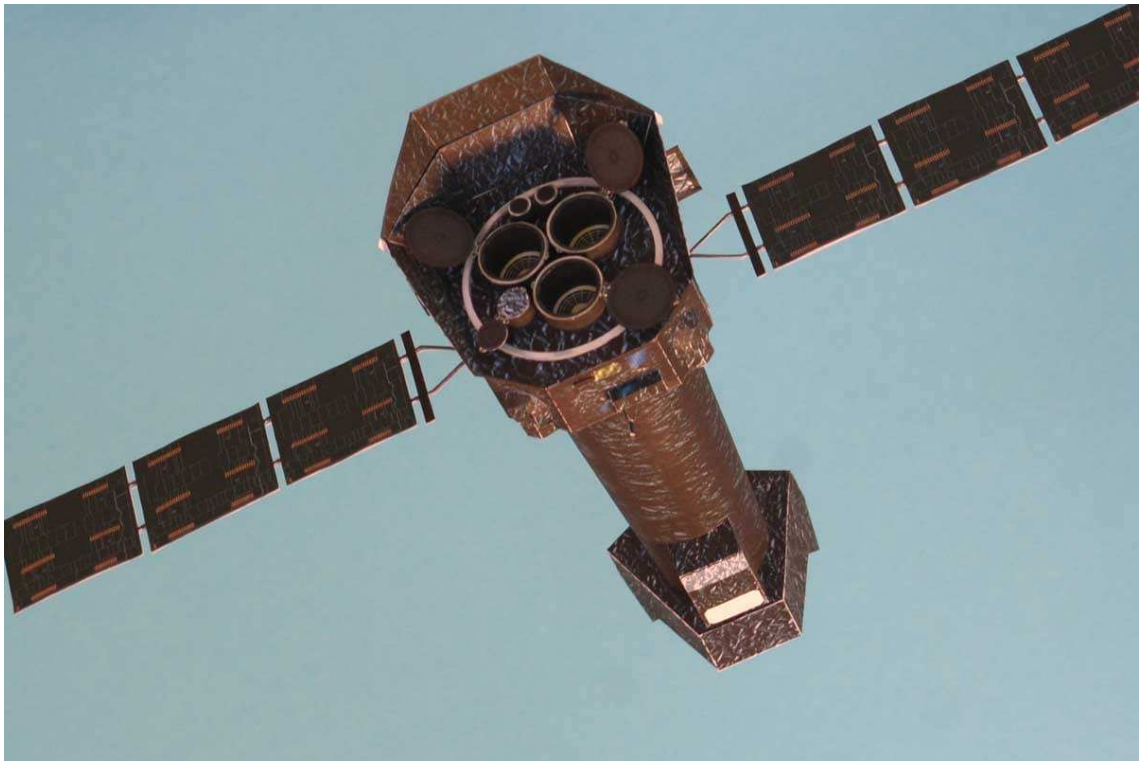
# XMM-Newton

Card model - Scale 1/48 - designed by Thorsten Brand



This is a scale-paper model of the XMM-Newton Spacecraft in 1/48. It is designed to be printed onto conventional paper. If you wish to build it in 1/24 what is a bit easier than 1/48, please print it onto slightly heavier sheets of DIN-A3-paper. If you do so, set the printer's scale up to 200%. Otherwise, just leave the scale at 100% and use DIN-A4-paper. Some parts should be strengthened by gluing them onto cardstock. This is mentioned in the instructions when needed.
Before you begin you should have
-small scissors and a knife to cut out the parts,
-a needle,
-a ruler,
-glue (do NOT use a glue-stick!),
-toothpicks to disperse the glue,
-florist wire or a barbecue stick for the solar panels and
-a table where you can work without being disturbed and where you can let the parts laid out when you need a break.

Before cutting out parts, take the ruler and a needle and carefully scribe in all lines which will be folded later. This should be done to ease folding and results in more exact edges.
There are two types of folding lines: The dashed lines have to be folded backwards, the dash-two-dot lines forwards, as seen from the inked side of the paper.

The model is divided into three main parts: The Service Module, where the telescope-openings are, the telescope tube and the Instrument Section. You can build those three parts separately and then, put them together. For various small parts it is easier to attach them in the end, as it is done in this manual.

**1-Service Module**

Cut out S1 and pierce in the two holes for the solar arrays. Fold and glue it into a ring.

Glue S9 onto cardstock and let it dry.

Cut out S2. You have the option between detailed and simplified telescopes. For the detailed version, cut out the three yellowish openings like shown on the picture on the right.
If not, simply let them closed.

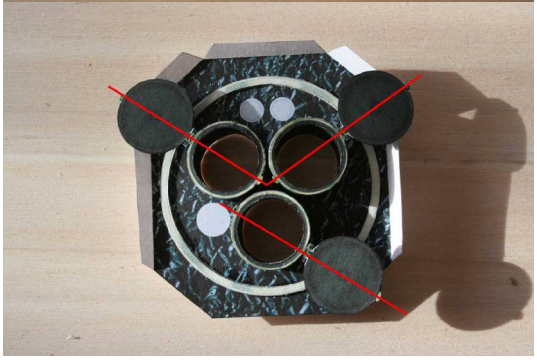
Now cut part S9 (cardstock!) to a ring and glue it onto place on S2 (grey ring).

Cut out Parts S10 and S10b and roll them into small tubes. S10 is the outside-part, S10b for the inside. Glue them together as shown in the pictures, shifting them to the half of each other.
If you chose the detailed variant, do the same with parts S11 and S11b.


Now take part S10c. Cut out the opening in the ring on the left side of the part, and fold the right sides such that it gives a cover for the tube.

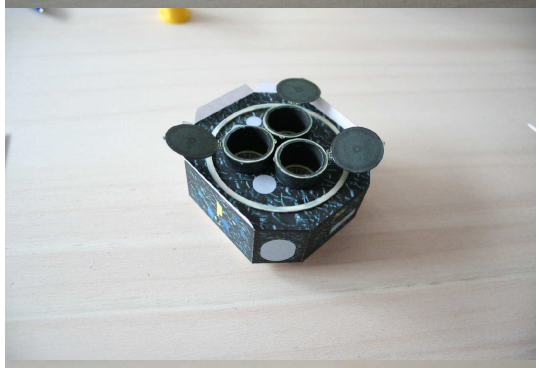
Glue the S10/S10b-tubes (and for the detailed variant also S11/S11b for the inside) to the opened ring of S10c from the back, like seen on the picture. Repeat two times.
Let it dry for a moment.

Now take the tubes and glue them onto S2, considering the orientation of the covers (see photo).
If you chose the detailed version, the bottom half of the inner tubes should stick out of S2.
**NOTE:** To ease handling the model while building, you can also glue the telescopes to the bus in the end, but you need to attach parts S11c first and trim them to pass through the openings in S2.



In case of building this version, glue now one S11c behind each tube.

Now glue S2 to S1, and take care of the correct orientation (refer to red dots) and that the white flaps around S2 are free of glue. Now your model should look like the one on the right.

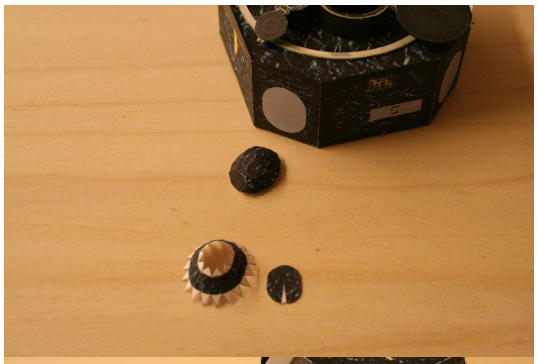


Cut out S3, and also the red circles on it. Glue it to form a ring. Glue the ring into the inside of the Service Module, the holes in S3 have to align with the holes for the solar arrays in S1 (see red line on the photo).
Now glue S4 to the flaps on the open side of S1 and to the ring. You should have a closed box now.

Glue parts S13, S13b to tubes like you did with S10, and place S13c on one side and close that with it. Repeat one time. Place these two tubes on the two grey circles on S2.


Cut out S14, S14b and S14c and do the same as above. S14c is a cover like S10c. Glue it onto the tube made from S14/S14b. Glue this tube on the last grey circle of S2. Once more, respect the orientation! The cover should point away from the centre of the large telescopes.

Cut out S7 and S8. Glue S7 to a ring, and bend S8 into a convex form. S8 has to be glued to the inner flaps of S7. Fold the flaps at the outside of S8 to the inside of the created part and glue it-with the seam pointing away from the telescope openings (in this picture downwards)- to one of the grey-marked areas of part S1 .
Repeat three times.



Now glue parts S12 as shown in the picture. They have to be attached to each of the four bulges you made before, the trapezoidal face aligning with the surface of S4 and the open side covering a part of the seam of S7.

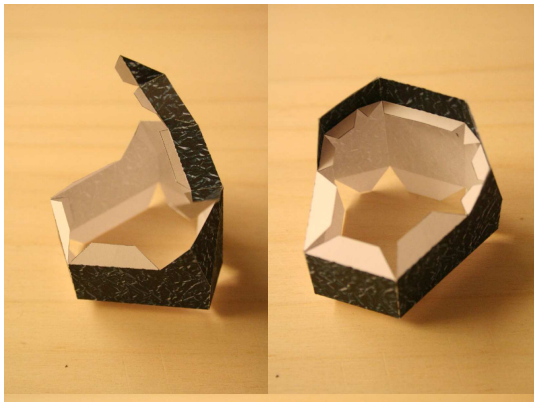
Cut out S5 and fold it carefully. Glue the centre-area of the side where all panels hang together to the centre flap on S2, then continue with the outer panels. Now fold and glue the separate panels to the inside. Take care not to damage the covers of the telescopes.

**2-Telescope tube**

Cut out T1 and T2. They will represent the large tube which connects the Service Module and the Instrument Section. It is a slightly conical part and you should pay attention that it is round and has no edges. Therefore you should lay the part S1 onto your table, with the straight edge parallel to the edge of the table, press it against it and-while doing that- slowly push it over the corner. This will make the part roundish. Do this a few times until there is no more tension when you join the two straight sides of the part.
When this is done, do the same once with part T2, and glue it behind one edge of T1. T2 now is the flap with which you can glue T1 to its final shape. Glue T3 onto the seam.
Let dry.

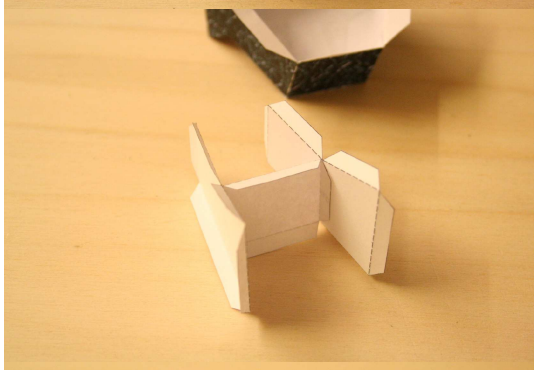
**3-Instrument section**

Cut out and fold Part I1. Make a ring as shown in the picture on the right by using the three flaps. Now fold the coloured stripe to the inside, and the flaps pointing upwards. Glue only the inked area together, so that the flaps stand nearly horizontally.

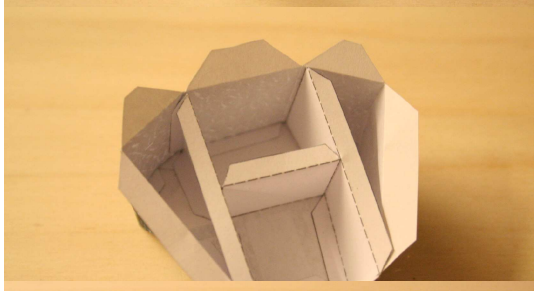


Cut out I2, fold it in the middle, and glue it onto the flaps.


Take parts I3, I4 and I5, and glue them into an “H”-shaped structure.



This structure has to be glued into I1 for stability. Trim the flaps where needed.
Close the object by gluing part I6 to the open side. Let dry a bit.

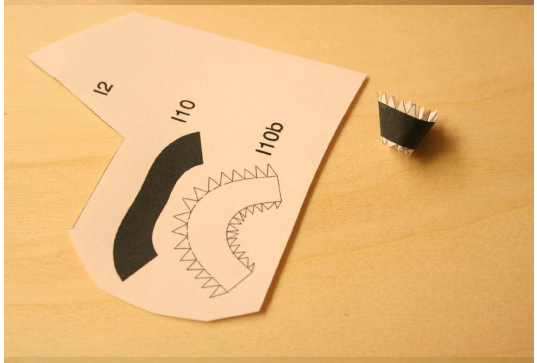


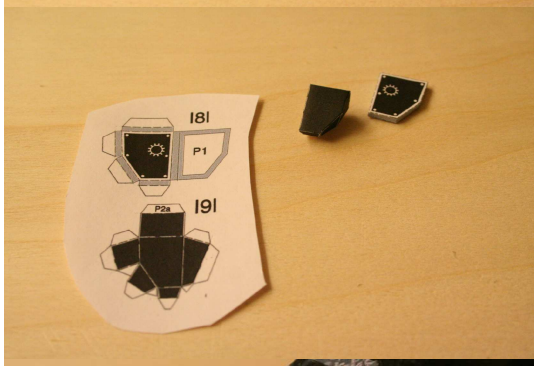
**4-Further Construction**

Take the Service Module and the Telescope Tube and glue the wide end of the tube onto the grey circle on S4, with the seam pointing to the middle of the centre section of S5. Make sure that it is round. Let dry for a minute. Then do the same with the Instrument Unit (see orientation in photos). Let dry carefully.

Take part T4 and glue it into a box with one open side. Glue T4 to the marked place on the tube. Attach T4b to its place on T4.

Cut out I10 and I10b and roll them into conical parts. They are glued together like parts S10 and S10b. Fold all flaps to the inside. Glue I10c to the wide end. Glue I10 to the grey round areas on I2, the low side facing the black area of I2. Do this two times.
Take I7, fold it together and glue it on its place in the middle of I2, the high side facing to the two cones.
Fold and glue together I8r and I9r as shown in the picture on the right. Then glue the large, black area of I9r on its place on the bottom of I8r. Glue the whole part to the right grey area of I2.
Do the same with I8l and I9l.




The Instrument Section should look like in the picture on the right.

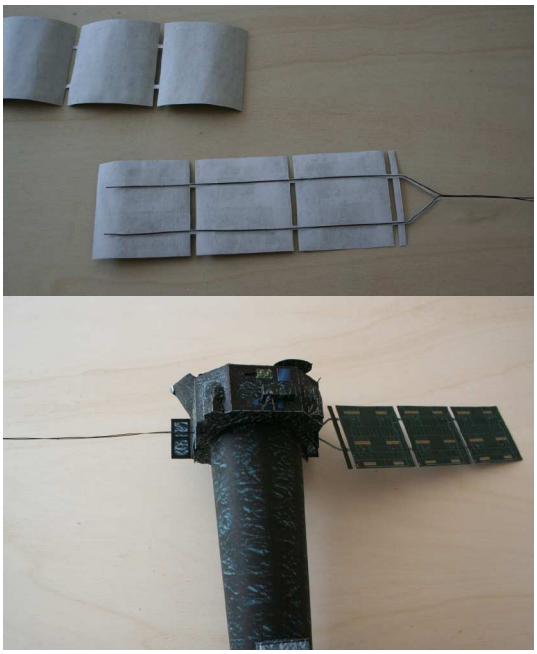
Cut out S15, fold and glue it. Repeat three times. Attach the pieces onto the four grey places on S4, with the trapezoidal side facing away from the tube.
Cut out and fold together the two parts Sp1, the coloured flaps pointing away from the parts. Glue them to the two edges of S1 which you can identify with their grey colour.

Fold and glue S6 into its shape. Take care that the two attachment points on both sides are free of glue.

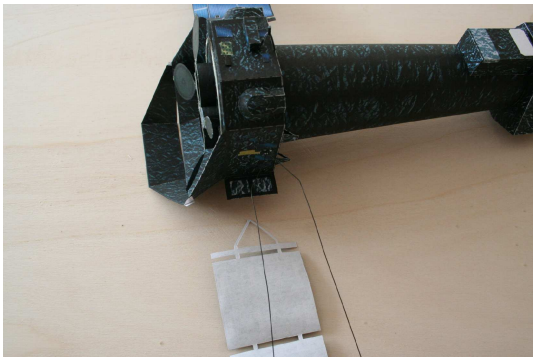
Attach S6 to S5. Use glue only on the white attachment triangles.
Let dry for a while.
Take part L1, fold and glue it to an open box and attach it to its place on S1, marked in grey.
If you wish, take sheet 4 and glue the details on the bottom to their place on the Service Module, this will give them a more plastic appearance.

Now take a break and decide how to make the solar panels. There are two options: one which is more sturdy but less detailed, and one with more detail but a bit wobbly. For the first option you need a wooden barbecue stick, for the second you need a preferably stable wire, such as florist wire. In the latter case, when orientating the model horizontally, the panels could bend through lightly, depending on the strength of the wire.
If you use a barbecue stick, simply cut out SpA1 and SpA2, but not the inner, white areas. Then glue one third of the barbecue stick onto the centreline one of the parts, the other two thirds extending beyond the support structure as an axis. Glue the second part to the top, “sandwiching” the stick. Let dry for a moment. Widen the holes in S1 such that the barbecue stick fits into them.
Now push the stick into the Service Module. Refer to the picture on page one for the correct side.
Cut out the other parts for the panels and glue them symmetrically to the stick, which sticks out from the other side of the module. Let dry for a while before attaching the last parts.

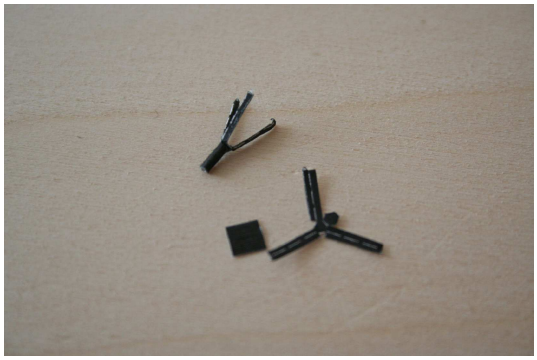
For the more detailed variant, cut out SpA1 and SpA2, but now also the inner, white areas.
Take two approximately 40cm long pieces of the wire and bend them as shown in the picture. Fix each wire with adhesive film to one of the parts. Glue the other part onto it, covering the wires. Make sure that the wires are very close to each other, and as straight as possible where they stick out as an axis.
Push the wires through the Service Module. See picture on page one for the correct side.



Bend the outcoming wire like you did on the other side, using the parts SpB1 and SpB2 as a template. Glue them to the wires after having shortened them to an acceptable length.
Let dry for a while.



Cut out S16, fold and glue it to the shape of a tripod. Roll S16a to a small cylinder and glue it to the hexagonal platform atop of S16. Do that twice.
Glue the legs of the tripods to the blue-marked places on S1.



Now you have finished your model of XMM-Newton. It was not an easy build, but we hope you enjoyed it! The next photos show you how it should look like.