# JUMP PLANES


**by Michael Rogg**

## PREFACE

Dear modelers,
this report is the third 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

**These two guys are obviously happily awaiting their next transport to a jump altitude of about 700 to 1000 feet above the ground.**

This time we are going to focus on the models that take our jumpers up into the air. We will deal with engines, airfoil sections, silencers, undercarriages and whatever is needed to take the skydivers up safely and effectively.

## Teamwork

First of all I want to say thank you to all those nice pilots who are not only willing to transport our skydivers, but also voluntarily provide us with adequately equipped jump planes (some people prefer to call them carrier-planes) AND are prepared to follow the instructions of the jumper-pilots time after time.

## Tractors Of The Air

Since there are extremely big models with gas engines at hand in virtually every flying club now, it shouldn´t be too much of a fuzz to get a jump plane.

In order to give you an idea which aeroplanes are the most suitable ones, I have compiled a table with information on three different kinds of aircraft: First, there is the type of sport scale aeroplane that is usually built from a kit. These are planes like the Bellanca Decathlon, Dornier Do27, Jodel Robin or PA18 Piper Super Cub. All of these models can be transformed into a very apt jump plane fairly easily.

Then there is a Daisy, which was built from scratch according to enlarged plans (Over here obtainable from Verlag für Technik und Handwerk = VTH, Baden-Baden).

Last, but not least, there is an OHA, a purpose-designed aeroplane, whose owners swear to high heaven that it is the best jump plane ever.

Rc-pilots who prefer to fly even bigger models than the ones mentioned above will admit that it doesn´t take much of an effort to instal a self-contained jump box (also often called a drop box). By self-contained we understand that the box includes the necessary release servo, maybe even an extra battery pack and receiver.

## Sheer Size...

In fact, extremely big models are highly suitable for transporting skydivers. Their high undercarriage helps to keep the jumper at a safe distance from the ground. Minimum speed is at its lowest with such models, which is perfect when releasing the jumpers.
Furthermore, the very large engines provide more than enough surplus

| Aeroplane | B. Decathlon |
|---|---|
| Manufac-turer | Weiershäuser |
| Span | 3,06 m |
| Length | 2,12 m |
| Engine | 3W flat twin 70 ccm |
| U.C. track | 0,6 m |
| U.C. height | 0,3 m |
| U.C. modi-fications | additional springs |
| Position of jump box | struts |
| Jumpers | 2 |
| Weight without payload | 14,8 kg |
| Owner´s comment | ideal for transport, touch down asks for a good pilot |

| Aeroplane | Dornier 27 |
|---|---|
| Manufac-turer | Modellbau Vogt |
| Span | 2,70 m |
| Length | 2,2 m |
| Engine | Zenoah 62 |
| U.C. track | 0,6 m |
| U.C. height | 0,3 m |
| U.C. modi-fications | additional springs |
| Position of jump box | fuselage bottom |
| Jumpers | 2 |
| Weight without payload | 14,8 kg |
| Owner´s comment | ideal for transport, even in gusty winds, touch down asks for a good pilot |

| Aeroplane | Piper PA 18 |
|---|---|
| Manufac-turer | practical scale |
| Span | 2,70 m |
| Length | 1,9 m |
| Engine | Zenoah 45 |
| U.C. track | 0,52 m |
| U.C. height | 0,26 m |
| U.C. modi-fications | --- |
| Postion of jump box | fuselage bottom |
| Jumpers | 1 |
| Weight without payload | 11,5 kg |
| Owner´s comment | docile and forgiving model, can carry hea-vy loads |

power for transport.

## Specifications

As a rule of thumb your jump plane should be a really docile model with a bit of extra power.

A span not in excess of 3 metres is ideal for transporting the aircraft to the flying field. If the span is above 2 m, you´re usually on the safe side concerning wing loading and so on. Your model should have a fairly thick wing section. The famous flat-bottomed Clark Y (11,5 to 15% thick), the NACA 4415 as well as the semi-symmetric NACA 2415 are widely used. If you have the choice, go for a fairly thick aerofoil. It will stall at a lower speed than a thinner one. The slower your model flies during the release of the jumper, the more stable its free fall will be right from the beginning and the less problems will occur during descent.

Normally one jumper weighs 1,4 to 1,7 kg over here. As a good 62 Zenoah engine is powerful enough to take up three skydivers at a time, we must keep an eye on the wing loading. Don´t overload your model! If you plan to take up to three jumpers in one go, span should be 2,4 m or more. Start test flying with one jumper attached, then two. If there are still no problems, some further test-flying is certainly worth the effort: increase weight step by step until you reach maximum load. Remember: The lower the wing loading, the lower the stalling speed and vice-versa.

Although I have seen all sorts of aeroplanes being used for transporting jumpers, there is no doubt that high-wing planes with a few degrees of dihedral are to be preferred.

The next aerodynamic topic is that of stability. Of course we want to let the fully loaded aircraft fly itself to a considerable degree. So longitudinal stability is a main concern. Basically, a big distance between the wing and the tail and a large tail area relative to the wing area result in good longitudinal stability. If you compare a DO 27 to a PA18 by having a close look at the fuselage and the tailplane, you will surely note the difference. Good lateral stability and control are also invaluable things to have. Therefore I´d suggest to use a wing with a few degrees of dihedral and not to fly without ailerons.

As all experienced modellers know, the center of gravity is also an important parameter that must be kept in mind. You can´t always mount

| Aeroplane | Jodel Remorquer |
|---|---|
| Manufac-turer | Rödel |
| Span | 2,18 m |
| Length | 1,82 m |
| Engine | Am. Enignes 42 |
| U.C. track | 0,6 m |
| U.C. height | 0,20 m |
| U.C. modi-fications | --- |
| Postion of jump box | center of wing |
| Jumpers | 1 |
| Weight without payload | 12,4 kg |
| Owner´s comment | OK! |

| Aeroplane | Daisy |
|---|---|
| Manufac-turer | enlarged plan built from scratch |
| Span | 2,83 m |
| Length | 2,13 m |
| Engine | Zenoah 62 |
| U.C. track | 0,65 m |
| U.C. height | 0,35 m |
| U.C. modi-fications | additional piano wire |
| Postion of jump box | fuselage bottom |
| Jumpers | 2 |
| Weight without payload | 15 kg |
| Owner´s comment | flies as steady as a rock, fairly slow model |

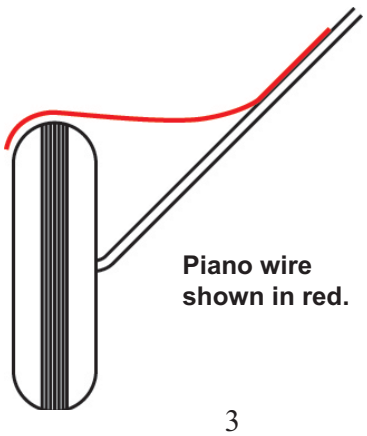
| Aeroplane | OHA |
|---|---|
| Manufac-turer | Hans Flad |
| Span | 2,2 m |
| Length | 2,0 m |
| Engine | 3W 60 |
| U.C. track | 0,59 m |
| U.C. height | 0,30 m |
| U.C. modi-fications | --- |
| Postion of jump box | fuselage bottom & sides |
| Jumpers | 3 |
| Weight without payload | 8 kg |
| Owner´s comment | purpose-designed for jumper transport; perfect fibre-glass u.c. by KHK |

your jump box and jumper without changing the ideal position of the center of gravity. For example, quite often the undercarriage is to narrow to get the jumper into the ideal place. So the position of the jumper often leads to a more tail-heavy model. Therefore it´s a good idea to balance your model a bit nose-heavy beforehand. But please don´t overdo that either!

The higher the undercarriage, the easier it is to attach the jumpers. There is no need to install a Fieseler Storch-type undercarriage, yet the lowest point of the jumper should stay clear of the ground by about an inch. This is the case with the back jumper of my Do 27, for example. When taxiing, the jumper´s knees appear to plough the airfield. However, so far I haven´t even noticed any green spots on the jumpsuits.

The undercarriage has to be robust and reliable. The all fibre glass and resin undercarriages by KHK are perfect for the job and therefore are widely used over here. If you use a model built from a standard kit, it might be necessary to reinforce the undercarriage with extra springs or piano wire of a higher gauge.

If the hands or any lines are in danger of getting caught between the legs of the undercarriage and the wheels, you should add a piece of piano wire that „covers“ the wheel at its top.



**Piano wire shown in red.**

Of course extra power is important, but it is not the answer to every problem. For example, we used to (unfortunately used to, yes) transport our jumpers (one by one) with a Wilga with only 2,2 m of span. It had an OS BGX 35 ccm with a tuning pipe. Now, that model climbed like a homesick angel. The payload apparently didn´t make much of a difference...

Every jumper pilot really appreciates tuning pipes, especially when the exhaust outlet is at the aft position. The jumpsuits stay clean and there is no fuzz with oil soaking and ruining the precious parachute. Especially

the modern types of oil are really hazardous!

Therefore, if your jump plane pilot prefers to use a standard muffler, add some extra silicon pipe or the like to keep all the exhaust fumes out of the way.

Pilots who are experienced enough to take your jumper up safely usually also know how to deal with airscrews. Still, don´t forget: you normally take your jumper up at full throttle. So it´s a good idea to keep the airscrew well-balanced and to resort to those sophisticated carbon types to keep noise down. 8 to 10 inches of pitch are ideal.

## The jump box

Now for some principles with respect to the jump box. It´s main job is to hold the jumper safely during transport and eventually release it into free fall. Neither vibrations caused by the engine nor heavy jolts during take off should lead to any mishap. One of the biggest hazards is a parachute that deploys itself at altitude when the jumper is still fixed to the aircraft. Even if the canopy doesn´t get caught at the tailplane, it causes such terrible drag, that the aeroplane can´t be controlled any more.
As a consequence, the box itself as well as the releasing mechanism must be 110% reliable. Designs are entirely up to you, of course, but we really don´t want any suspension line or aerial get caught by any means.

The jumper or container must have one of the safety devices already described in parts 1 and 2.
A little box as shown in the technical drawing and the photos is a must. It safely holds the jumper in place and tightly surrounds the container with the parachute in it. Every now and then one of the flaps of the container loosens due to vibration. Then the jump box prevents the parachute from getting „sucked out“ and unfolding.

You also need some device to fix your static line. There must be an easily accessible loop or hole either at the aft end of the box or on one side. To fix the static lines one of the following is usually employed: a loop, velcro tape or a snap-hook.

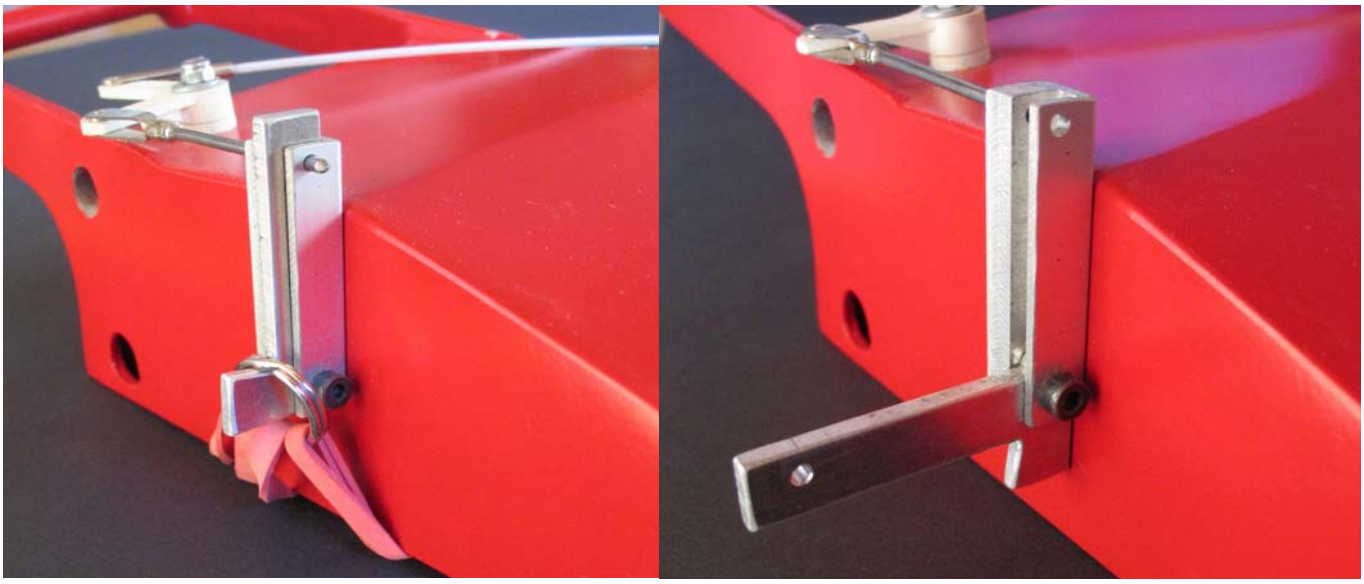
**This kind of situation should happen by no means.
Here the back jumper got caught in the undercarriage. Neither aerobatics nor high G-pulls helped to get rid of the jumper. Luckily the cool-blooded pilot eventually managed to land without any damage after several attempts.**

**This jump box is made of carbon fibre. Of course 2 mm birch plywood would be sufficient too.**

Whatever kind of material you use for the strap, it must be strong and flexible at the same time. Even if you only take up your own, one and only jumper, you will find that the packed parachute varies in size.
Some people prefer to use a strap of leather including some tiny rubber bands and a split ring. Others like to cut braces to an appropriate length and sew on a split ring. Then again people adjust the length of the strap by means of velcro or a tie-wrap.

The locking device must be sturdy and easily accessible. The servo should have at least 5 kg of thrust. Just think of that: In case only one jumper can be released, you will have to touch down with your model totally out of balance.

It is best to release the jumper by pulling the rod rather than pushing. A spring or rubber band helps to move the rod back into the „locked“ position. If you don´t mind an extra hour or so of work, it certainly is a good idea to make your own L-shaped locking device. The long end is drilled near the corner to allow the L to pivot. The long end also gets a hole for the piano wire that locks the device.
The short side takes the split ring. According to lever principles this design reduces the stress exerted on the servo and thus helps to prevent jamming under extreme conditions. The pushrod should be partly made of steel cable or the like. Thus the jumper pilot can attach the jumper while the plane pilot has switched off his model and saves on electricity.



**Dou you remember learning about levers at school? If you use an L-shaped lock, here it is made of aluminium, your lock will surely open under big stress.**

**This release mechanism is made of different sizes of brass tube, a spring and a piece of steel cable. The Allen screw is the „handle“ of the lock. The slot to the right of the screw takes the split ring. The steel cable retracts the „pin“.**

## A single passenger onboard

If you intend to take up only one jumper, I can´t see why the jump box shouldn´t be built into the fuselage bottom right from the beginning and stay there permanently.

Just design a wooden box of appropriate size. In case you want to hide the strap and static-line, add a removable hatch. If at all possible, the box should be placed in a way that the centre of gravity stays in place with the jumper attached. If there is not enough space fo the arms, it is okay to fix the jumper legs first, of course.

If you use your model as a jump plane only every now and then, you had better install a removable box. Two drive-in nuts will ease the job.

## Two or more jumpers

If you want to take up two or more jumpers, you have to consider longitudinal and lateral stability first. If you are not sure what to do, study pictures of other jump planes. A Do 27 usually takes the jumpers along the fuselage, one behind the other. Over the years I have taken up hundereds of jumpers with my Do 27. Normally the back jumper is released first. In this case you can easily balance the then nose-heavy aircraft with just a tick of up elevator. If the front jumper ist dropped first, there is no need to panic either. Of course I prefer to use the front box when I have to take up only one jumper. The model is clearly nose-heavy then, but still easy to control.

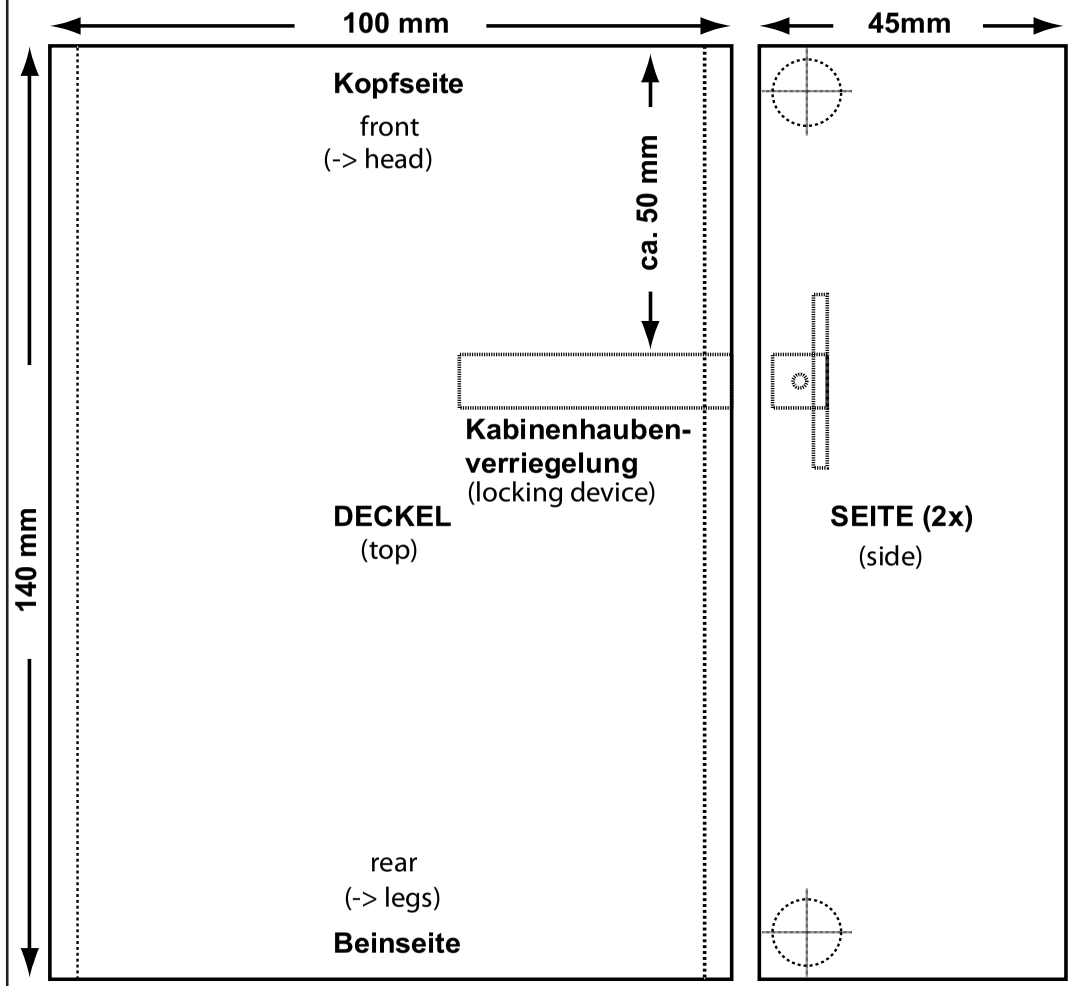
On Pipers or Decathlons the jumpers are normally fixed on either side of the struts. The struts should be made from steel tube, of course. From what I have seen it seems to work really well.

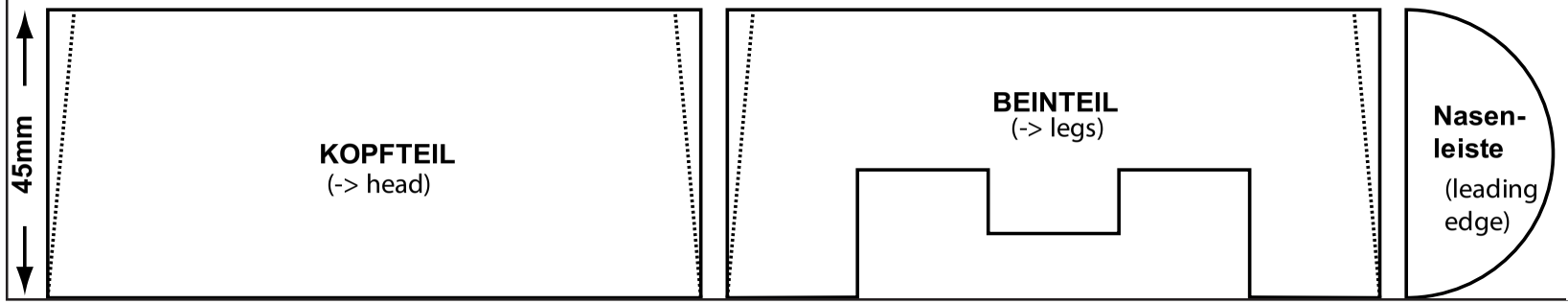
In my opinion the best solution is to use what you may call jibs for the boxes. We normally run two carbon tubes (10 mm in diameter) through the fuselage and slide on two jump boxes on either end.

Where the carbon tubes have to take the greatest stress, for example where they pass through the sides of the fuselage, we epoxy short pieces of beech in place.
If you have loads of surplus power and a high undercarriage, you can add a third jump box underneath the fuselage bottom.

## Standard size

As I have mentioned before, the overall weight of the jumpers for competitions is limited to 1,7 kg. As a consequence our jumpers are usually „standard size“. So, if static lines can easily be attached and removed your model should be adequately equipped for any jumping event.




Jump-box

These are the measures for a jump box that takes a MIKE or ANDY. The body is made of 2 mm birch plywood. All parts must be notched where they are joined. Reinforce corners with a layer or two of glassfibre. If you want, you can taper the front and rear end (see dotted line). If you mount your box with carbon tubes, use a diameter of 10 mm. The cut-outs at the rear end are for the rubber bands that keep the legs in the „up"-position. I use a big canopy lock and a wire bracket to capture and safely hold the ring at the end of the strap that holds the jumper.
The strap should be about an inch wide and just long enough to firmly hold the jumper in place. The system works best, when the strap runs across the chest of the jumper, fairly close to the ampits.

Don´t forget to add some device that allows „static-lines" to be easily attached and removed.

Drawing not to scale!

## Safe flying...

Of course any ordinary pilot who can control an aerobatic model is able to take your jumper up to the desired altitude absolutely safely. Still, here are a few points I´d recommend you to take into consideration.

Full throttle and nose dead into wind are only part of the business. Don´t forget your model is fully loaded, so only take off upwind even in fairly calm conditions. Keep a perfectly straight path using rudder. If the aeroplane starts to squirrel about, abort take-off and try again.
If there is considerable 90° cross-wind, it is a good idea to put in a bit of aileron, into the wind of course. As a result, if the model banks during take-off, it will bank into the wind only. Let the model run down the strip to pick up more speed than necessary for take off. Keep it on the ground with a tiny bit of down elevater. Then let the model fly itself off the ground. Climb at a really flat angle. During the first seconds of flight, adjust the sticks to counteract any severe turn or climb. Thus the model will take up more velocity and you will be on the safe side as far as tip-stalling is concerned.

Don´t forget: The high wing loading induces a considerably higher stalling speed. The extra drag caused by the jump boxes and the jumpers slows the model down. This happens exactly at the time when you need more speed to create sufficient lift. This is also the reason why you had better not deploy flaps. In theory they increase lift, in practice they first of all increase drag, which again counteracts our need for speed. What is more, due to the big weight you want to toss around the sky now, especially rudder and elevator must exert more thrust than normally, so - yes, this is another reason for sufficient speed!

## Dropping the jumper

You´re a team in the true sense of the word. Agree on the point where you want your jumper to be dropped before take-off. If there is any problem during approach, go round and try again. By the way, after a few flights the aeroplane pilot will develop a distinct feel for

**Isn´t it perfect?**

wind drift and velocity at different altitude levels. This helps to adjust the position of the model. During the last ten seconds or so of the final approach, the aircraft should fly dead straight into the wind. Just maintain altitude, let speed decline gradually, and eventually fly on the verge of the jump plane becoming sluggish on the controls. About three seconds before he wants his jumper to be dropped, the jumper-pilot must announce his intentions clearly.
Ideal dropping speed is the point, when you can still control the aircraft with normal control input, yet without being in danger of tip-stalling.

The faster your plane flies during release, the more problems will occur during free fall. The jumper needs more time to stabilize. If released with too much horizontal velocity it sometimes just keeps tumbling around the sky. As a result, arms or legs get easily caught in suspension lines during deployment.
The aircraft pilot must always announce the drop with a clear „go“ or the like. As it happens, due to dense mist, you may sometimes not be able to see your jumper right from the beginning of its free fall. Then just slowly count to three and finally deploy the parachute.

Becoming a good jumper pilot is a matter of gathering experience, so why not grab your equipment and have a try right off? See you at the flying field - test flying your jumper according to the last report of this series.