point the plane's nose towards the south and off we go!'

'Oh, yes, after a couple of weeks' flying, old Arnie has sprouted wings and now, as a result, he's not afraid of anything.'

'You're telling me that? Take a look at yourself and then say who sprouted wings.'

'I'm also in favour of everything being properly planned, especially where we will be landing to refuel,' chipped in Christian.

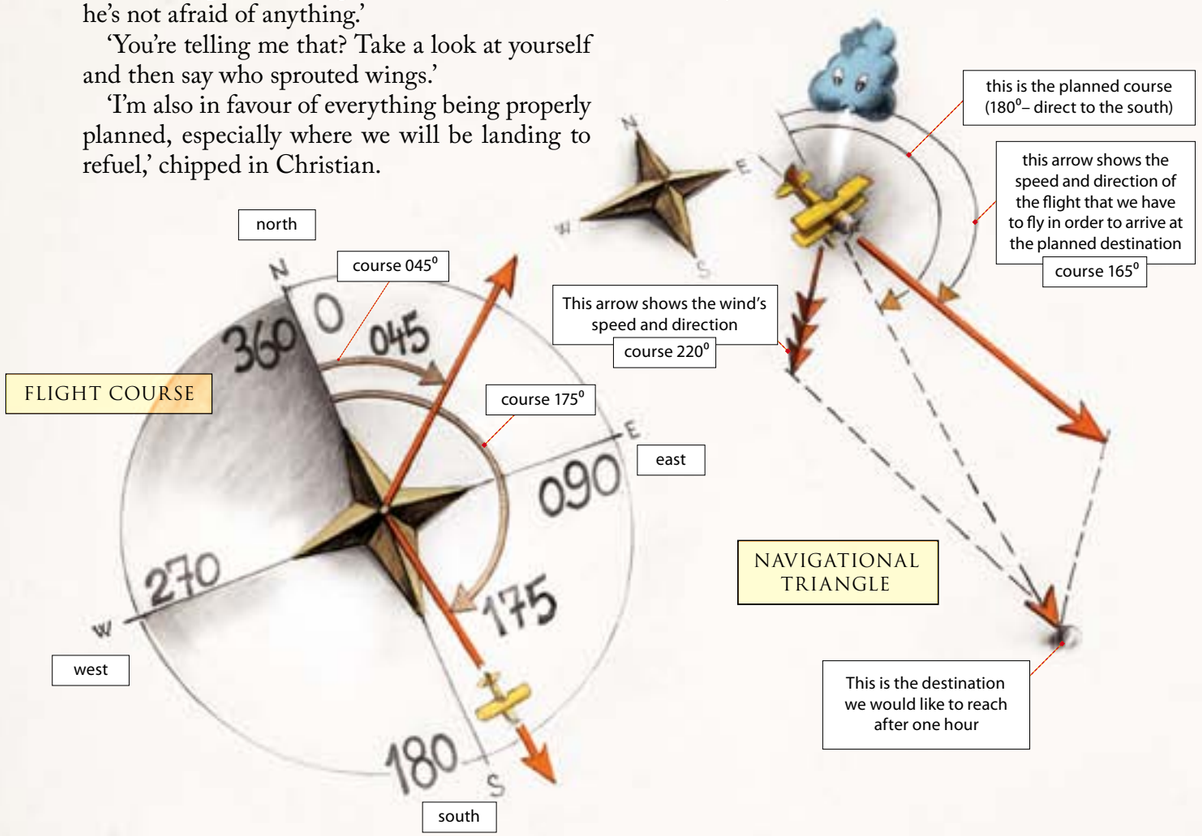
'Hang on a minute, you're going to fly with us too?' asked Arnie, surprised.

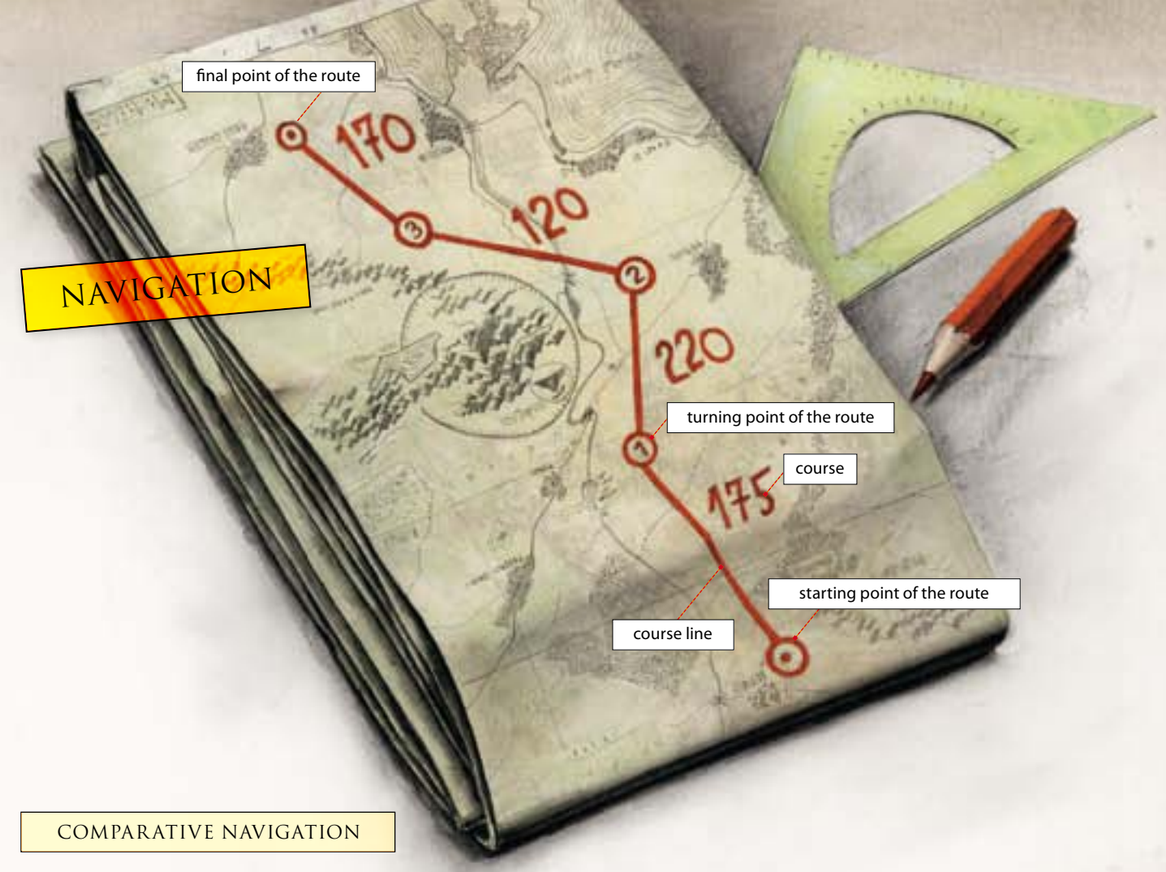
'Yes, I am. Didn't I tell you?'

'No, but that's great. You're really going to fly too? Fantastic!'

'I decided the evening after you saved me from the stork. I realised, to my surprise, that I actually enjoyed flying.'

'Hurrah, all three of us will be flying after all – that's always more fun.'





'I'll be responsible for the navigation,' continued Bill. 'At every stage of the flight we should know where we are located. Before take-off we'll plot the whole route on a map – it will be made up of separate course lines. We'll also mark the major orientation points, such as large towns, ruins, rivers and so on. During the flight we'll compare the land we pass over with the map. Before take-off we'll also ascertain the wind's speed and direction from the met office. We'll make a navigational triangle in accordance with their forecast, so that we know how to modify the course. Well, and if by chance everything should fail and we got lost, then I'd have to rely on my sparrow's instincts – after all, a bird can't get lost, can it?'

‘Why couldn’t we build a plane though?’ Arnie the rat asks his friend Bill the sparrow one autumn afternoon.

‘Doesn’t that strike you as a bit odd, Arnie, a bird building a plane?’

That’s roughly how the latest volume in the Technical Fairytales edition begins. The reader will learn how an aeroplane can stay up in the air, how it is controlled, what instruments the pilot needs to have in the cockpit, what the engine looks like, and so on. The main characters in our story struggle not only with technical difficulties but also with doubts and fears, and, at one moment, even their lives are put at risk. In this gang they do not go in for grand pleasantries, but when the chips are down the strength of their friendship is demonstrated and it is obvious that they can rely on each other without fail.

For children from the age of 6

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