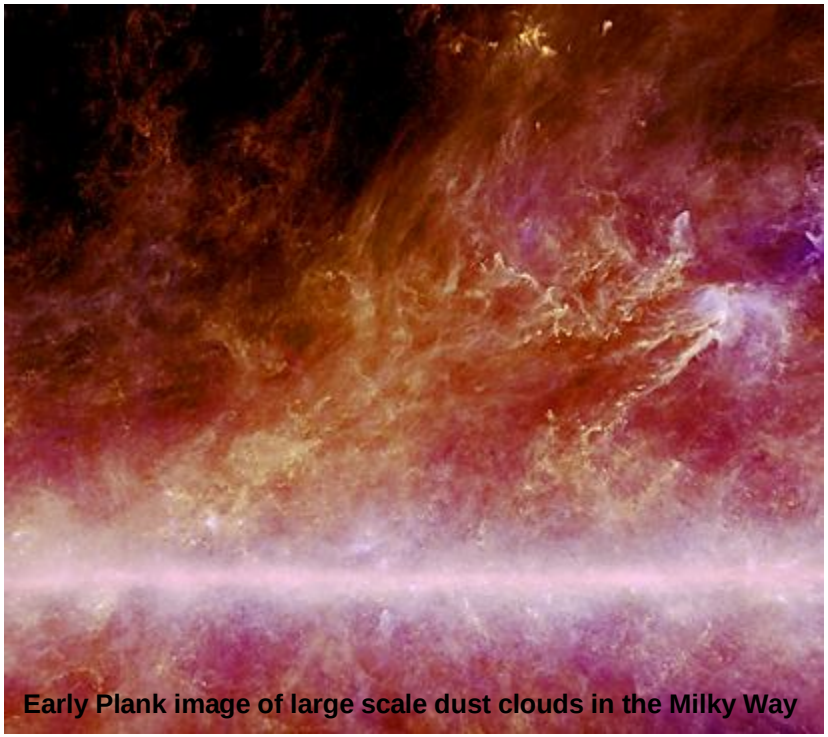
Planck microwave space telescope

1:48 scale



Early Plank image of large scale dust clouds in the Milky Way

The Planck mission will listen to the echoes of the Big Bang that created the universe. It collects and characterizes radiation from the Cosmic Microwave Background using sensitive radio receivers operating at extremely low temperatures.
Plank follows the COBE and WMAP probes. Plank is designed to give a sharper view of the CMB than its predecessors with much better temperature resolution. Plank's observations will be used to produce the best ever maps of the CMB radiation field.

Planck in a nutshell
The Planck satellite is a mission of the European Space Agency which has been designed to help answer key questions for humankind: how did the Universe come to be and how will it evolve. Planck's objective is to analyze with the highest accuracy ever achieved the first light that filled the Universe after the Big Bang, the so-called Cosmic Microwave Background radiation (CMB).

Launch and orbit:
Planck launched in May 2009, together with ESA's Herschel Infra-red Telescope. The two satellites separated after launch to operate independently at a distance of 1.5 million kilometres from Earth.

Telescope and instruments:
Planck carries a 1.5-metre telescope. It will focus radiation from the sky onto two arrays of highly sensitive radio detectors. Together they will measure the temperature of the CMB radiation over the sky, searching for regions very slightly warmer or colder than the average.

Participants:
More than 40 European and some US scientific institutes participate in the design and construction of the instruments.

Dimensions:
Approximately 4 metres high and 4.5 metres wide.

Launch mass:
About 1.5 tonnes

Operations:
Planck will rotate slowly and sweep a large swath of the sky each minute. In about 15 months it will have covered the sky fully, twice over. It will operate completely automatically and will dump the acquired data each day to a ground station within a three hour period.

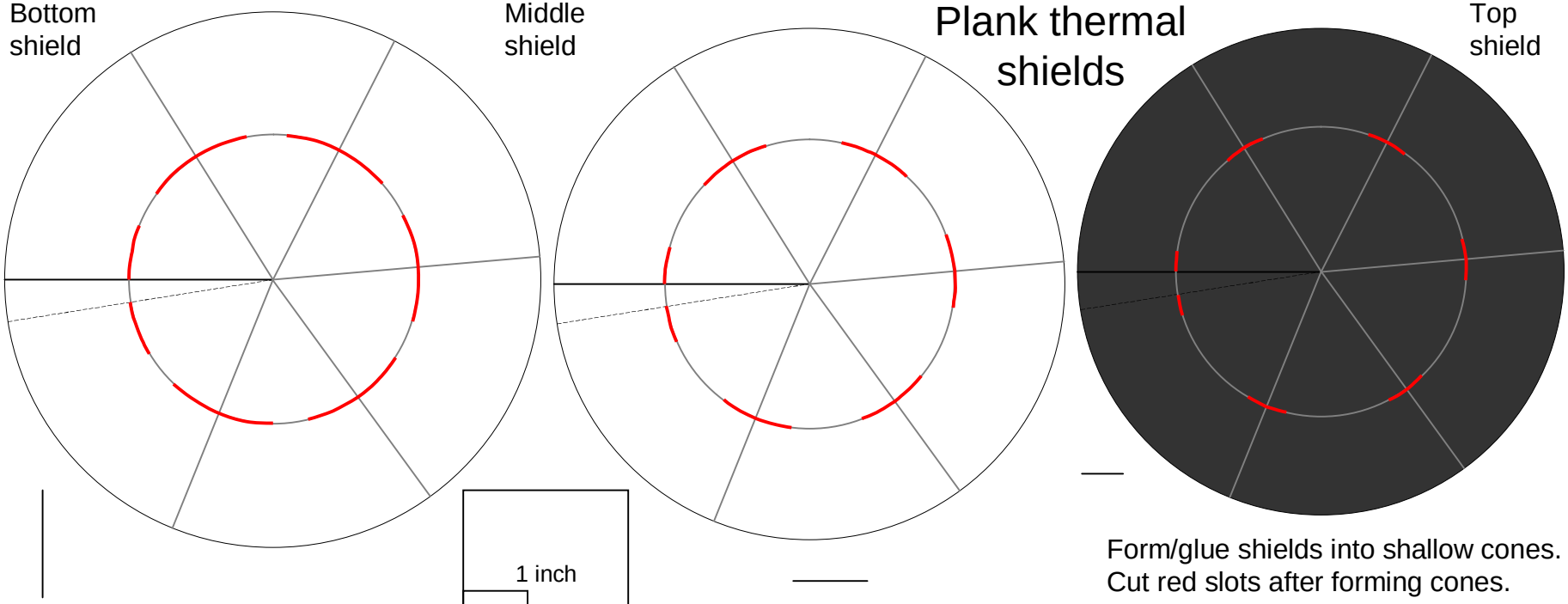
Operational duration:
15 months of routine operations are foreseen.

Plank thermal shields

Bottom shield

Middle shield

Top shield



1 inch

1 cm

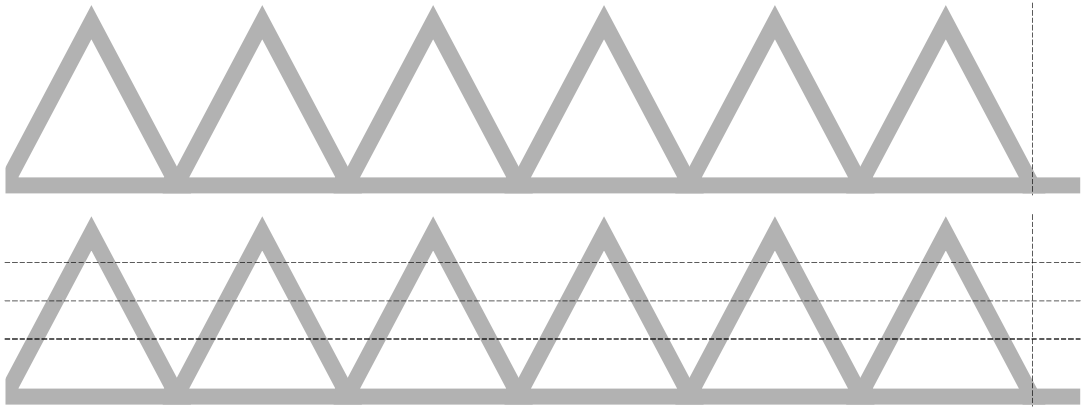
Form/glue shields into shallow cones. Cut red slots after forming cones. Slots must be wide enough for two layers of card to slip through. Struts slip through slots.

Overlap with other end to secure

Top Hex-frame

Overlap with other end to secure

Heat shield struts

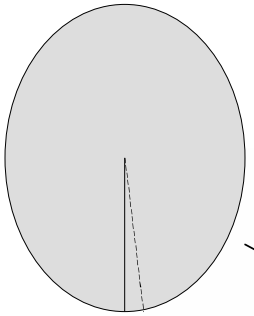


Glue struts back to back and form into a circle. Dashed lines go inside. Position lowest (widest) heat shield, slipping the shield over the struts using the slots in the shield and setting the shield on the lowest dotted lines. Glue in place.
Repeat for remaining shields.

Glue top frames back to back, bend on the dotted lines into a hexagon and join with the end tab. Glue to the top of the struts at the frame folds (straight between struts).

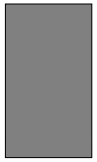
1:48

Plank telescope



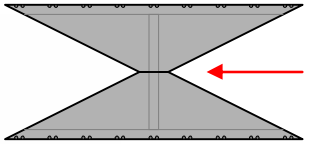
Primary reflector

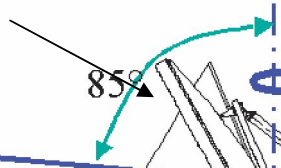
STRUT



Roll narrow struts or laminate to thick card and cut strips.

SHELF: Fold and glue across back plate and use to attach struts.





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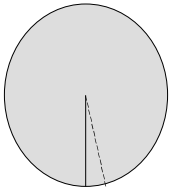
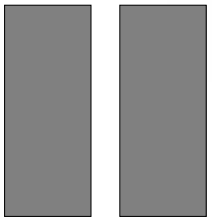
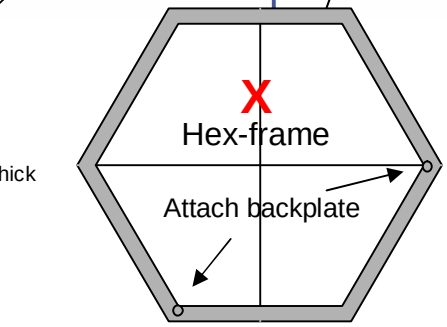
Secondary reflector



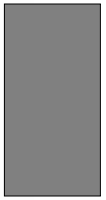
STRUTS

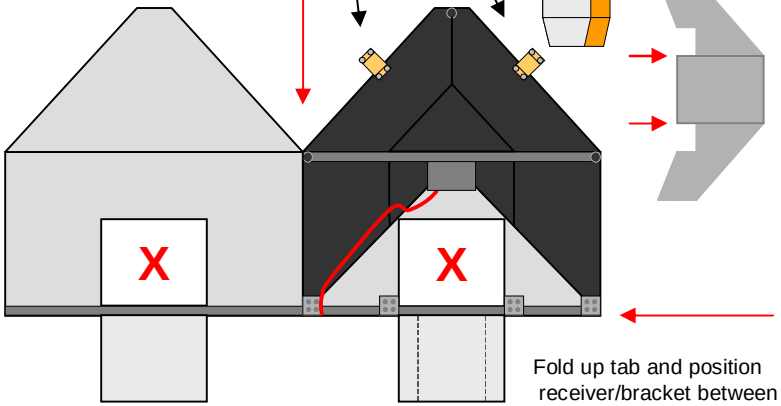


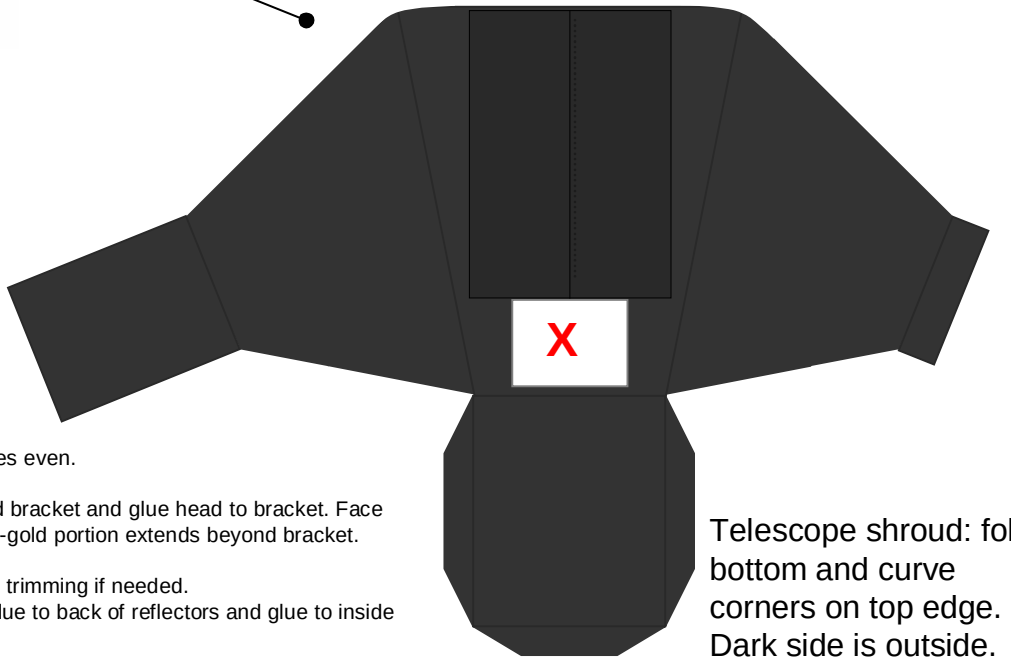
Roll narrow struts or laminate to thick card and cut strips.



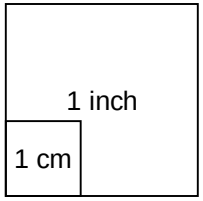
STRUT





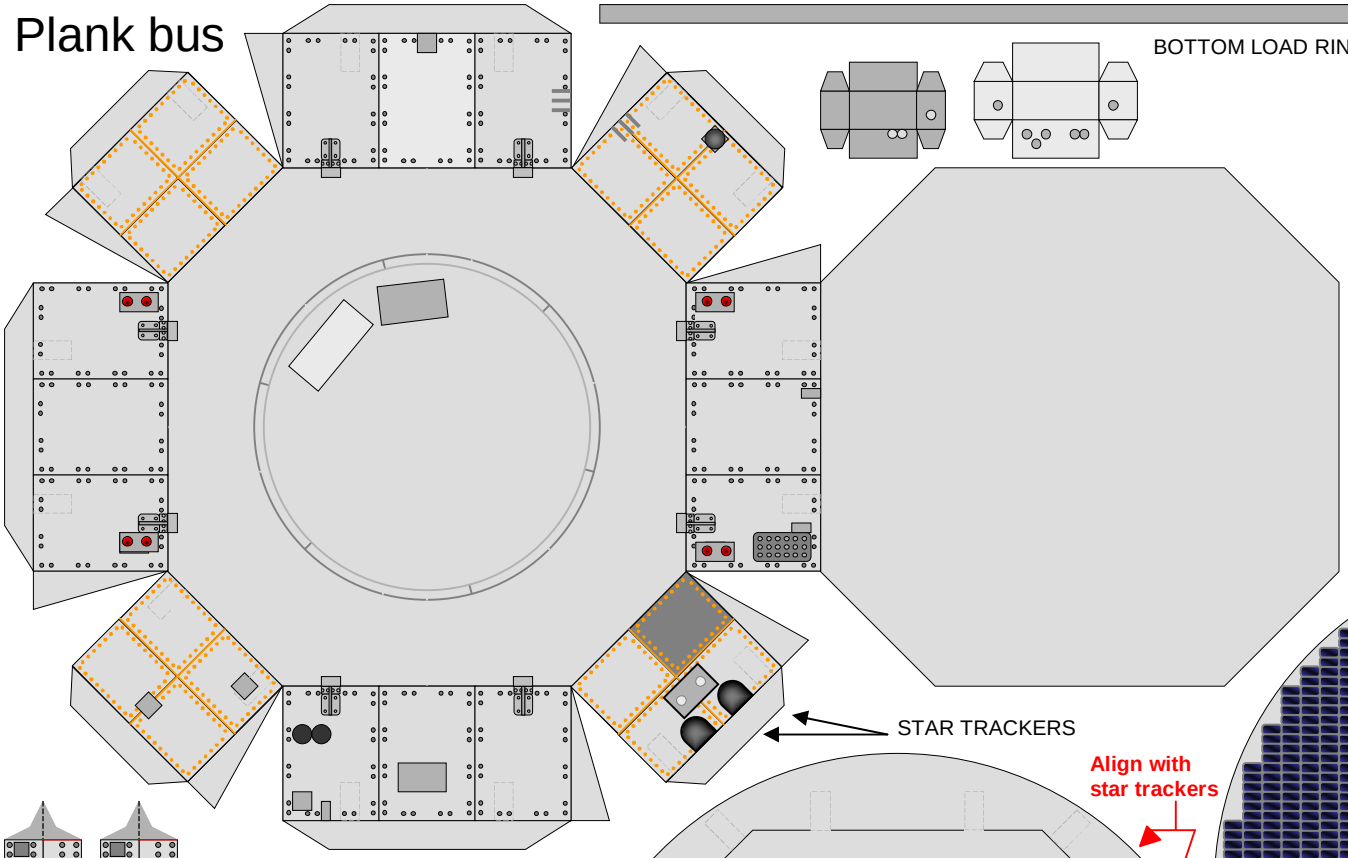


Telescope shroud: fold bottom and curve corners on top edge. Dark side is outside.



Assembly: Form/glue telescope shroud.
Fold/glue backplate and shelf, glue together.
Glue backplate assembly to shroud – bottom edges even.
Glue backplate/shroud to hex-frame.
Roll/glue and cap receiver head into cylinder. Fold bracket and glue head to bracket. Face of the receiver head is parallel to the bracket front-gold portion extends beyond bracket.
Glue receiver assembly to tab on backplate.
Form struts and glue as indicated on the diagram, trimming if needed.
Form/glue reflectors into shallow “cones.” Apply glue to back of reflectors and glue to inside of shroud as shown on diagram.

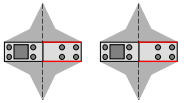
Plank bus

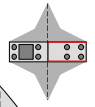


BOTTOM LOAD RING-CURVE INTO CIRCLE AND GLUE TO BOTTOM DISK

Form/glue bus into octagonal box.
Glue top and bottom disks together.
Glue bus to top disk where marked.
Form/glue bottom load ring into a circle and glue to the bottom disk.
Roll star trackers into short cylinders and glue to bus where indicated.

BOTTOM DISK

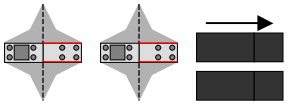




STAR TRACKERS

Align with star trackers

BUS-FOLD/GLUE INTO BOX



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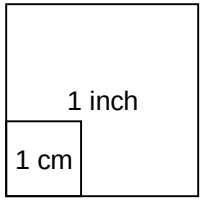
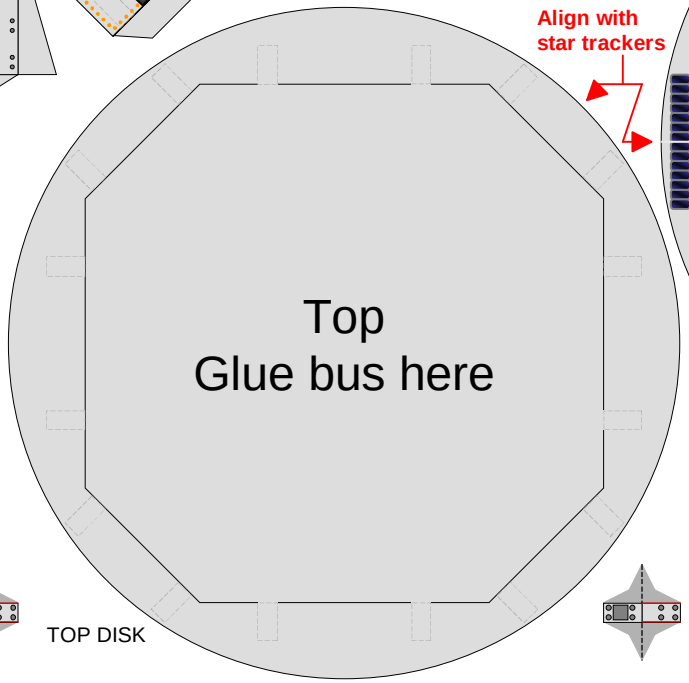
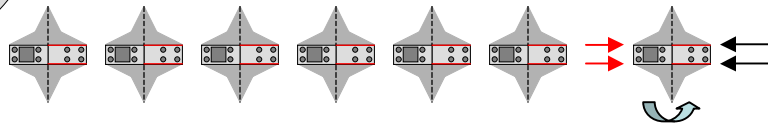
STAR TRACKERS ROLL INTO CYLINDERS AND GLUE TO BUS

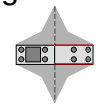




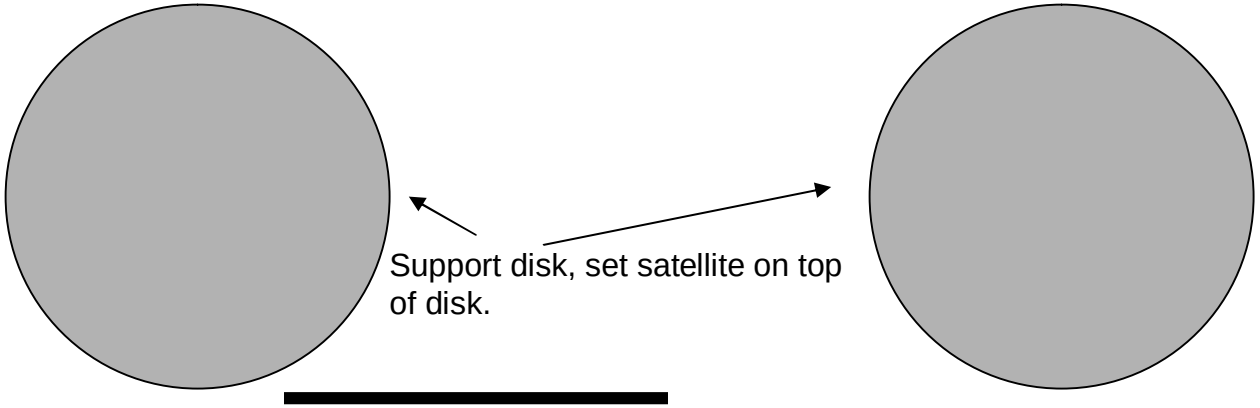
Base brackets – cut red lines, fold (printed side out) and glue 2 to each bus face and top disk.



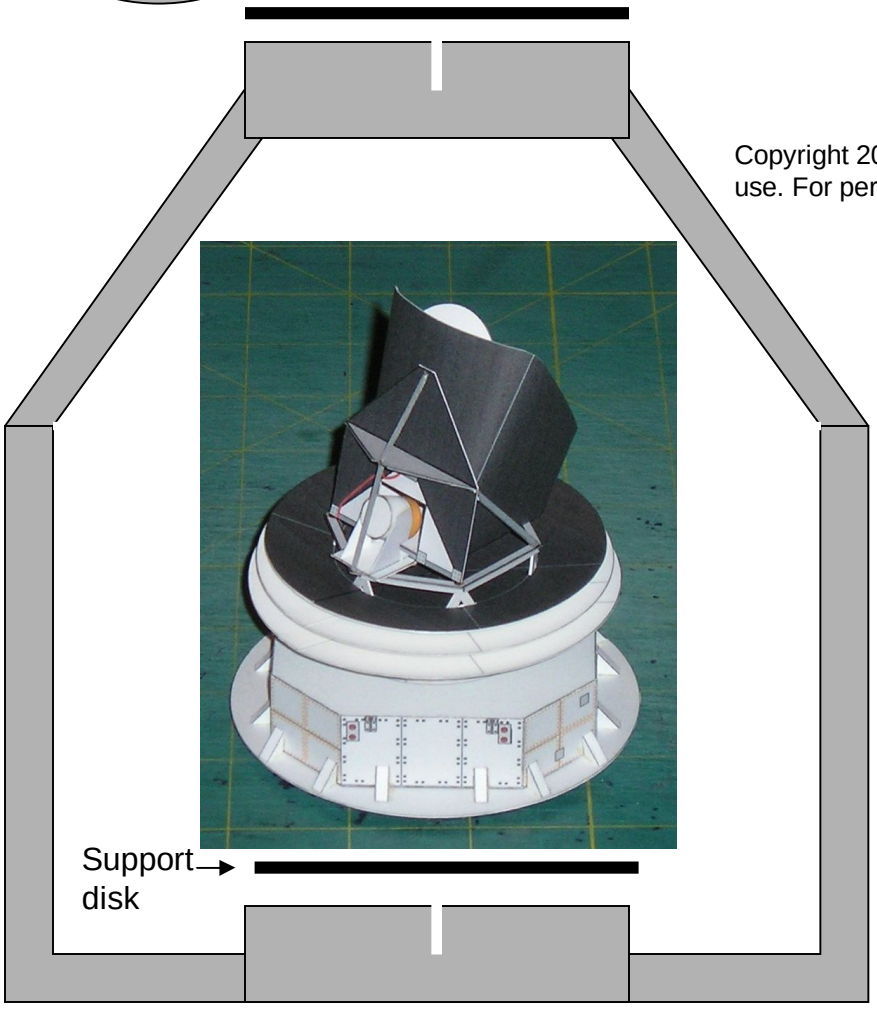
Final assembly: Glue telescope assembly to top of heat shields, aligning hex-frames. Glue bottom of shield struts to top of bus, aligning the bottoms of the struts with the tic marks. Antenna faces the same direction as the star trackers.

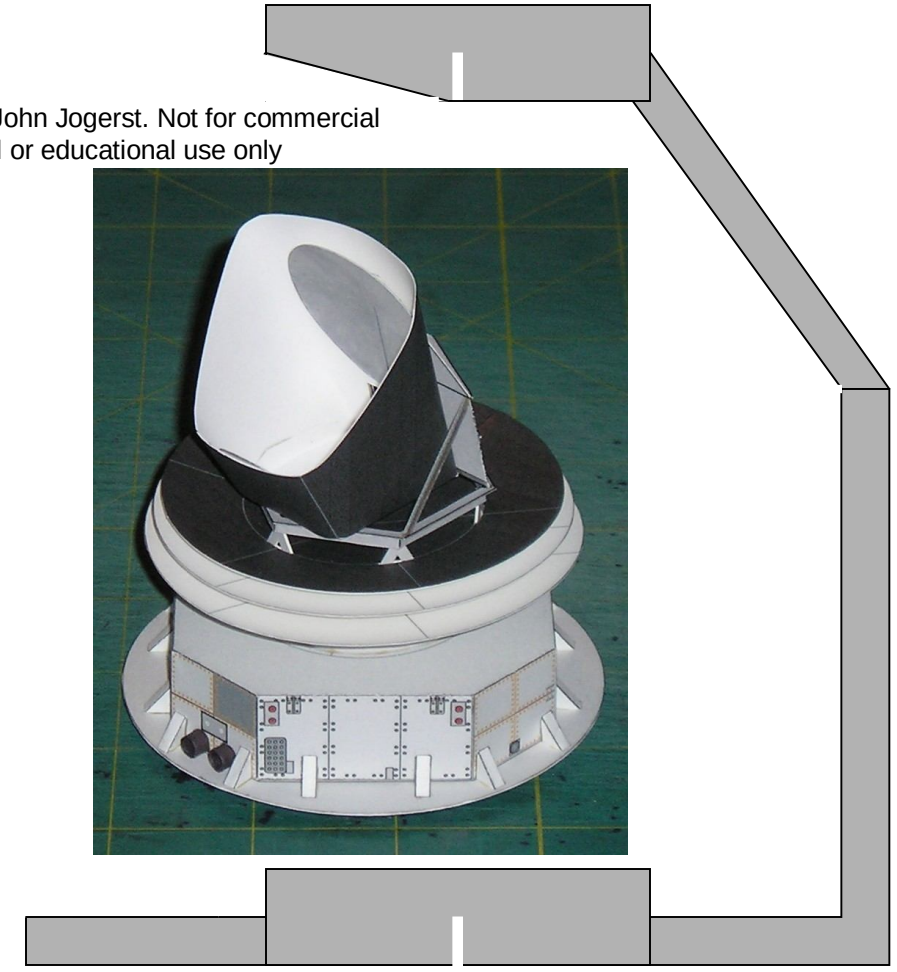


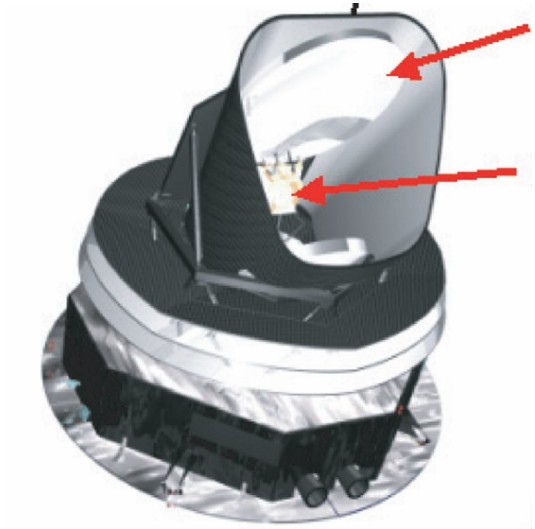
TOP DISK

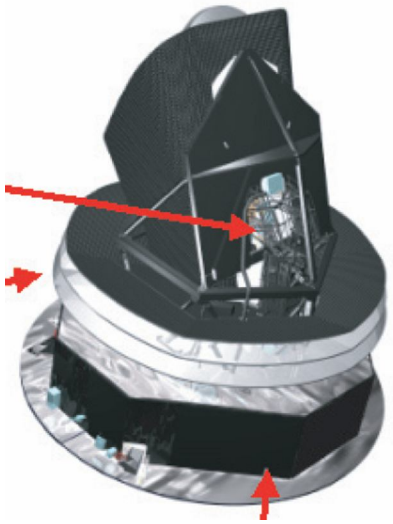


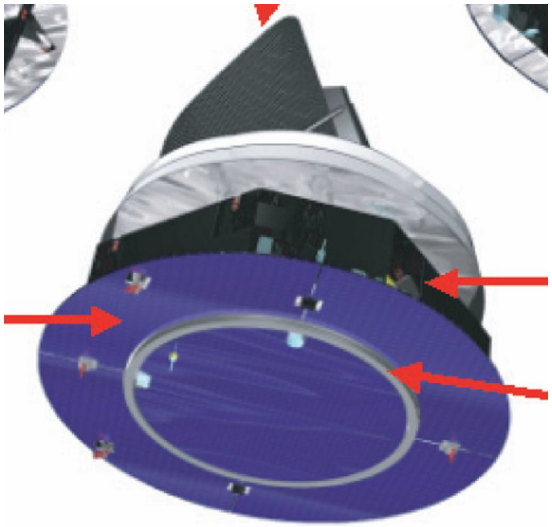
Herschel-Plank display stack. Laminate to thick card. Slip together using the notches. Glue disks on top of crossed frame pedestals.











Herschel

Planck