BASIC INFORMATION ON RC-SKYDIVING

PART 1

THE TOP TWO
ANDY & MIKE

by Michael Rogg

PREFACE

Dear modellers,
this report is the first one out of a series of four I wrote for MODELLFLUG INTERNATIONAL. The reports cover various aspects of rc-skydiving. They were published in MODELLFLUG INTERNATIONAL by Modellsport Verlag June 2007 - September 2007.
By courtesy of Modellsport Verlag-Verlag Baden-Baden I translated the reports into English to provide the information involved to a wider range of readers. RC-parachuting is a fantastic sport and in my opinion information should readily available for anyone seeking for it - so it´s worth the effort.
YES, I translated my reports myself, yet, as you will easily notice, NO, English is not my mother tongue. So if you come across any miscellaneous points, just send an e-mail to: rgkestrel@t-online.de
Michael Rogg, June 2008

A New World

Whether you are an experienced modeller or a newcomer to rc-models, if you take up rc-parachuting, you enter a completely new world. The idea behind these reports is to help you get into rc-parachuting as smoothly as possible.

Questions

Who, what and why are the most commonly used question words when anybody interested takes up rc-skydiving. I´ll do my best to give you adequate answers.

ANDY and MIKE

are the most successful model skydivers available on the German market. So let´s have a look at them first. Further reports deal with parachutes, jump planes, test jumping, competitions and so on.

Permanent Racing Duell

There is hardly any regional, national or international title that couldn´t be sticked on ANDY´s or MIKE´s hardhat.
They both have been jumped in competitions extremely successfully for years.

The building instructions for ANDY include photos and technical drawings.

I am deliberately not going to work through the building instructions step by step as it is often the case in model magazine reports. After all both kits are provided with detailed building instructions. But as we go along, we will deal with many basic questions.

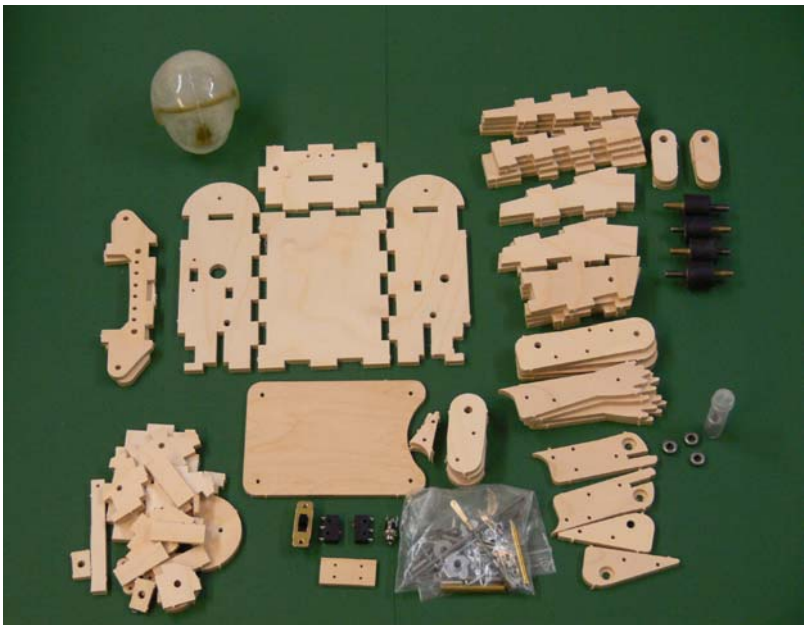
Where To Get The Jumpers From

ANDY is made and sold by AP Modellbautechnik. This jumper has been the German champion several times since the year 2000 (and actually holds it at the present).
In addition to ANDY, AP also do another wooden jumper called WOODY. WOODY´s body was designed to take extremely big and strong servos. AP mainly make their wooden jumpers, yet if you need accessories like a jumpsuit, a container or an LR-16 accuracy parachute, they can also deliver.

PARAMAX has been on the market with their all glass-fibre reinforced plastic jumper MIKE for years. Meanwhile they also sell a partly wooden model. On top of that PARAMAX offer an extremely wide range of acessories. The jumper, the helmet, the jumpsuit and the container are made to the customer´s choice. The future owner can choose from a whole range of colours and materials available. You can even purchase different kinds of harness and leather boots. The customer can also choose the colours of his future canopy. Besides, PARAMAX also offers a „Safety & Sound-Modul“, and several purpose-designed parachutes.
Any snags? Unfortunately, yes, there are. It often takes PARAMAX months to deliver.

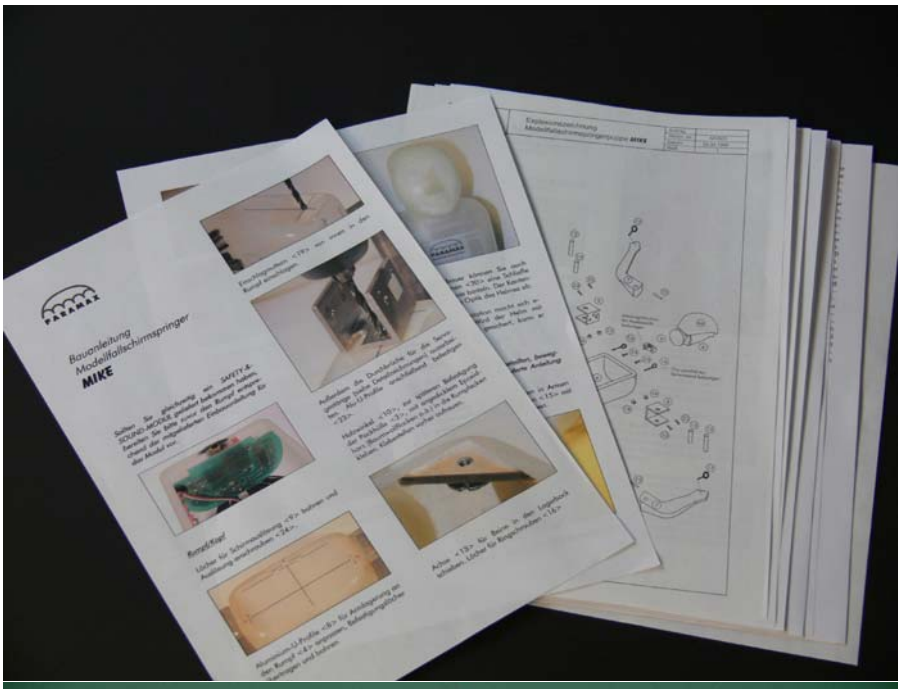
Arms

ANDY and MIKE are available with both, conventional or fully movable arms.
Since the arms are THE central unit of our jumpers, let´s have a close look at them from different points of view.



A N D Y

ANDY is a bit taller than MIKE. The wooden legs are quite heavy, but that helps to get the centre of gravity in the right place.



The building instructions by PARAMAX are really detailed and also come with loads of pictures and helpful hints.

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PARAMAX accessories

However, before we go into detail let me draw your attention to a few facts concerning flying as such.

Flying

In order to fly any flying object around safely you must be able to control the following:

- horizontal speed
- rate of descent
- turns

Conventional aircraft feature movable parts, usually located at the aft end of the airfoil, for example the ailerons or the elevator, to control the parameters mentioned above.
How do you control a parachute? You pull down the flexible ends of the canopy by means of the control lines. If you pull the left and the right control lines at the same time and to the same extent, horizontal speed drops. Vertical speed may increase or decrease within certain limits. If you pull the control lines, let´s say on the left only, there is more drag induced on the left side than on the right side. Therefore your parachute turns to the left.

Conventional Arms

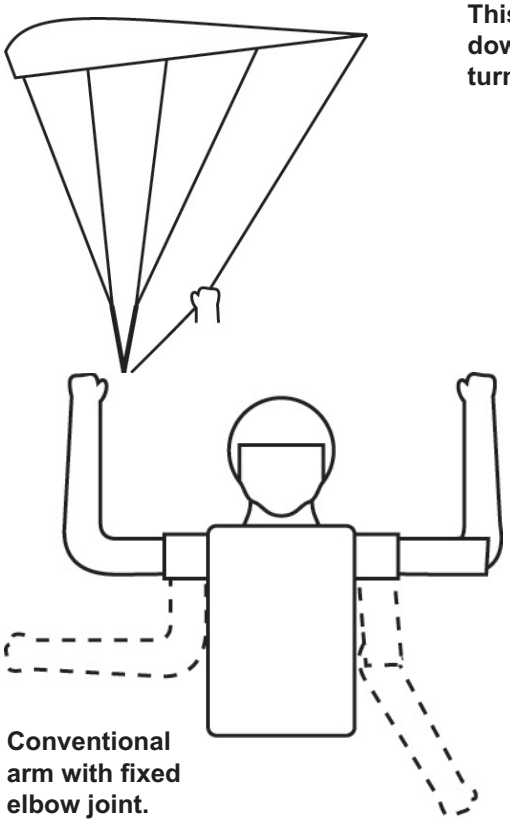
If your model skydiver has conventional arms, you will find that only the shoulder joint is movable. The elbow joint is not. Conventional arms are easy and cheap to make from a wide range of materials. They have turned out to be extremely durable and reliable. If you use conventional arms, servos with about 60 to 80 Ncm (appr. 110 oz.in) of torque provide ample thrust. Yet, there is a very big disadvantage to conventional arms: Modern canopies ask for a bigger throw than older ones. If there is not enough throw, you can´t make use of the complete speed range.

Fully Movable Arms

So if you are looking for maximum performance, fully movable arms should be your choice. Here both the shoulder and the elbow joint are movable. Both parts of the arm are moved by levers. As a result, the hand travels a considerably longer distance from its top to the bottom position. Among competitors, fully movable arms have achieved more

Moving up or down the ailerons of a wing helps to bank an aircraft.

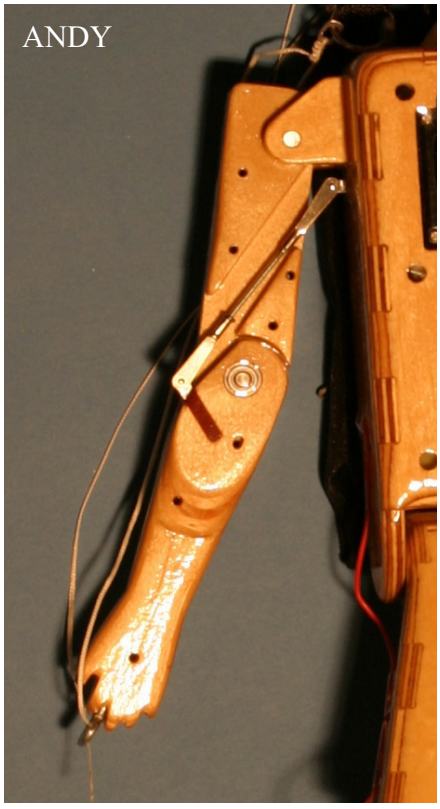
On parachutes you can pull the flexible end of the airfol downward. This increases drag and slows down the parachute or makes it turn.



Conventional arm with fixed elbow joint.

Fully movable arm as designed by Alfred Rachner some years ago.

Both the shoulder and elbow joint are movable, which considerably increases the throw of the hand.



Fully movable arms

and more acceptance over the past few years.

On the other hand fully movable hands are very complex and laborious to manufacture, so they are anything but cheap. Besides, they ask for high torque servos of the 120 Ncm class or higher.

Servos

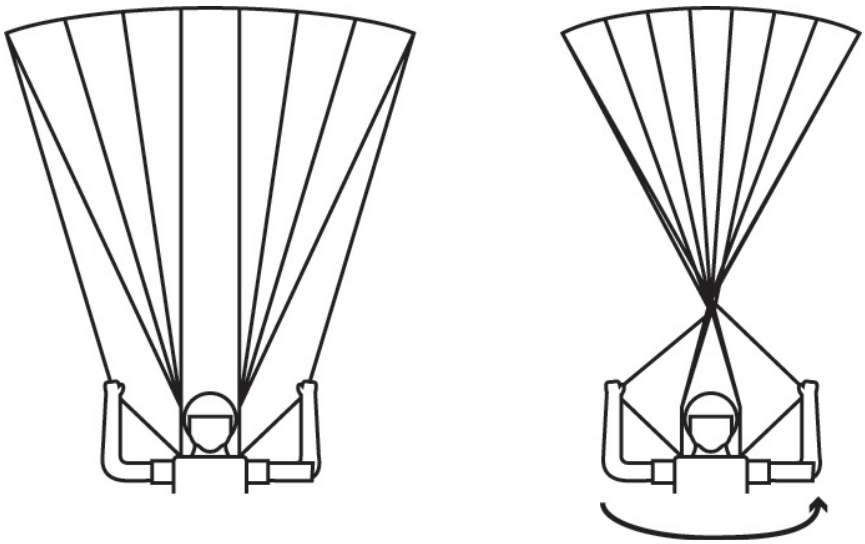
What do you think of when you think of servos? Speed, torque and money, yes indeed.
Of course all the servos you use for rc-parachuting should have metal gear. If one of the arms happens not to be in the correct position when the canopy unfolds or if your jumper falls on either hand during the landing, you will find that metal gears really pay off.

Highly experienced rc-pilots prefer the most powerful servos available for the job, because they give them a chance to clear one of the most common mishaps: twisted lines. Of course we can´t break away and pull the reserve, so we have to try to clear our problem with other remedies. Normally friction between twisted suspension lines is so high, that standard servos can´t move the arms any more. However, if you use high torque servos, these often exert enough thrust to move the jumper a bit. Sooner or later it starts to swing which often helps to initiate a turn and untwist the suspension lines.

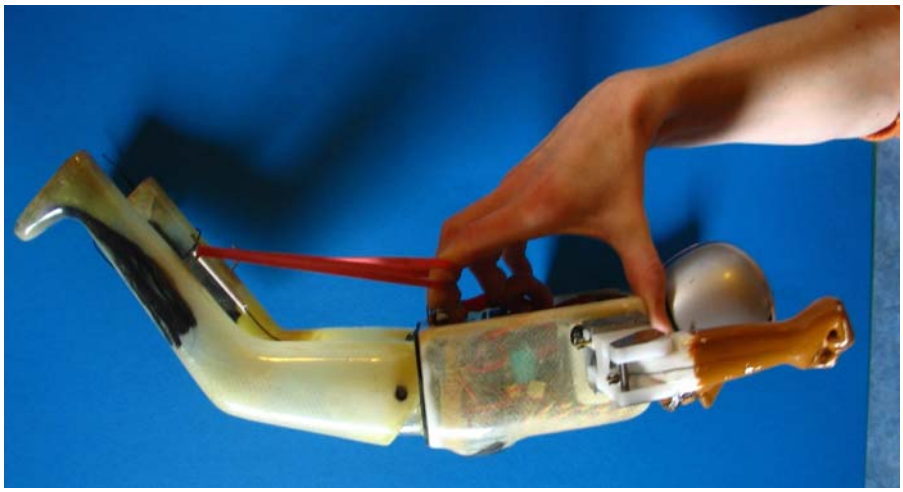
Although they are designed in different ways, both Andy´s and Mike´s fully movable arms withstand everyday and competition jumping. Both feature predetermined breaking points to avoid major damage. So you shouldn´t replace any of the parts provided by stronger ones.

About Beer Bellies And Movable Limbs

Why are skydivers „as steady as a rock“ during free fall? I admit it is not a perfect anology, but free falling skydivers keep their equilibrium the same way as the well-known shuttlecock used in badminton. Any lump or mass falling down towards the earth follows gravity.



Powerful servos help to untwist the suspension lines.



The typical position during free flight. Please note the „beer belly“ , which is filled with lead ballast, and the rubber bands that keep the legs in the desired position.

It is drawn towards the earth like an iron thing is drawn towards a magnet. Of course this happens at a certain speed, or velocity, as it is called in physics. Now anything falling towards the earth is slowed down by a certain amount of drag. Basically, this drag is brought about by the air that surrounds us. The more leightweight something is and the bigger the surface is that is exposed to the air, the more drag is induced. Now we can understand why a shuttlecock works the way it does. Its „head“ is a little rubber or plastic ball. That is to say, it has got quite some mass in relation to its surface. So the „head“ tends to fly fairly fast. On the other hand the feathers of a shuttlecock are extremely lightweight, yet provide an enormous surface, which brings about a lot of drag. Consequently, they are slowed down considerably. Whenever the shuttlecock flies, the rubber ball is slowed down by the feathers that are attached to it. This makes the shuttlecock turn around immediately after each hit and fly away head first. In other words, the feathers stabilize the rubber ball in the air.

Now if you pretend that the body of a jumper is the rubber ball and the limbs are the feathers you begin to understand, why skydivers don´t normally tumble during free fall. Besides, it also becomes obvious why the battery and any dead weight necessary is usually installed in the middle of the body. What is more, some jumpers like the MIKE have a „beer belly“. It is filled with lead to keep the centre of gravity as low as possible.

All the modern jumpers have movable legs. During free fall both

legs are pulled backwards and upwards by rubber bands. They are hitched to hooks in the calfs at the one end and to one flap of the container at the other. As soon as the container opens, the legs can pivot forward for the landing.

Save Flying Is No Accident

Rc-parachutists tend to land close the target more often than some critics want to make people believe. Nevertheless, it is clear that everybody is prone to mishaps. Therefore always take precautions before you jump your model.

If necessary, ask a friend to assist you. He or she can watch the sky or the surroundings and warn any passers by. Never drop your parachutist above a parking site or spectators. Never jump your model unless it is equipped with safety devices. You definitely need a beeper. Please instal it before you have to look for your precious model in a huge corn field. In addition, the beeper helps to keep damage to farmland to a minimum.

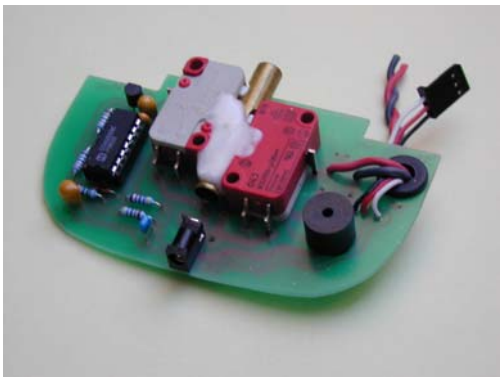
It is also of major importance to instal some kind of safety device that prevents your parachute from unfolding during transport to altitude. If the parachute opens while your skydivers is still under the jump plane, both will usually be a complete write-off. In most cases the canopy or suspension lines get caught in the tailplaine and the aircraft can´t be controlled any more. Over here we employ two different techniques to make sure that the canopy is kept in place. Some people have conceived a system using a special locking pin for the container. (This system will be dealt with in another report).

Others prefer to use a so-called „safety-pin“ and a „static-line“. The static-line is about 30 cm (no more!) long and made of nylon textile tape, about half an inch wide. (Believe me, ordinary chord or chalk line won´t do the job!) We sew at least 10 cm of Velcro onto it. We use a split ring to attach a carbon pin to it. The pin switches on and off the radio gear of the jumper. Usually, there is a piece of brass tube with an inner diameter of 6 mm. We drill two holes into the brass tube to allow for the „shift levers“ of the push-buttons. The diameter of the carbon pin is reduced to 5,6 mm to prevent jamming. In addition, we use a safety circuit with two push-buttons (of the kind used in car industry) and an „OR“ layout. That is to say that it works in a way that if one of the buttons fails, the other one still can switch on the radio equipment. The push buttons are soldered to a circuit board, the brass tube is glued in between with epoxy resin and micro balloons.

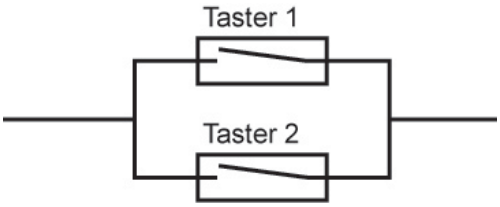
It is also a good idea to keep the free end of the aerial rather short. I glue thin plastic tubes to the inner side of the legs and run the antenna through them.

Whether you prefer to attach your static line to the jump plane by means of a snap-hook or Velcro is entirely up to you, of course. But please remember it MUST be strong.

One of the „static-lines“ commonly used in Germany. The carbon pin is very leightweight and doesn´t damage the fuselage.



This „safety & sound module“ features two push-buttons, a beeper and a connector for the charging cable. (PARAMAX)



In case one push-button fails, the other one can still switch on the radio equipment.

How to keep the aerial out of the way.

ANDY V2

Whether your jumper shall be made of wood or glass fibre depends on your personal preferences and financial limits, of course.

If you decide on ANDY V2 (= version 2), you get a well-engineered wooden model, whose parts fit like the pieces of a 3-dimensional puzzle. Head and hardhat are in one and the only part made of glass fibre.

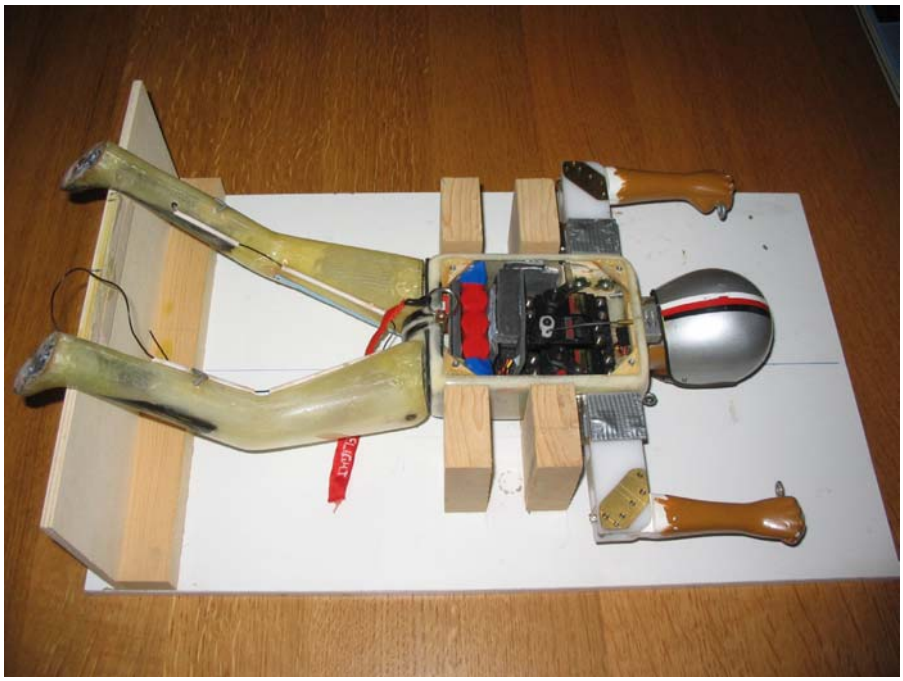
The building instructions emphasize that you should use good quality „slow“ resin to stick the parts together. There are ball-bearings in the shoulder and elbow joints. This keeps friction low and also allows for minimum tolerance not yet achieved by any other design. There is a technical drawing for an „or“ circuit included. You also find two microswitches and a connector for the charging cable enclosed in the kit.

The thighs are linked to the body in three places, which prevents any possible damage in hard landings. Two shock absorbers at the knee and the ancle keep the legs flexible and help to absorb the landing impact. All in all, ANDY V2 is a well engineered model that is used by more and more rc-pilots.

MIKE

Each of the precious glass fibre reinforced plastic pieces is sent to the customer wrapped up in air bubble film. The upper arms consist of very ductile plastic material, whereas the forearms are made of glass fibre. The clenched fists look very real - a lot more real than anything else available. PARAMAX doesn´t want to ask too much of newcomers, so they deliver the arms properly adjusted. The head and the hardhat are manufactured separately. This again doesn´t just look absolutely real, it also makes handling a lot easier in case some parts of the equipment must be mounted inside the head. The legs are connected to the body by means of a rigid steel axle of appropriate diameter. Yet on the contrary to ANDY V2, there is only one central axle-bearing. Carbon rovings reinforce the axle-bearing.

The „safety & sound module“ does a perfect job and is easy to install.



A wooden jig helps to get the model symmetrical.

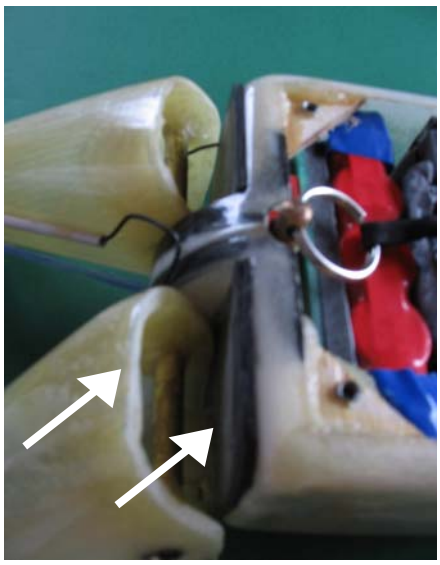
As mentioned before, there is a whole range of colours you can choose from when ordering your canopy, container, hardhat or canopy.

I personally have jumped all glass fibre jumpers for about ten years now. I have jumped them for fun and in many, many competitions. So far, I have never had any of the big parts replaced, except for once, when I accidentally stepped on a body. In my first year, due to lack of experience and knowledge, I replaced the static line that had come with the kit by an ordinary piece of string. The string broke and the carbon pin remained in the brass tube. It was impossible to deploy the parachute. As you may have guessed, the little skydiver hit the ground at a speed of about 100 km/h. Due to the heavy impact there were numerous fissures, but none of the big parts was destroyed. Only the quartz of the receiver was gone. The jumper was back in the air one day later.

Improvements

The following changes helped to improve the overall performance of my MIKES.

Since we want our parachutist to dive without tumbling around the sky, it is a good idea to build it as symmetrically as possible. I use a jig made from some pieces of scrap board for the final assembly (see picture).



Add shock-absorbing layers of bicycle tube. Thicken thigh edges.

The aft position of the legs given in the building instructions is okay as a starting point for test flying the jumper. However after some dives I usually make the angle of the thighs more acute. This obviously helps towards a more steady free fall.

The feet get soles of 2 mm plywood. The inside of the knees is doubled up with a few layers of glass fibre. I also thicken the upper edges of the thighs with some glass and resin. In the end they are about 2 mm thick.

This is a good thing to do, because the impact during hard landings is enormous.

The very bottom of the body is coated with two to three layers of bicycle tube.

If you do all these things before the first jump, you add only very little weight, but strenghten your jumper a great deal.

The next report will deal with parachutes.

Michael Rogg, June 2008

If there are any questions please mail to: rgkestrel@t-online.de

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