LZ 45  "L 13"

1:144

- Thorsten Brand -
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This is an accurate scale paper model of the airship LZ 45 (flown as “L 13” for the German Navy in World War I) in scale 1:144.

The model is free, it can be downloaded, printed and built by anyone as often as requested. It may not be sold, either in digital or in printed form. Please notify thorstenbrand@gmx.net of violators.

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The LZ 45

LZ 45 was a 'p'-class Zeppelin airship. It was built by the Luftschiffbau Zeppelin in hall 1 at Friedrichshafen and entered service in the German Navy as "L 13" on July, 24, 1915, 1. Its commander was Kapitänleutnant Heinrich Mathy, one of the most famous airship commanders of the First World War. "L 13" took part in several bombing raids over England. It was one of the ships which attacked London on September 8th and October 13th, 19152. As newer and better ships were available, LZ 45 received a new role as a training ship, identified by a white stripe around the ship's bow (see profiles below). "L 13" was decommissioned in late April 1917 and scrapped in December of that year. During its operational career, "L 13" logged a total of 159 flights, which included 17 attack and 45 reconnaissance missions.

Technical data:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
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<tr>
<td>Length</td>
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<tr>
<td>Height</td>
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<td>Width</td>
<td>25.789 m</td>
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<td>Volume</td>
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<td>Engines</td>
<td>4 x Maybach C.X,</td>
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<tr>
<td></td>
<td>210 hp, 1200 rpm</td>
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<tr>
<td>Mass</td>
<td>21470 kg</td>
</tr>
<tr>
<td>Crew</td>
<td>18</td>
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</tbody>
</table>

LZ 45 "L 13" as seen during front line operations.

LZ 45 "L 13" as seen during its career as a training ship.

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1 Schiffskunde LZ 45
2 Robinson, D. H., Deutsche Marineluftschiffe 1912-1918
3 Schiffskunde LZ 45

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**The model**

This model represents LZ 45 as seen during its combat career. In 1:144 scale, the model measures approximately 1.14 meters (44.8'') overall.

**Construction sections:**
The model is broken down into five construction sections:

1) Skeleton
2) Hull
3) Front gondola
4) Rear gondola
5) Final assembly and details

**Printing:**
The part sheets have to be printed on white DIN-A4 paper\(^4\) of different weights as listed below. In the U.S. Use legal size paper which will leave approximately 2 ½ inches unused at the bottom of the page. Before printing, deactivate the "fit to page"- function. Every page has cm-scale bars to control the print settings.

- The **parts for the skeleton** have to be printed on 250 g/m\(^2\) paper  
  (U.S.: use .055" mat board, .050"/1.3mm illustration board or 1mm cardstock).

- The **parts for the hull** have to be printed on 120 g/m\(^2\) paper  
  (U.S.: use 90 lb cardstock).

- The **hull join strips** have to be printed on 80 g/m\(^2\) paper  
  (U.S. use 65 lb cardstock).

- The **parts for the fin skins** should be printed on 80 g/m\(^2\) paper, 120 g/m\(^2\) paper won't show the translucent appearance like on the real subject.

- The **parts for the gondolas** should be printed on 120 g/m\(^2\) paper.

There are three pages which need to be printed on both sides.

The kit also includes a stand onto which the model can be clamped to ease skinning, gondola assembly and transportation. The sheets for the stand should also be printed on 250 g/m\(^2\) paper.

Additionally, 0.5 mm (.020'') plastic rod and 0.4 mm (.016'') wire is required for struts.

Templates for **crew figures** in 1:144 are available separately.

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\(^4\) Letter format should work as well
Stand
The stand consists of two parts which can be connected so that the body of the Zeppelin rests above the table, providing enough height for the gondolas and the propellers.

The upper part of the stand is built up from the parts U1-U4 and JT1 and JT2.

The lower part is similar (parts B1-B4 and JB). Insert a piece of rolled paper through the holes of B1 and U1. Onto this, laminated parts UB can be plugged. Another set of paper rolls can fix the upper part of the stand to the lower.
**Skeleton**

The skeleton is built with a series of rings and longitudinal girders. It is divided into five sections. The skeleton is NOT symmetrical across its diameter! The sector which depicts the keel of the ship is marked with the value of the original longitudinal coordinate (in meters), measured from the last ring forward.

Additionally, a “backbone” with triangular cross-section is run into the rings. Construction starts with the backbone.

Parts **St1** are glued to a triangular tube using tabs **TSt1**. The same is done with parts **St2**, **St3**, **St4** and **St5** and their respective tabs. Parts **St2-a,b,c** and **St5-a,b,c** have slits and openings (red rectangles) and have to be positioned like seen on the front and back views above. The slits seen in the back view (red lines) must not be closed! Extensions of the fins' formers will slide through them. The sections are connected with the joiner tabs (**JstX-Y**).

Assembly continues with the fins. For the top fin, one part **F5tt** is glued on each side of part **F5t**. The same is done for the lower fin with parts **F5bb** and **F5b**. For the left and right horizontal fins, part **F5eee** is on the bottom, **F5ee** is in the middle and **F5e** is on top. Two mirrored examples are made by laminating these parts together. The thin joints have to be soaked with CA (superglue) to avoid the fins from sagging on the finished model.

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The fin trussworks are covered with their skins (parts F1–F8) as seen above, the tabs on the parts need to be folded 90° away from the skeleton.

The formers of the main body are assembled by plugging the longitudinal girders and rings together. The rings and slits on the longitudinal girders are labeled with their 1:1-station number for identification. The station number is located on the keel side of each ring so that all rings align along the keel. L2t with the cutout for the platform has to be placed in the roof ring slits. Parts L4e are positioned near the slots for the elevators on each side, L5e follow behind them. The roof slits of the sternmost segment are empty.

The upper and lower fins are inserted in their respective slits. The horizontal fins' extensions run above the horizontal longitudinal beams towards the center. All extensions may be connected with strips of paper. Parts L45 are placed in front of the lower fin, parts L55 in front of the horizontal fins as seen above. The segments are plugged onto the backbone and joined with the parts JX.

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**Hull**
The hull is made from individual tapering strips at the bow and stern and bigger parts at the cylindrical sections. First, on all longitudinals *joiner strips* are glued.

The skin application is best started with the last strips around the control surfaces (*parts H14-H29*), working forward. A map on the next page shows the parts' exact positions. *Part H02* closes the hull at the bow, *part H01* at the stern.

The gun platform (part *T1*) must be glued into the cut out in part *L2t* before the surrounding skin is applied.

Above each gondola a hatch may be cut out (black rectangles on parts *H8* and *H49*). Then, parts *K2* and *K1* have to be folded as seen above and glued to the backside of the hull parts, imitating the gangway of the real ship. The hatch to the upper gun platform on *part H58* can be cut out and *part T10*, formed to a rectangular tube, will serve as staircase. This will go through the openings in parts *St2-a/b*.  

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For the control surfaces, parts $R(h,u,d)$ 1 and 2 (h=horizontal, u=top, d=bottom) are laminated in the order 1-2-1. Between the single strips of part $R(h,u,d)$ 2, a piece of wire is placed to serve as an axis. Then the rudder is covered with parts $R(h,u,d)$ S1/S2. The trailing edge is slightly pressed into the gaps between the struts to represent the sagging of the fabric.

The rudder axes are then plugged into the small holes in the longitudinal beams behind the stabilizers. Onto each dark stripe on the hull a thin ring (parts BX) is glued. The number (X) thereby stands for the longitudinal station number of the real Zeppelin. Between the control and stabilizer surfaces, the parts are divided into four (u=top, d=bottom, l=left, r=right).

The body of the airship is now finished.
**Front gondola**

First the commander's car is built.

The interior of the commander's car is formed by parts GF 1 and GF 2. Trusses, tables and other items are glued to the marked areas as seen in the pictures.

The radio room is separated by part GF 28 with a table (part GF 29). Chairs are placed inside the car. A crew may be added now. Parts GF 3-GF 8 are assembled and GF 9 and GF 10 are glued behind the openings. Cellophane has to be glued behind the two small windows.

The interior is glued into the outer face. The trusswork for the ceiling is built up from parts GF 31, GF 32, GF 33 and GF 34. Two trusses (GF 19) are added before the trusswork for the ceiling is placed on top of all vertical beams.

The ceiling (GF 37) is placed on top and the last interior parts are added.

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For the windows, the openings in parts GF 44–GF 49 are cut out first and the paper is glued to cellophane, with the parts already shaped to avoid distortion. After the glue is dry, they are cut out completely and placed on the car like seen above.

Then the front engine car is built.

The interior is formed by parts GF 50 and GF 53. The engine is assembled from parts GF 58, GF 59 and GF 60. A wire shaft is added between motor and gear and from the gear to the aft end. Small parts are placed in the car as seen in the pictures.

The exterior parts (GF 51 and 52) are glued onto the interior (add transparent foil behind the windows) and part GF 65 is glued on top. Part GF 76 connects the two forward cars.

After the front engine car and the commander's car are joined together by part GF 76, part GF 77 seals the step between the sections.
Rear gondola

The rear engine car is built up similar to the front engine car.

Parts GM 1, GM 2 and GM 3 are held together by parts GM 5, GM 6 and GM 7. Floors are added (parts GM 8 and GM 9).

The engines (parts GM 16, GM 17 and GM 18) and gears (parts GM 11–GM 15) are placed inside the car with wire as axes. Various floors, trusses and other items are added.

Cellophane is glued behind the windows of the part for the exterior skin (part GM 4) before it is added to the interior. The last interior parts are glued into the gondola.

Part GM 38 is preformed as the ceiling and part GM 37 is glued 17mm in front of the first fold to the inside. Then the ceiling is glued to the gondola. The front windows are treated as the ones for the commander's gondola and glued to the car.
**Final assembly and details**

The front gondola is attached to the airship's hull with struts.

The drawings at the end of this document show the exact lengths and positions of the struts. An oil cooler is shaped from part GF 80 and fixed to the hull with parts GF 81. Other parts are added to the gondola according to the picture above.

Handrails have to be made from plastic rod or wire. Templates are provided at the end of this document. The propeller is assembled from parts GF 72, GF 73 and GF 74 and then glued to the black circle at the aft end of the engine car.

Six machine guns are made from parts MG3 and MG4 each. The MG nest at the top of the ship is completed like seen in the picture. The handrail (part T8) can be substituted with plastic rod for a better finish. The platform is equipped with three tripods (parts MG0, MG1, MG2) but only two machine guns. The other weapons may be glued to the tables behind each of the large windows of the gondolas.
The rear gondola is glued to the hull with struts in the same manner as the front gondola. As usual, templates for all struts are provided at the end of the document.

Here, three oil coolers (parts GM 51-GM 53) are added. Thereby the longer struts (parts GM 52) are for the outermost trusses, GM 53 for the inner trusses.

Further detail can be added by connecting the oil coolers with the gondolas and the body of the airship like seen on the drawings.

The outrigger gearboxes are identical on each side but are not located symmetrically on the hull. On the left side, the truss frames are attached in front of ring 57.5, on the right side behind ring 57.5.

The gears themselves are built up from parts OG0-OG6. The trusswork needs to be assembled from 0.5mm plastic rod. The drawings at the end of this document may serve as templates for the struts.
The remote drive shafts link the outrigger gears to the gears in the engine car, the skin of the gondola therefore has one small hole on each side. Handrails and other details are added like on the front gondola.

The rudder horns consist of three parts RA 1 laminated together with RAS 1 and RAS 2 as skin. One rudder horn is glued to both sides of each rudder. The flag is laminated together and added to the flagpole (Two versions are provided, one with the pole in paper and one with only the endcap. For the latter, the pole itself is built from wire.). The flagpole is then fixed to the point of the airship's stern. The model is finished.

* The Zeppelin featured extensive rigging between the body and the gondolas and to the fins. However, the cables can only be seen on close up pictures, so the most common model rigging methods would result in an out-of-scale impression. Additionally, no reliable data on the fins' rigging could be found.
References

- Admiralty War Staff Intelligence Division, *German Rigid Airships*, The Naval & Military Press Ltd, 1917 (Reprint 2008)
- Author unknown, *various detail drawings and photos of p-class Zeppelins*, Archiv der Luftschiffbau Zeppelin GmbH, 1915-1918

Additionally, I'd like to thank Andreas Horn and Harry Redner for their extensive and competent support on the subject, and Major Charles Davenport and Janina Lange for corrections of the instructions.
Templates for attachment struts of command and front motor car.

Templates for attachment struts of rear motor car.

Templates for handholds.
Templates for drive shaft struts and side propeller frames.
Use plastic rod or wire (diameter approx. 0.4–0.5 mm).
Assemble as shown in the drawings.