

# The shining long-distance boomerang

by Uwe Kitzberger

Long- distance boomerang (LD) is a fascinating sport, which I have practiced intensively for many years. During the 2002 Swiss championship in Klotten I got to know Christian Schuster from Traunreut, who was also interested in long distance. He revealed to me his idea for the TV program "Wetten Dass", to throw an illuminated LD boomerang around the television tower in Munich at night, and he asked me to construct a boomerang for this purpose. I was impressed by his idea and set to work. He later abandoned his plan. However, by this time I had already constructed the first LED equipped long- distance boomerang and was impressed by its performance.

The illuminated LD boomerang flight offers a fantastic visual display at night. The impression of UFO's is immediately apparent. Although it is unusual to throw at night, it can be a thrilling experience. Suddenly, new opportunities arise and a fundamental limitation of the original sport is no longer an issue.



Most participants of the sport will be familiar with searching for a boomerang following an unsuccessful throw, the new illuminating design means the boomerang can easily be spotted in the open terrain. Furthermore, a returning LED boomerang can be seen more clearly. Therefore, the risk involved (one of the biggest problems with LD boomerang) is considerably minimized.

When attending tournaments the width can be determined both, faster and more exactly with the help of a peaking- station and goniometry. It must not be forgotten that LD boomerang tournaments at night could also be interesting for the audience and media.

In order to hasten the introduction of this new version of the sport and to ensure a rapid increase in the usage of illuminated boomerangs and colourful nighttime tournaments throughout the boomerang community, I now will describe the various steps involved in its development. This information is for private use only and I expect complete confidentiality.

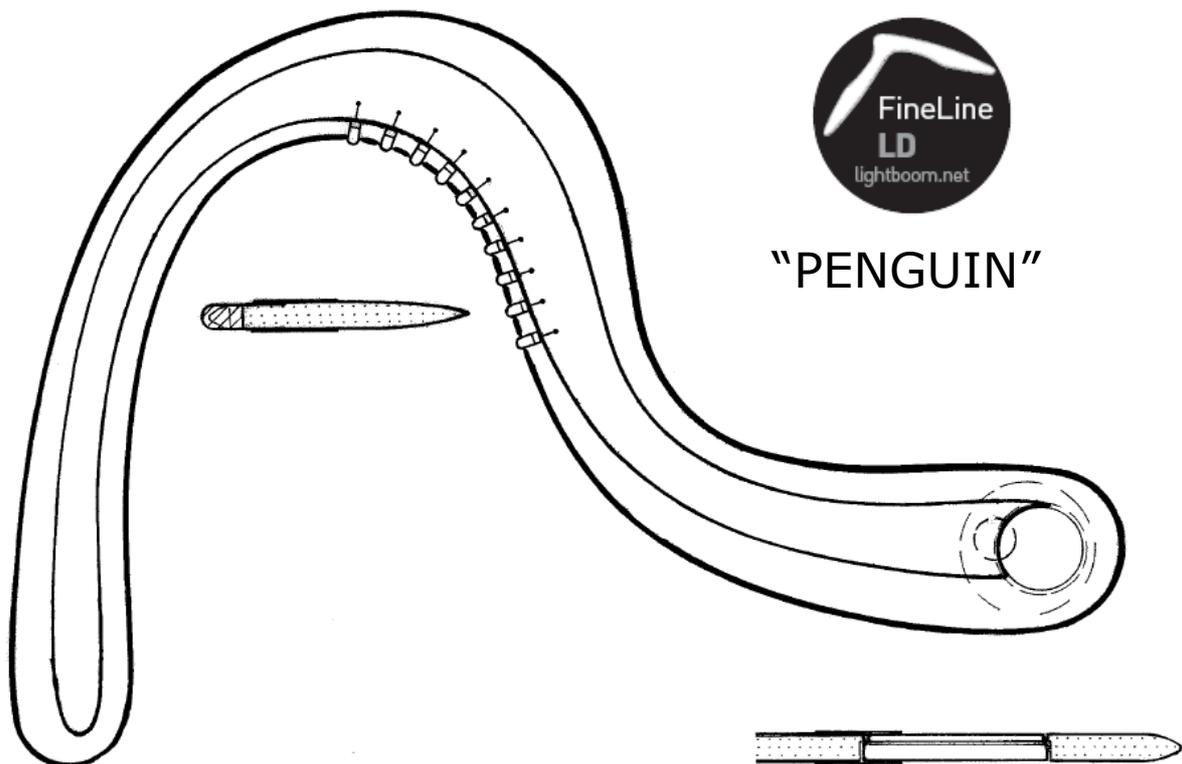
I am, of course, currently looking for customers and there will soon be a price list on [lightboom.net](http://lightboom.net).

Now enjoy and bring about a little bit of patience for many happy shining returns ...

# Construction Manual:

The GFK unit is 3mm thick and coated on both sides with a thin copper layer. The ultra light LED's, which are integrated into the moulded boomerang, are also 3mm high. The coin cells used (CR 2330, CR 2025 and CR 1620) each produce 3 volts and provide sufficient performance even without the inclusion of a transformer.

**Version 1 'PENGUIN'** (Named after the mascot animal of the EM 2007 championship in Pengwern). Span: 29.2cm. Weight (including coin cell CR 2330): between 75 and 78 grams, depending on the fluting.



The LED's are embedded at a depth two thirds of the way into the profile via a u-shaped cut\_out, and are soldered shorter flex up and longer flex down onto the copper surface. A channel is carved to hold the flex using a precision bow saw. This way the flexes (shortened to 2 mm) can be soldered flush with the surface.

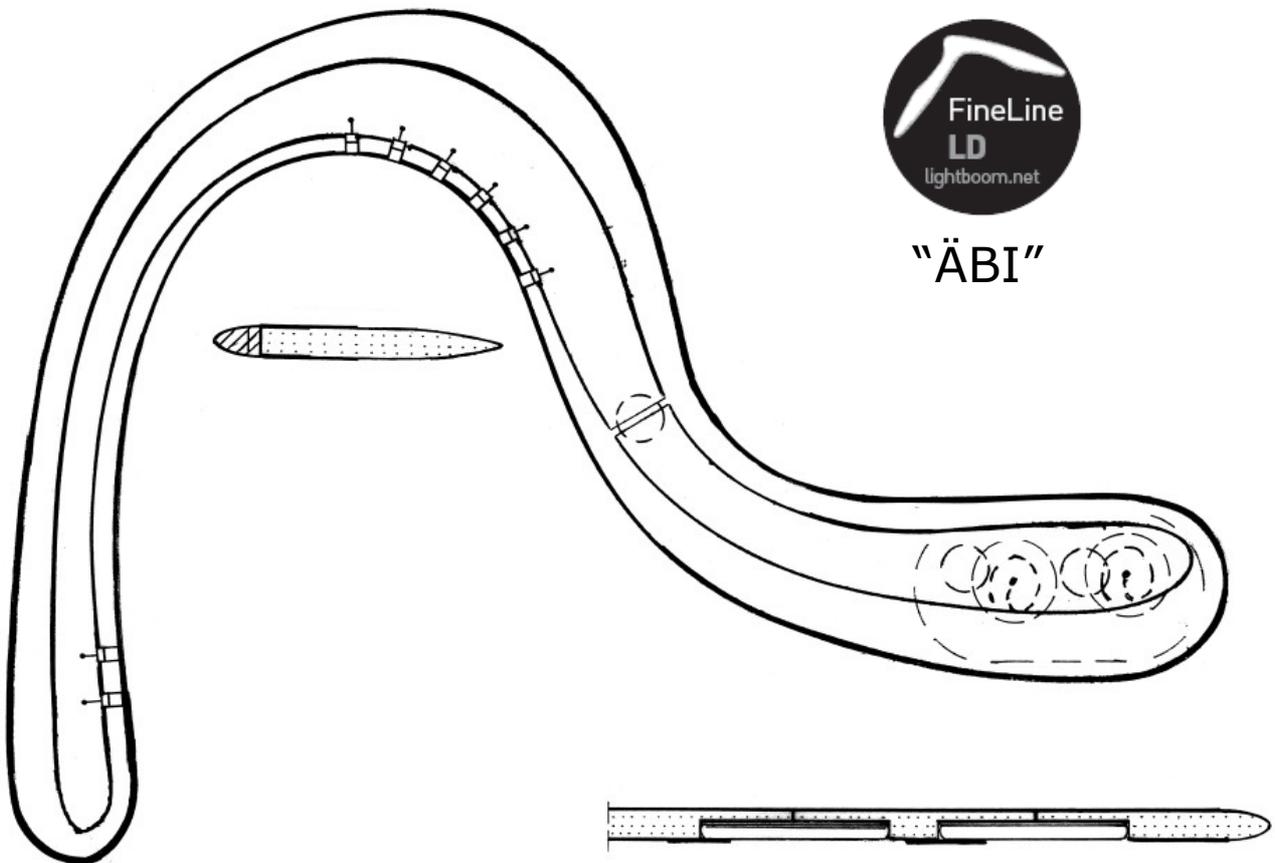
The gaps surrounding the embedded LED's are filled with clear epoxy resin. Any protruding solder or resin is gently ground smooth. In doing so, you have to be careful as the copper surface next to the soldering can be easily damaged. In this situation, the resin serves as a barrier to avoid scratching the copper. If grinding up to 0.1 mm of the protruding length, the soldering point will remain solid and should not compromise the aerodynamics of the boomerang.

The positioning of LED's close to the rotational axis of the boomerang results, when in flight, in a powerful pulsating central light that illuminates the night sky like a comet.

The battery case consists of a graded drilling from bottom up. This hole is designed to fit the coin cell perfectly. As the CR2330 cell is exactly 3 mm, it sits flush within the profile of the boomerang with the positive pole upward. To switch on the lights, the contact between battery and copper face is established by small copper discs above and below, fixed by sticky tape.

This variation is very reliable and the battery keeps working for many hours, even with 10 LED's. A disadvantage, however, is the amount of drilling.

**Version 2 'ÄBI'** (Named after Eberhard Duppel, who has organized the tournaments in Mühlacker for many years). Span: 29cm. Weight (including two CR 2025 coin cells): between 75 and 78 grams depending on the fluting. This design has flush mounted LED's, a double battery case and an external contact point.



Here the LED's are fitted so that they use the entire depth to achieve a flush finish with the surface of the boomerang. The LED's are set solidly in epoxy resin and the first 2mm merely serve as a refractor. This area is ductile, without disrupting the function.

This also enables the lights to be fitted at the end of the airfoil, as the flush LED's will not create any turbulence as the boomerang is thrown. In flight, the light pattern consists of an exterior light ring with a pulsating centre.

For two-coloured versions blue and green can be combined without the need for a transformer.

To achieve both, a higher material stiffness around the battery casing and a guaranteed increased electrical supply, for this model I installed two CR 2025 cells into 2.5mm deep holes drilled into the underside of the boomerang. The difficulty lies in not damaging the remaining 0.5 mm any further as this provides the added material strength over the previous model.

For this purpose I both reduced the central drill of a 20mm hole cutter to a 1mm diameter bit and ground the cutting edges to make them rectangular. This results in an even cut with a small whole at its centre. Through this hole, the contact flex is soldered to the upper copper face.

The flex is a thin snail-shaped wire. By forming evenly the flex gains a certain amount of spring tension, hence the contact surface of the flex is enlarged without taking up too much space within the battery compartment. This way the coin cell will sit flush with the underside of the boomerang and can be secured by copper discs and sticky tape.

Installing a further copper disc at the contact point enables the on/off function.

**Version 3 'BOOMERANG 33'** (Named after the famous French boomerang club in Bordeaux)

Span: 29.3cm. Weight (including coin cell CR 1620): between 73 and 76 grams depending on the fluting.

Here the LED's are fully integrated, the copper face is etched and the battery case optimised.

By fully integrating the LED's into the back fluting, a higher degree of illumination is achieved. The transparent GFK works as a diffuser meaning the LED's are visible throughout the full width. The LED's are set into holes close to the conductor; the remainder of the installation is as per version 2. With this design fewer LED's are required to achieve a better effect as before meaning smaller coins cells can also be utilised. A mechanical joint between the poles of the coin cells improves the contact in order to guarantee the boomerangs functionality. Though the potential operating time of the boomerang is shorter; the battery can be changed more easily. In addition, the lights are activated by inserting the coin cell.

The drilling of the battery case is similar to that of version 2, however the diameter is decreased to 16mm and the depth increased to 2.6mm. The inside edge of the hole has a 1mm chamfer, which helps to strengthen the upper shell of the battery casing. Through the small hole in the battery case, a contact point is soldered to the upper copper face. This contact point protrudes into the battery case by 0.5mm and is 3mm in diameter.

A bow-shaped copper plate is soldered onto the lower copper face alongside the edge of the hole in the area of the front profile with a slight protrusion. In the opposite area, the edge of the hole has to be chamfered slightly so that the coin cell can be inserted fully. The battery is pressed down between the positive and negative terminals. This tension is held by sticky tape and offers a very reliable contact. The coiled etched conductor looks good and provides a reduction in weight. The main reason for this design change however is to increase the boomerangs resistance to becoming damaged in heavy landings. In such situations, the boomerang bends, this results in an expansion of the copper face on the one side and a compression on the other side. Following such an incident, the copper is unlikely to return completely to its former shape. This means that the naturally flexible GFK is prohibited from 'springing back' resulting in a distortion in the shape of the boomerang. With the coiled copper track, the expansion and compression only affect a particular length of copper, which is the length of the copper face in bending direction. In our case, this length is only a few millimetres and the bending radius is negligible, any expansion of the copper is therefore prevented. The elastic force of the boomerang is maintained.

With the help of the fully integrated, flush mounted construction and the etched copper face we regularly achieve a quality of flight equivalent to standard LD boomerangs.

All boomerang models with a 3mm material thickness are eligible for the aforementioned light engineering.

