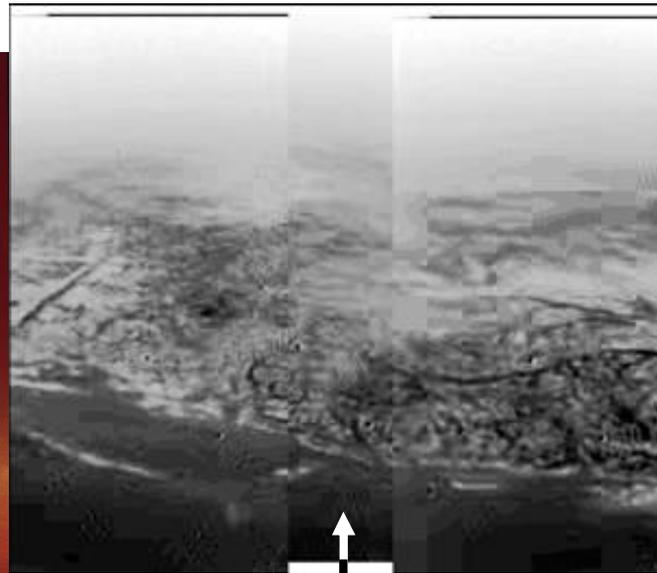


Huygens Probe to Titan/Saturn



View of Titan as Huygens descends
← Artist's concept of landing
Surface of Titan →

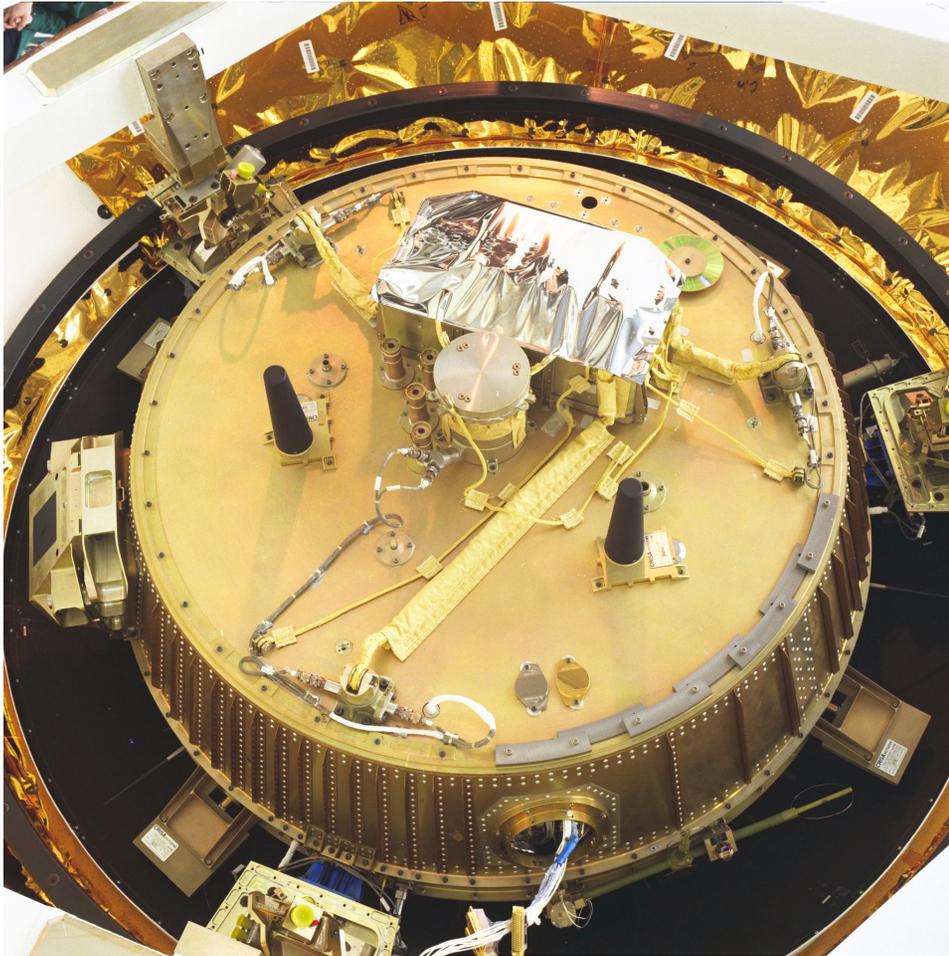


ESA's Huygens Probe was delivered to Titan by the Cassini Orbiter in January 2005 after a dormant interplanetary journey of 6.7 years - although Huygens was activated every six months for health checks. The probe started its descent through Titan's hazy cloud layers from an altitude of about 1270 km. During the following three minutes Huygens had to decelerate from 18 000 to 1400 km per hour. A sequence of parachutes then slowed it down to less than 300 km per hour. At a height of about 160 km the probe's scientific instruments were exposed to Titan's atmosphere, and at about 120 km the main parachute was replaced by a smaller one to complete the 2.25-hour descent.

Titan has intrigued planetary scientists for decades. It is the only moon in the Solar System with a thick nitrogen atmosphere. Hidden beneath thick haze, its surface had never been seen before in such detail. Huygens' pictures revealed a remarkably Earth-like landscape of hills, valleys and drainage channels.

The hills are made from ice, probably water ice although this remains a subject of debate, rendered hard as rock by the extreme cold. Huygens measured the surface temperature to be -179°C . Rain is highly likely but, instead of water, Titan rains methane and ethane. Although Huygens saw no seas of such exotic liquids, lakes of this concoction have now been confirmed at high latitudes. Huygens itself landed in a riverbed, which, although dry at the time of the landing, probably funnels the methane rain off the hills and onto the lower ground. Dark organic compounds created in the upper atmosphere also drift down to coat the moon's surface and mix with ice grains to form sand-like material which settles in longitudinal dunes.

1:12 scale

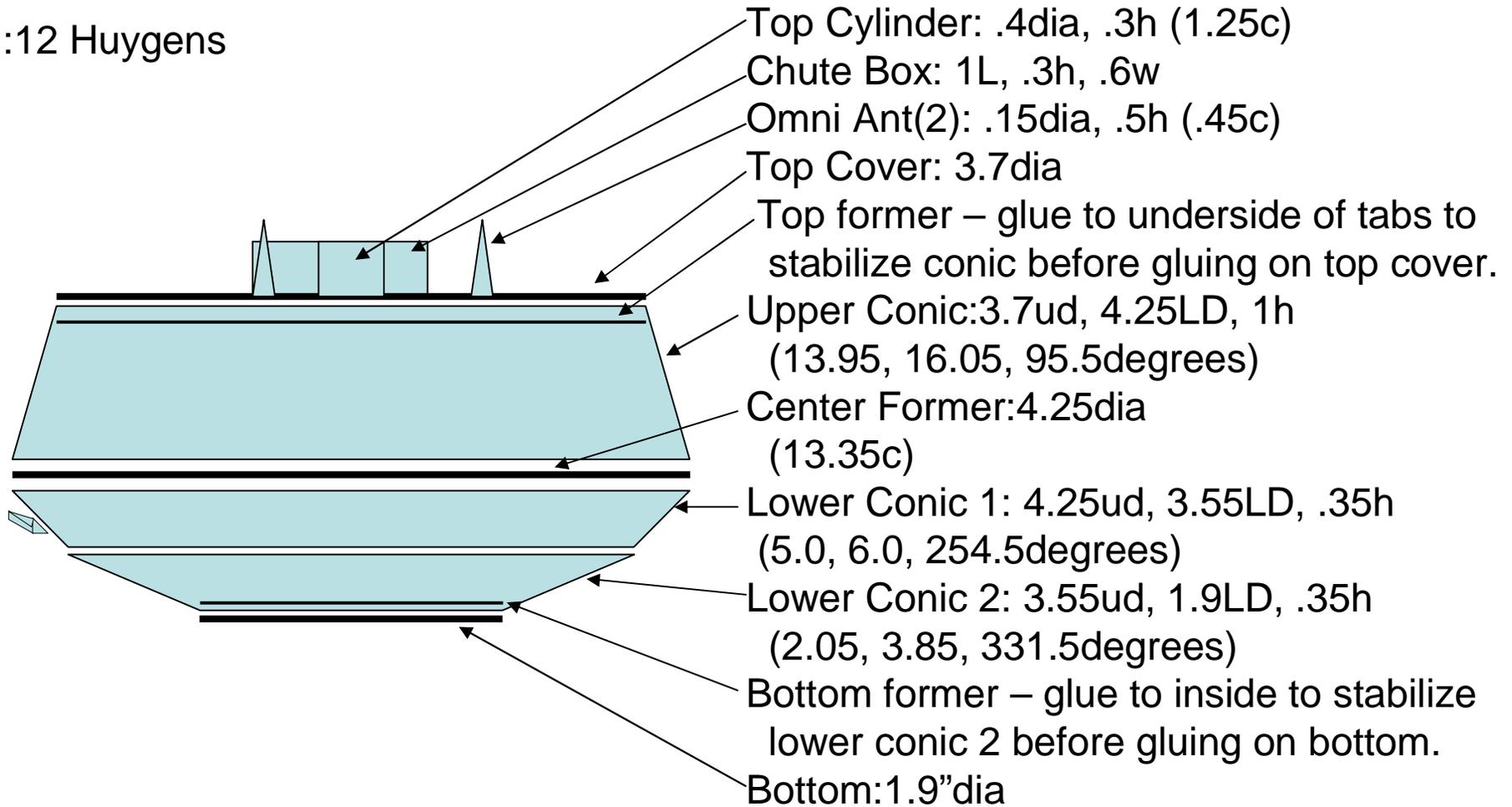


Score all fold lines before cutting out parts.

1. Cut out the parts for the upper and two lower conic sections. Splice together the two parts for the upper conic using the connector. Curve the conics and glue using the tabs, overlapping to the dotted lines. Bend the tabs on the smaller edges inward.
2. Cut out the top and bottom formers. Glue these to the inside of the conic parts to stabilize their shapes. Then, glue the top cover to the upper conic and the bottom to the lower conic. Line up the largest (blue) instrument aperture on the bottom with the seam on the lower conics. Next, glue the two lower conics together (aligning the seams) to form the Huygens front cover.
3. Cut out the center former and bend every other tab upward (away from the printed side). **DO NOT BEND THE SQUARE RED TABS.** Test fit the upper conic assembly by slipping it down over the tabs. Note the alignment – the square instrument housing and round connector socket printed on the upper conic should be halfway between the red pads (note the picture printed on the bottom of the center former). Apply glue to the inner edge of the upper conic assembly and slip it into position over the tabs.
4. Bend the remaining triangular tabs on the center former down and test fit the lower conic assembly. Note the alignment – the round red instrument aperture on the bottom should be aligned with the red pad between the square instrument housing and the round connector socket printed on the upper conic. The small rectangles on the edge of the lower conic assembly should align – approximately – with the red pads (radar antennae).

AT THIS POINT YOU HAVE COMPLETED A SIMPLE, ROBUST MODEL SUITABLE FOR ROUGH HANDLING. CONTINUE FOR MORE DETAIL.

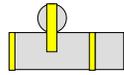
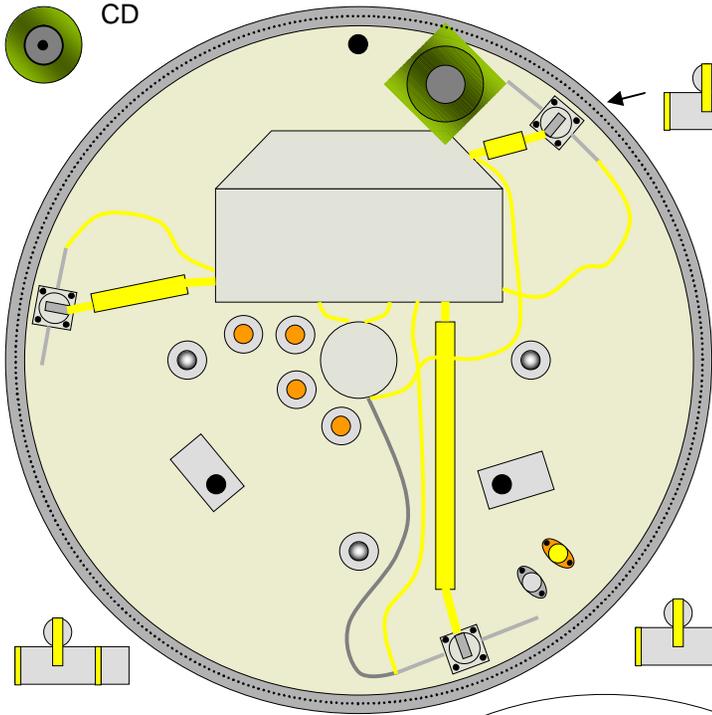
1:12 Huygens



5. Fold the two parts of the sensor head and glue, Glue together using the printed graphics as a reference. Trim the edge of the assembly to fit the curve of the upper conic using the line printed along the edge and glue over the printed graphic.
6. Top deck: cut out the CD, parachute line attachments, top cylinder, parachute box, top cylinder, small top cylinders, and omni antennae. Fold and glue the parachute box. Roll the cylinders, glue, then attach the tops (the omni antennae are open cylinders with no tops). Glue the detail parts in place over the corresponding graphics on the top cover.
7. Cut out the brackets, fold up the triangular side sections – toward the printed side. Glue the brackets to the top (unprinted side) of the red tabs (radar antennae). Apply glue to the edges of the brackets' side sections and glue to the side of the upper conic.
8. Cut out the aeroshell brackets, fold down ONLY the triangular side sections (away from the printed side). For best accuracy, trim the triangular side braces so the brackets extend straight out from the upper conic (parallel to the top and bottom). Glue the brackets in place over the blue squares on the side of the upper conic.
9. HASI sensor. Cut out the parts (cut out the slots marked on the oval pieces). Glue the stem of the HASI-Stud parts to either side of thick card or a toothpick, glue the “ears” together. Glue the stem of the HASI booms to either side of thick card or a toothpick – making sure the reinforcement does not extend to the oval section on the end. Slip the oval part into the slot in the oval at the end of the boom and glue in place. Roll the small orange part into a cylinder, glue, and cap with the attached circle. Drill a hole into the part to attach the HASI boom. Refer to the included diagrams and pictures to place the sensors.

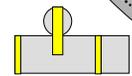
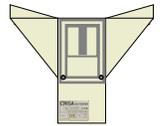
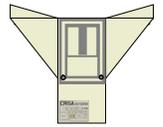
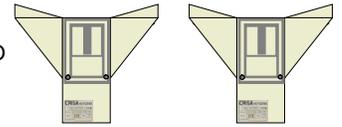


1:12 Huygens

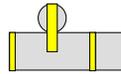


PARACHUTE
LINE
ATTACHMENT

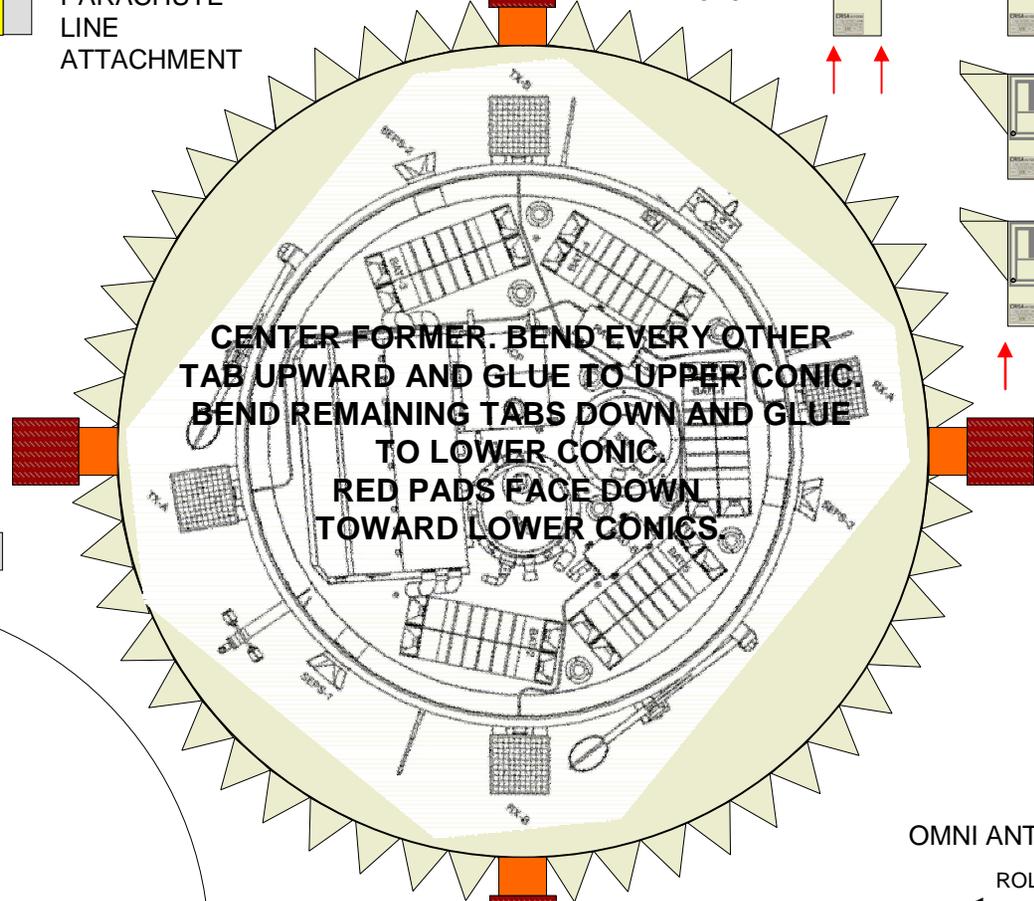
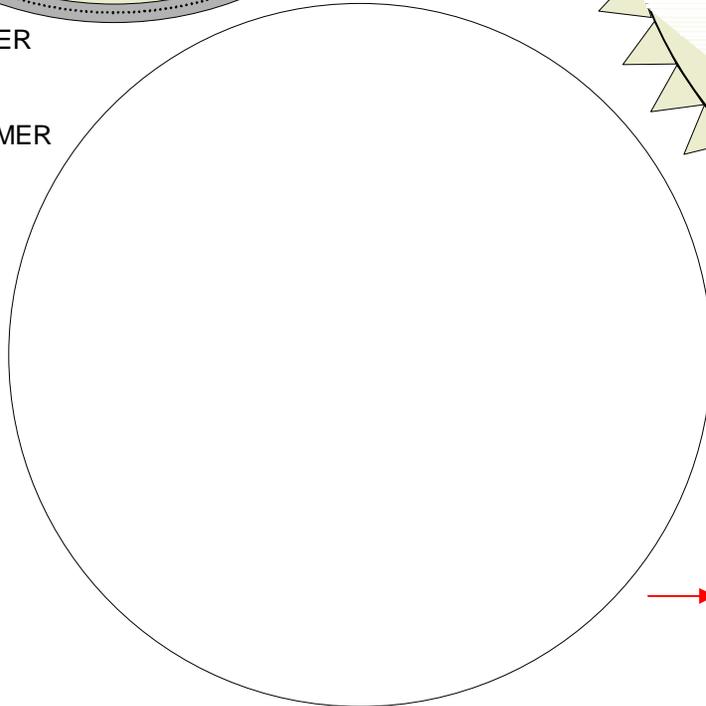
BRACKETS
GLUE ATOP
RED PADS TO
REINFORCE



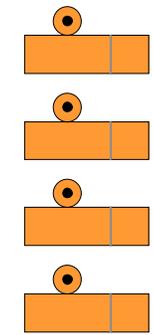
TOP COVER



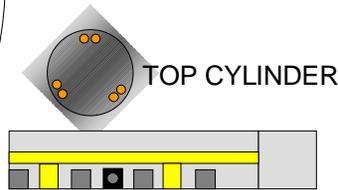
TOP FORMER



**CENTER FORMER. BEND EVERY OTHER
TAB UPWARD AND GLUE TO UPPER CONIC.
BEND REMAINING TABS DOWN AND GLUE
TO LOWER CONIC.
RED PADS FACE DOWN
TOWARD LOWER CONICS**

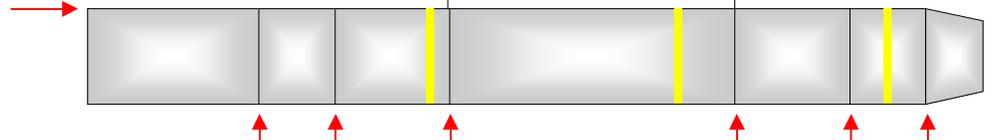
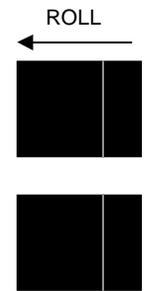


SMALL TOP
CYLINDERS

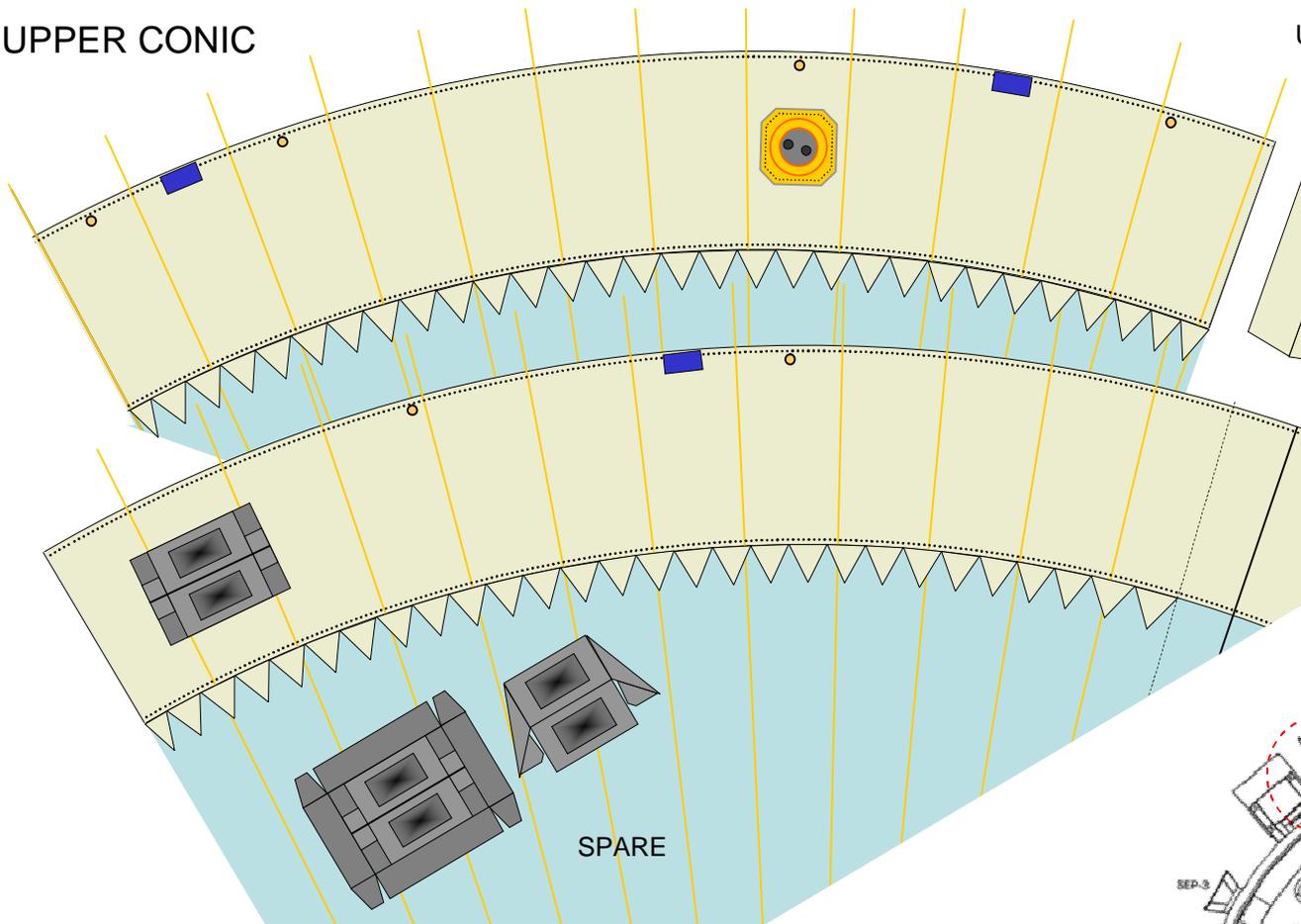


PARACHUTE BOX

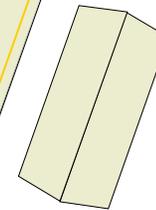
OMNI ANTENNAE



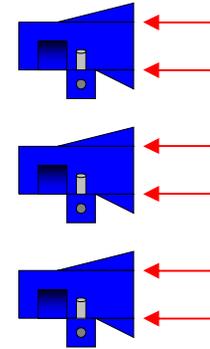
UPPER CONIC



Upper conic connector

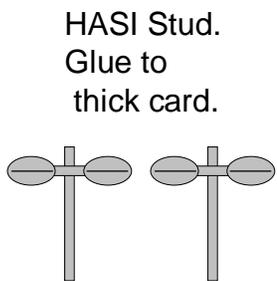


AEROSHELL BRACKETS. MOUNT TO UPPER CONIC OVER BLUE MARKS.

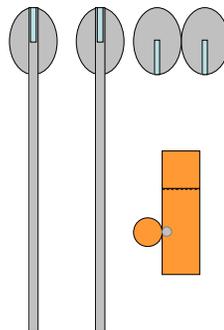


Probes (3). Cut toothpicks or laminate card to this length.

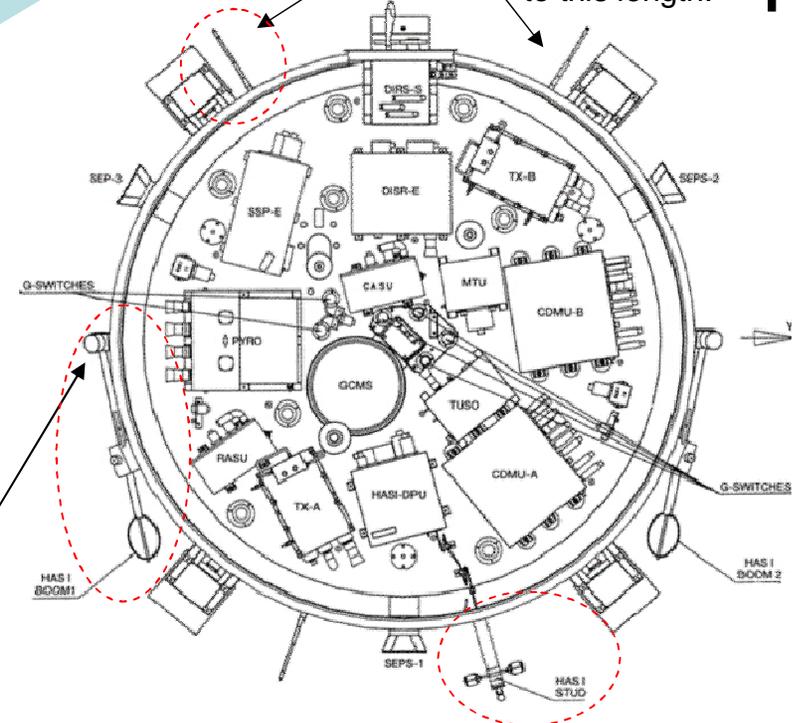
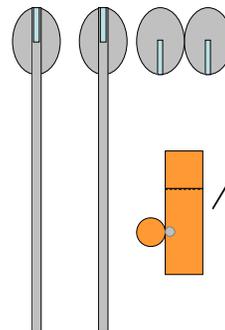
Huygens Titan Lander



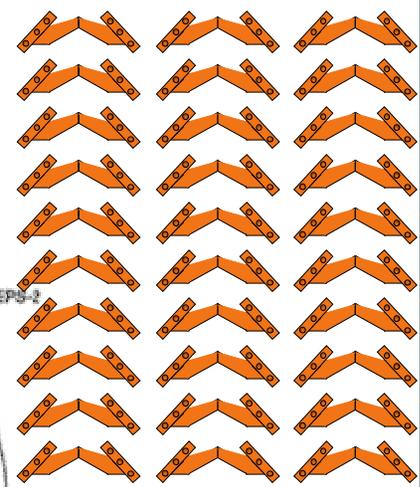
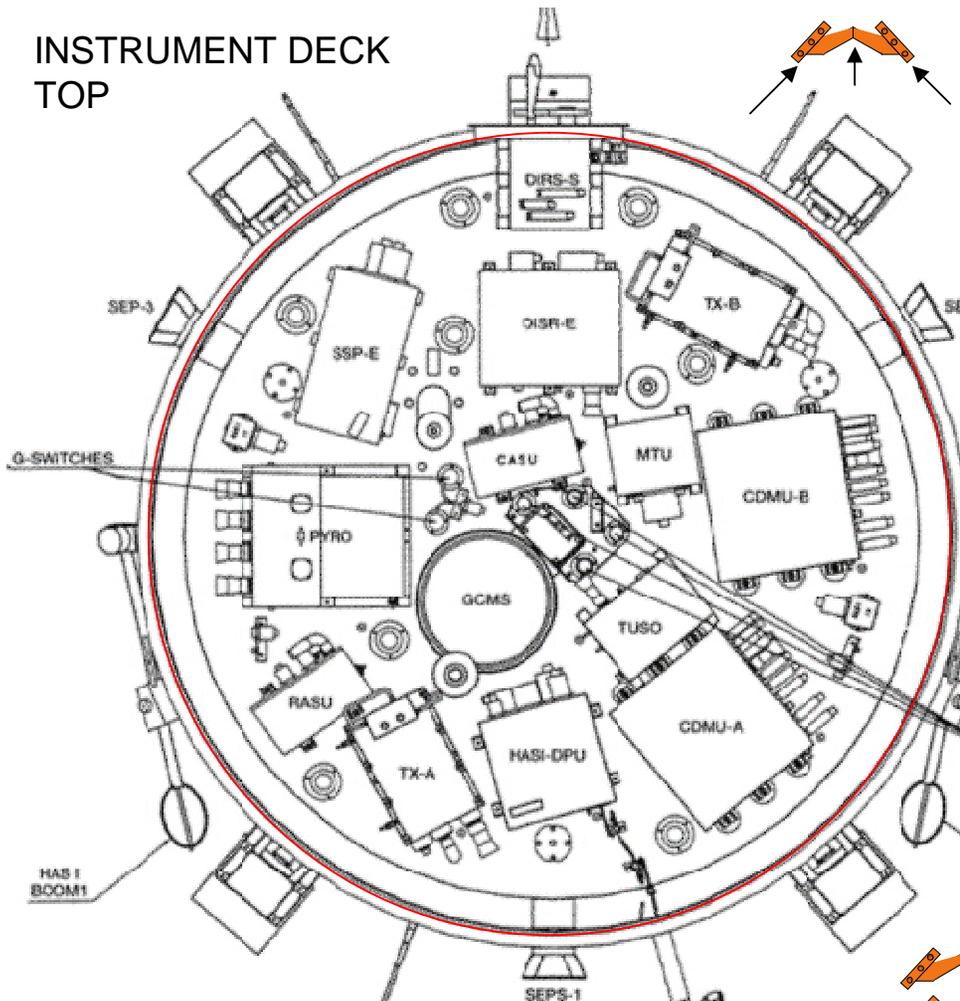
HASI Glue boom to thick card.



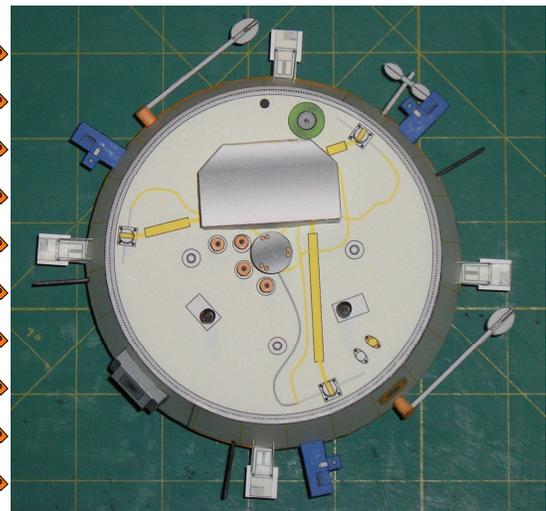
HASI Glue boom to thick card.



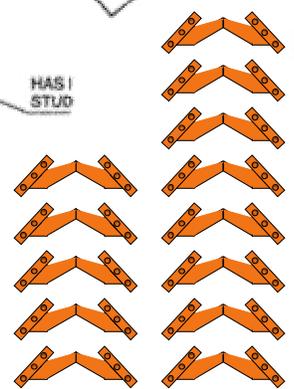
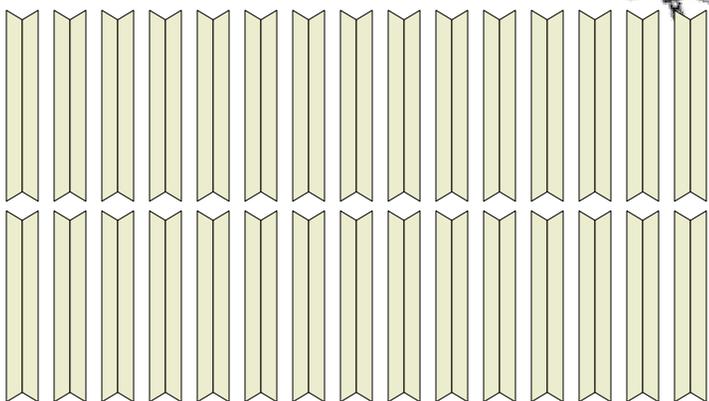
INSTRUMENT DECK TOP



OPTIONAL DETAIL: SPIN VANES



OPTIONAL DETAIL: UPPER CONIC STRINGERS



INSTRUMENT DECK BOTTOM

