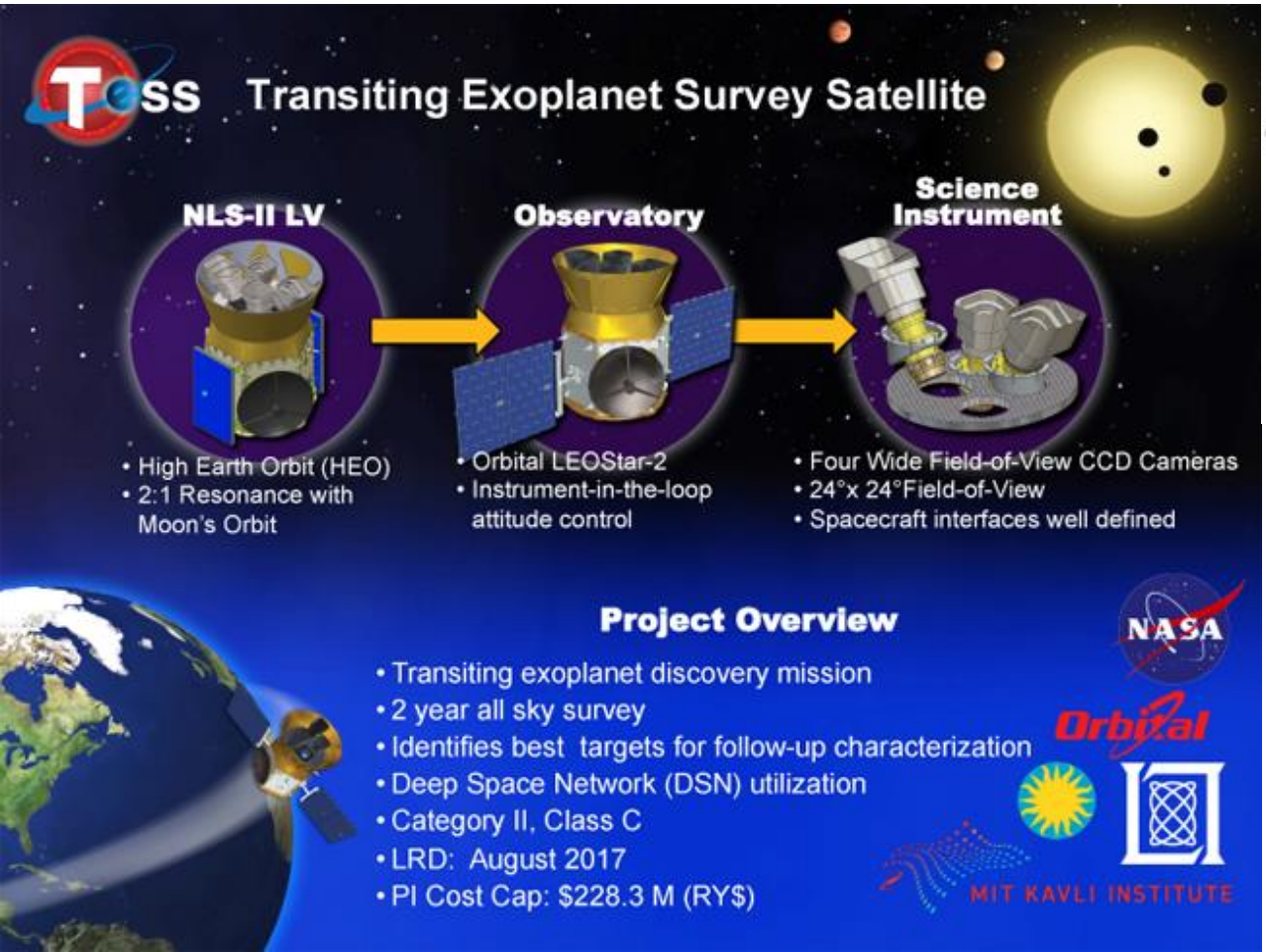
TESS: Transiting Exoplanet Survey Satellite 1:20 scale

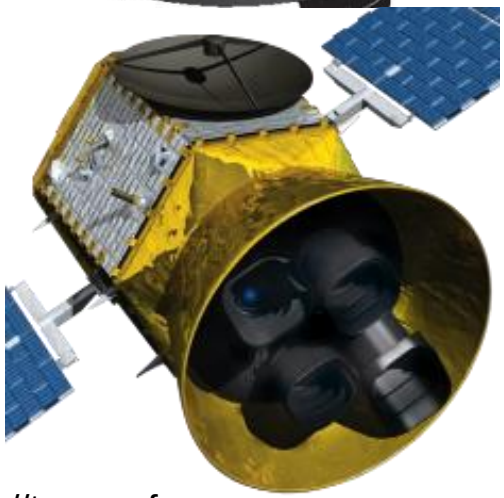
A Product of *Yogi's Workshop*
Idiosyncratic Carpentry & Shade Tree Engineering

Scheduled for launch in 2017, the Transiting Exoplanet Survey Satellite (TESS) will discover thousands of exoplanets in orbit around the brightest stars in the sky. In a two-year survey of the solar neighborhood, TESS will monitor more than 500,000 stars for temporary drops in brightness caused by planetary transits. This first-ever spaceborne all-sky transit survey will identify planets ranging from Earth-sized to gas giants, around a wide range of stellar types and orbital distances. No ground-based survey can achieve this feat.

TESS stars will be 30-100 times brighter than those surveyed by the Kepler satellite; thus, TESS planets should be far easier to characterize with follow-up observations. These follow-up observations will provide refined measurements of the planet masses, sizes, densities, and atmospheric properties.

TESS will provide prime targets for further, more detailed characterization with the James Webb Space Telescope (JWST), as well as other large ground-based and space-based telescopes of the future. TESS's legacy will be a catalog of the nearest and brightest stars hosting transiting exoplanets, which will comprise the most favorable targets for detailed investigations in the coming decades.





http://tess.gsfc.nasa.gov

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Print parts pages on cardstock. Score fold lines marked with red arrows – score similar parts the same. Cut out parts with small scissors or craft knife. Glue with any glue compatible with paper – Elmer's Glue or Titebond work well.

1. **SPACECRAFT BUS**. Fold and glue into a hexagonal box. Roll the **BOTTOM SUPPORT RING** into a circle and glue, then glue to the bottom of the **SPACECRAFT BUS** over the black circle.

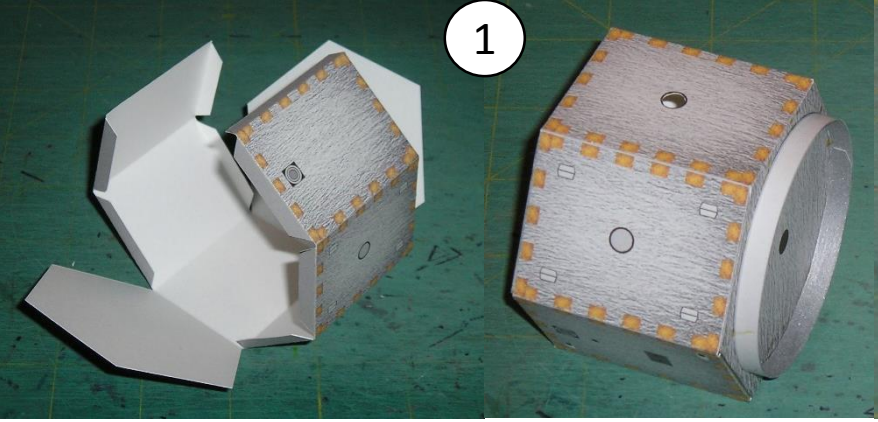
Optional detailing: Fold the **STAR TRACKERS** as shown with the printed side inward and glue to make a shallow cup. Color the outside of each part black with a marker. Cut out the small red slots on the graphic and glue the trackers to the sides of the **SPACECRAFT BUS** over the graphics with the trackers angled away from each other using the small tabs. Glue two **THRUSTER** parts back to back to make a two sided part, folding the small tabs outward. Glue the four completed **THRUSTER**s to the bottom of the **SPACECRAFT BUS** over the graphics, then bend the tips outward. Roll the **THRUSTER NOZZLE** into a cone and glue to the center of the bottom of the **SPACECRAFT BUS**. Fold the **PVA LATCHES** into small boxes. Glue the latches to the sides of the **SPACECRAFT BUS** with the gray circles, positioning the latches over the graphics above and below the gray circles in the center. If desired, add a very short piece (.1"/2mm) of a toothpick as a post in the center of each latch.

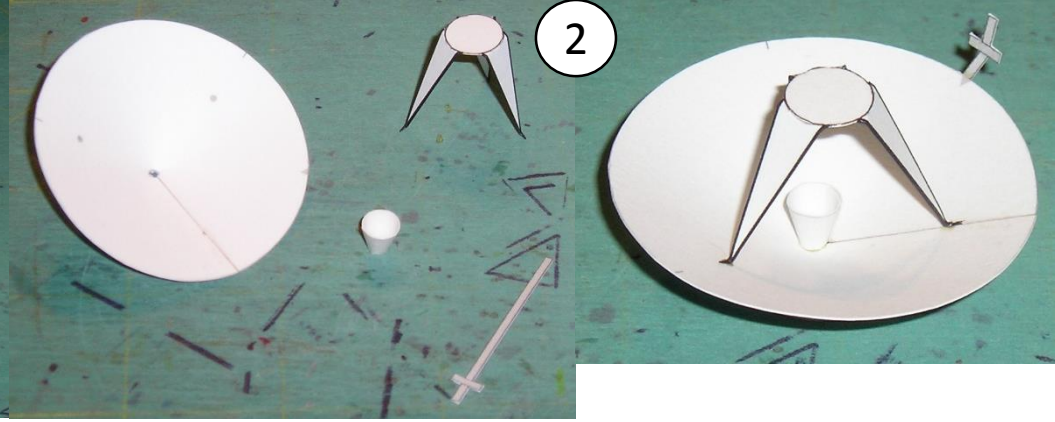
2. **HGA**, High Gain Antenna. Form **HGA DISH** into a shallow cone and glue. Roll the **FEED HORN** into a cone and glue. Glue completed feed horn into the center of the **HGA DISH**. Fold the legs on the **HGA RFLECTOR** and glue to the **HGA DISH** over the gray dots on the **HGA DISH**. Glue the long **LGA** part to the back side of the **HGA DISH** aligned from the center to the gray triangle on the edge, then bend up the short end of the **LGA**. Glue the short **LGA** part to the side of the **SPACECRAFT BUS** over the gray bar graphic. Cut out the black circle on one side of the **SPACECRAFT BUS** and glue the completed **HGA** into the hole with the dish seam down (refer to images for alignment).

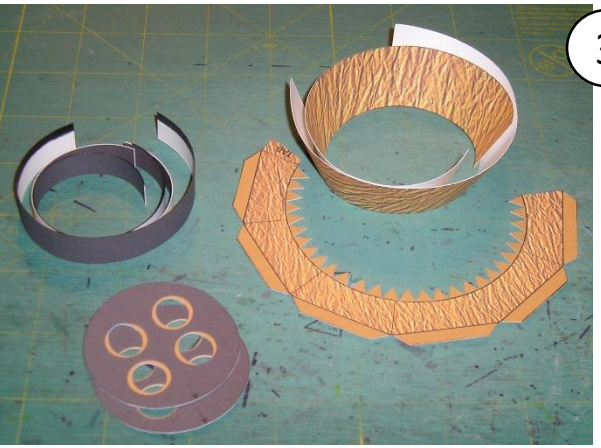
3. **TELESCOPE SHROUD**. Roll the **TELESCOPE SUPPORT RING** into a ring and glue. Then glue the two **SUPPORT BANDS** inside so the top edges of the supports make a shelf 0.2 inch/5mm below the top edge of the ring. Use a black marker to color the top inside of the **SUPPORT RING**. Laminate the **TELESCOPE DECK** on top of the **SUPPORT DISK** to make a stiffer part (carefully aligning the arrows and holes), then glue them inside the ring, resting on the shelf. Roll the **LOWER TELESCOPE SHROUD** into a band and glue. Glue the wide end of the shroud to the top of the **SPACE CRAFT BUS** using the tabs. The bottom of the shroud will be forced into a hexagon, while the top should remain circular. Fold in the tabs around the top edge of the shroud and glue the **TELESCOPE SUPPORT RING** inside – aligning the arrow on the **TELESCOPE DECK** with the arrow on the top of the **SPACECRAFT BUS**. Roll the **UPPER TELESCOPE SHROUD (INNER)** into a band with the printed side inward and glue. Carefully wrap the **UPPER TELESCOPE SHROUD (OUTER)** around the outside of the inner part and glue to make a two sided part – trim the end of the outer shroud as needed for a good fit. Slip the **UPPER TELESCOPE SHROUD** over the **SUPPORT RING** and glue into place.

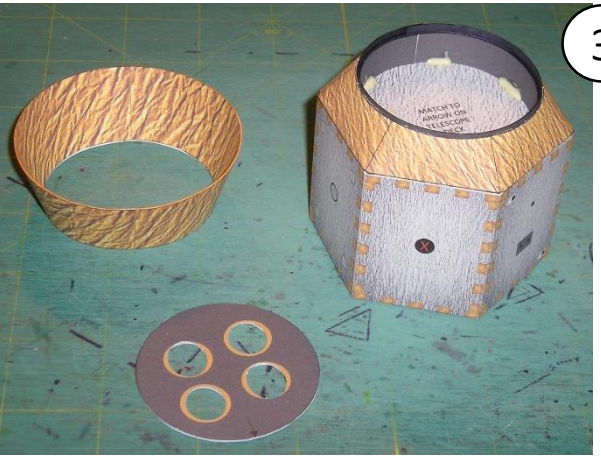
4. **TELESCOPES**. Roll the lower part of each **TELESCOPE BARREL** into a cylinder and glue. Fold the **TELESCOPE BAFFLES** with the printed side inward and glue. Color the outside of the baffles black with a marker. Glue the completed baffle to the lower barrel cylinder. Glue the **TELESCOPE BARRELS** into the **TELESCOPE DECK**, with the longer barrels placed in the holes marked "32" and angled approx. 32 degrees, the shorter barrels in the other holes marked "12" and angled about 12 degrees. See the graphics and images for more detail.

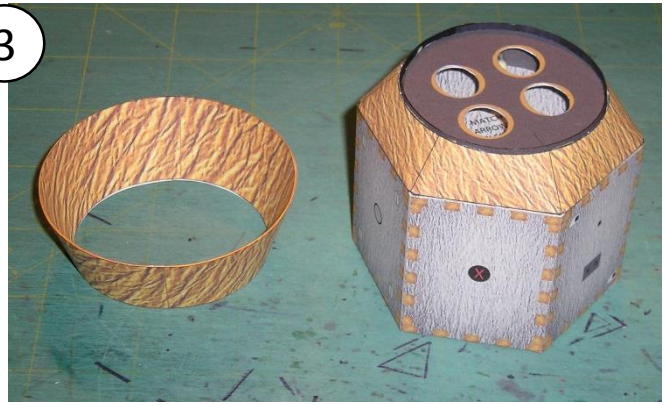
5. **SOLAR PANELS**. Cut a 7" / 18cm piece of very thin dowel or stiff wire. Fold one set of **SOLAR PANELS** and glue to make a two sided part, sandwiching the dowel/wire down the center of the part for stiffness. Punch a small hole in the center of the gray disks on the **SPACECRAFT BUS** and slide the dowel/wire through. Fold and glue the other set of **SOLAR PANELS** around the wire to complete the assembly.











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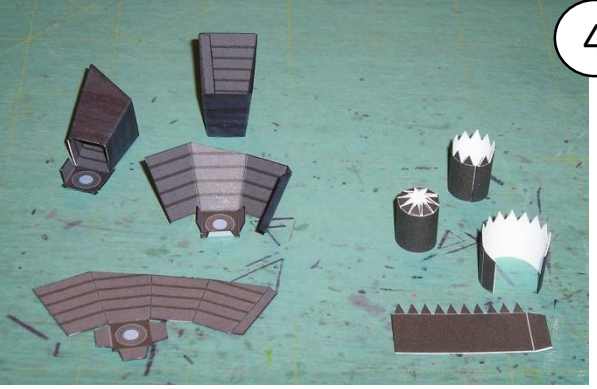

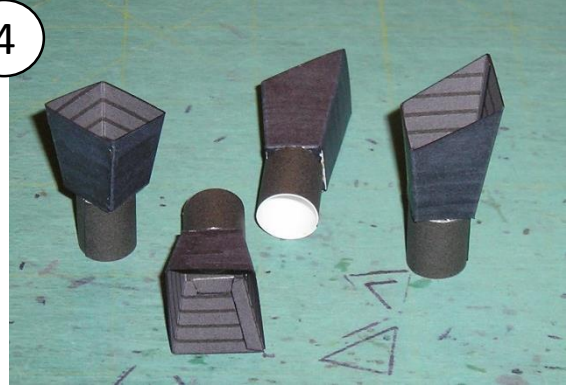

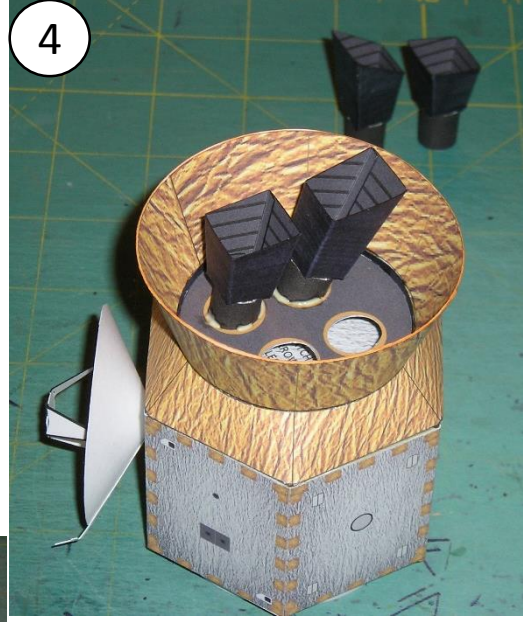

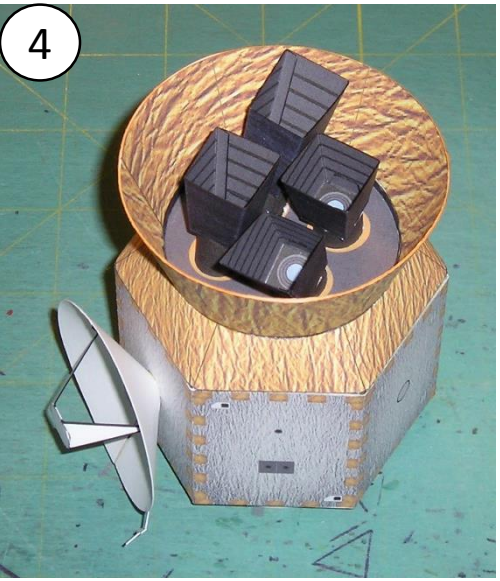

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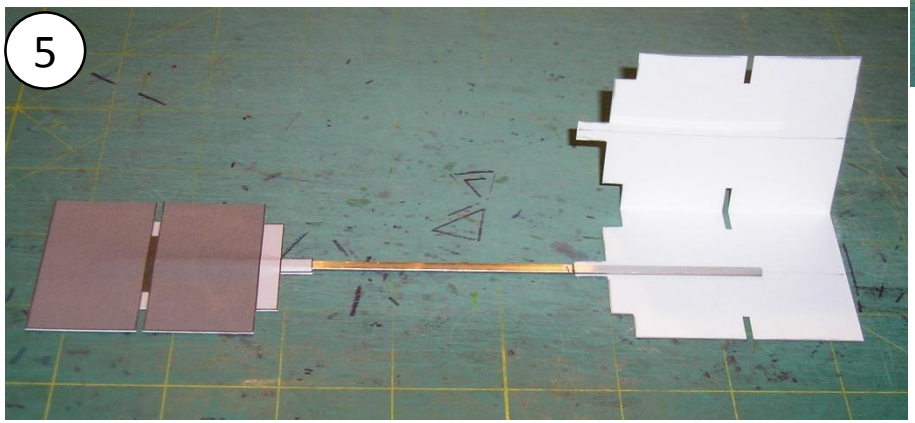
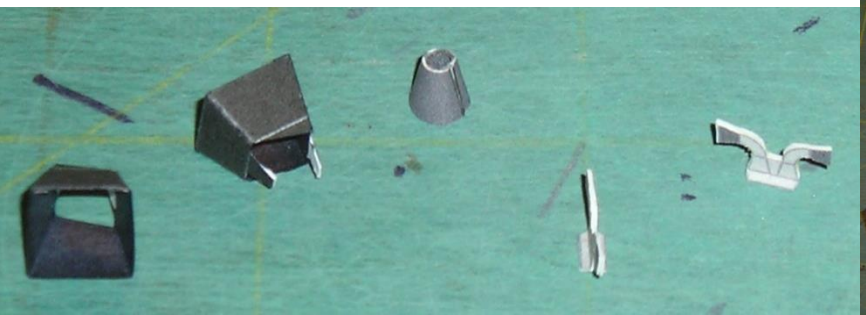
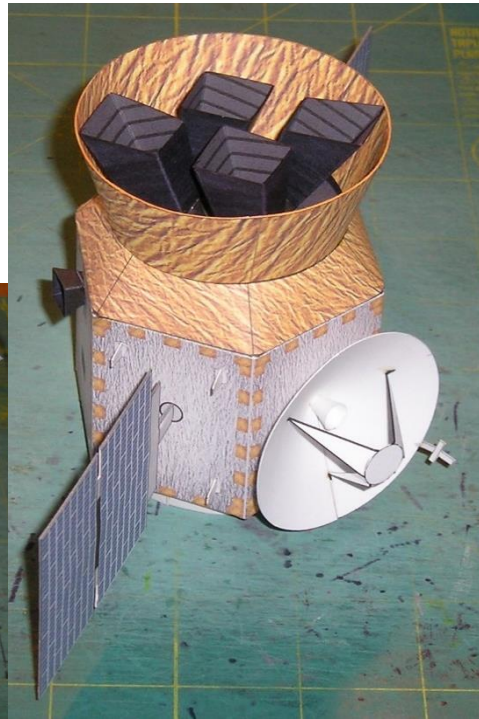


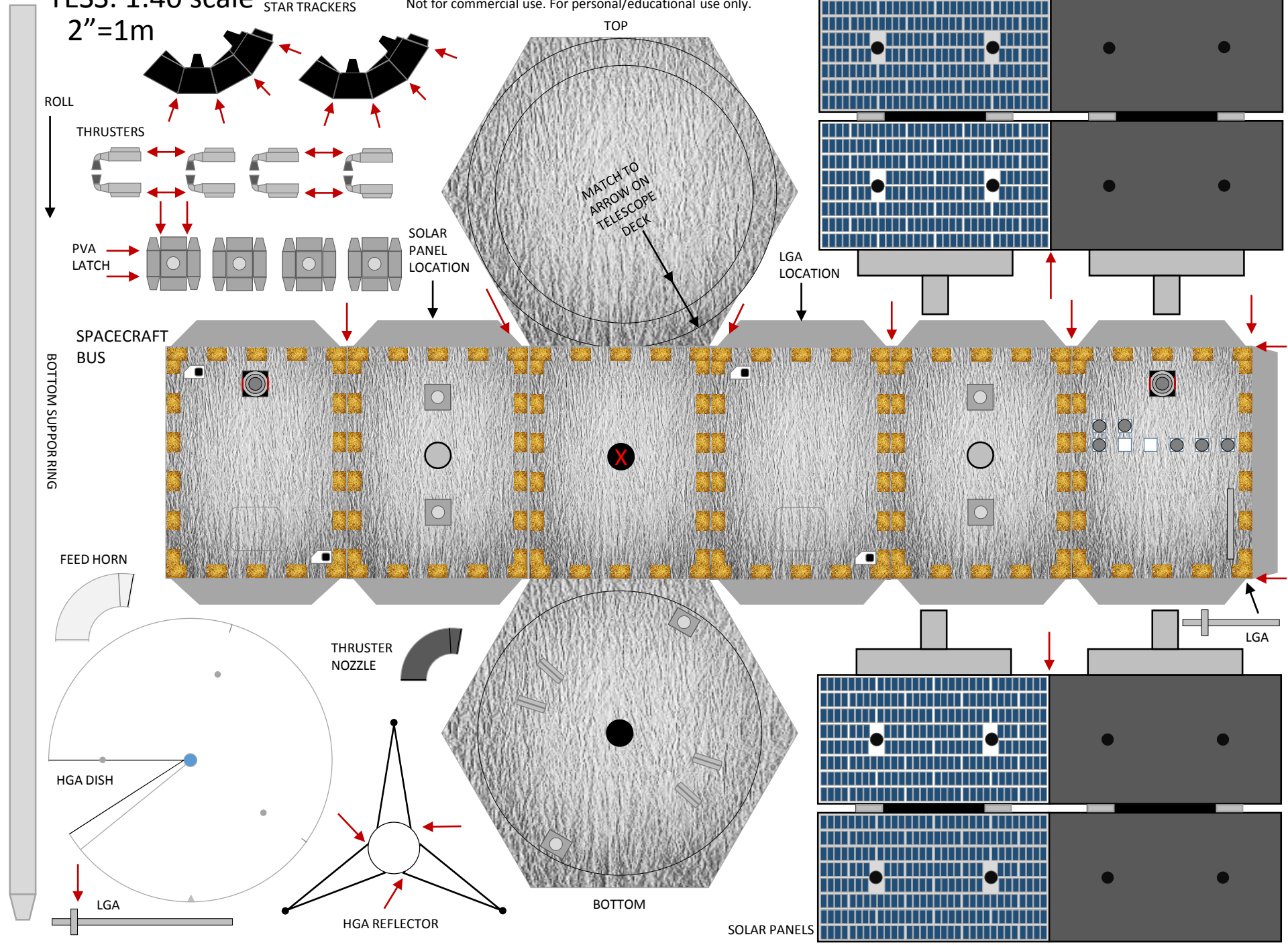
DETAILING





TESS: 1:40 scale

2”=1m



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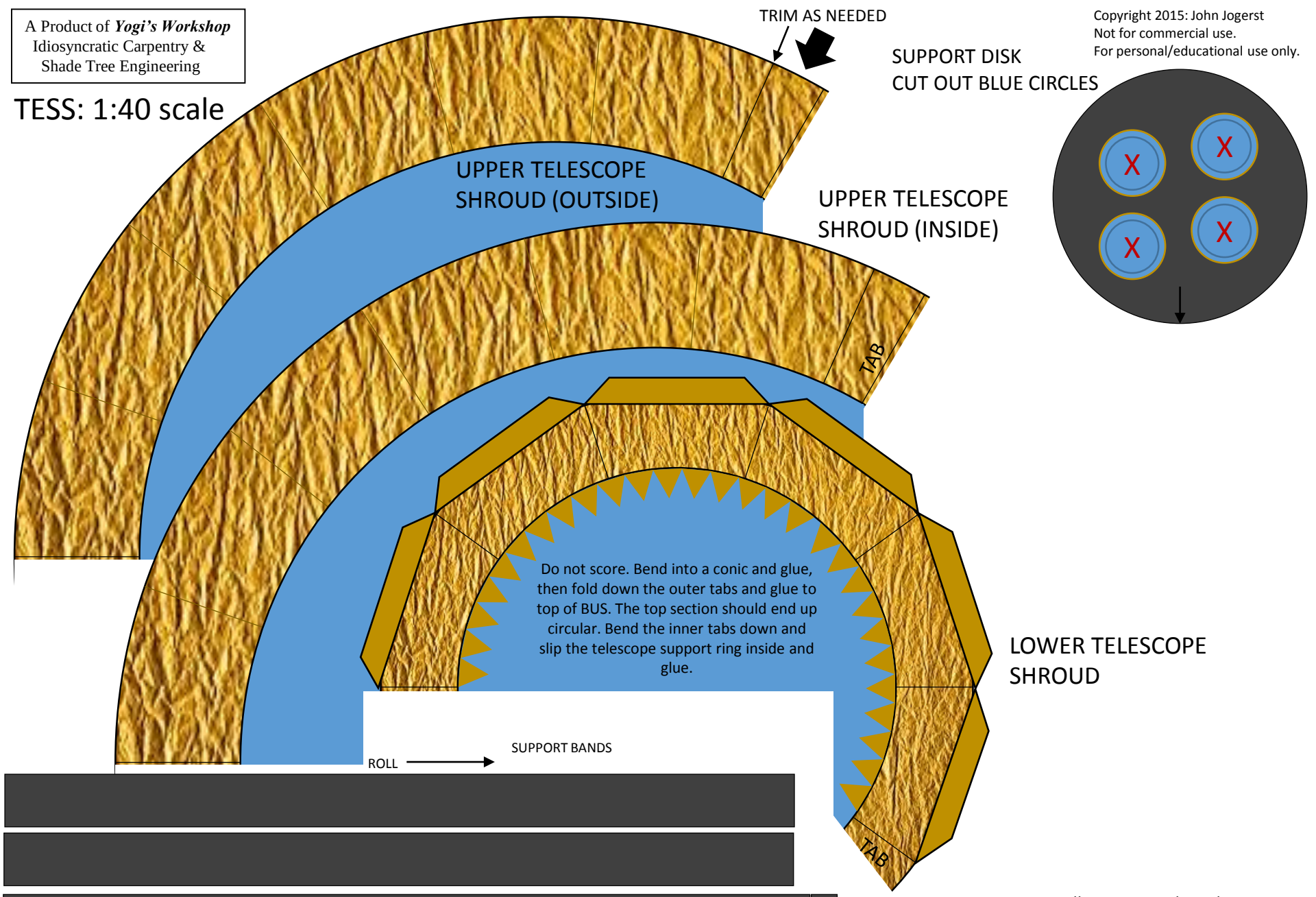

SUPPORT DISK
CUT OUT BLUE CIRCLES

TELESCOPE SUPPORT RING. Roll into a ring, then glue support bands inside so the top edges of the supports make a shelf 0.2 inch below the top edge of the ring. Glue the support disk inside the ring, resting on the shelf.

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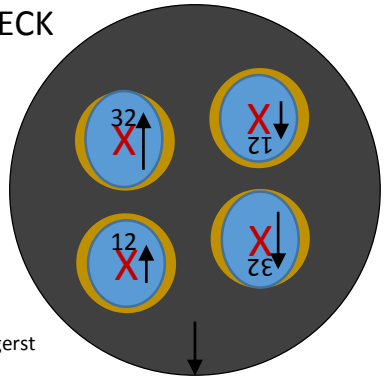
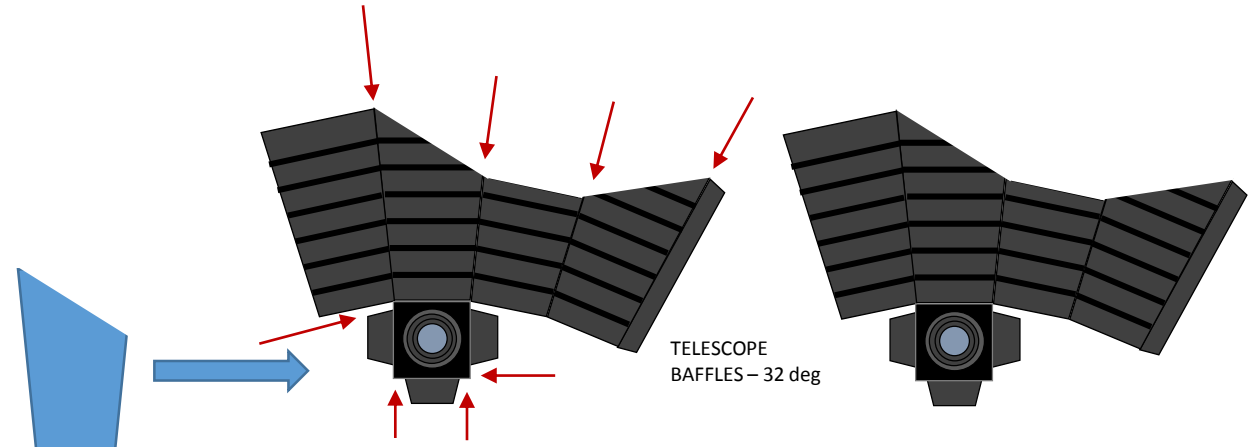
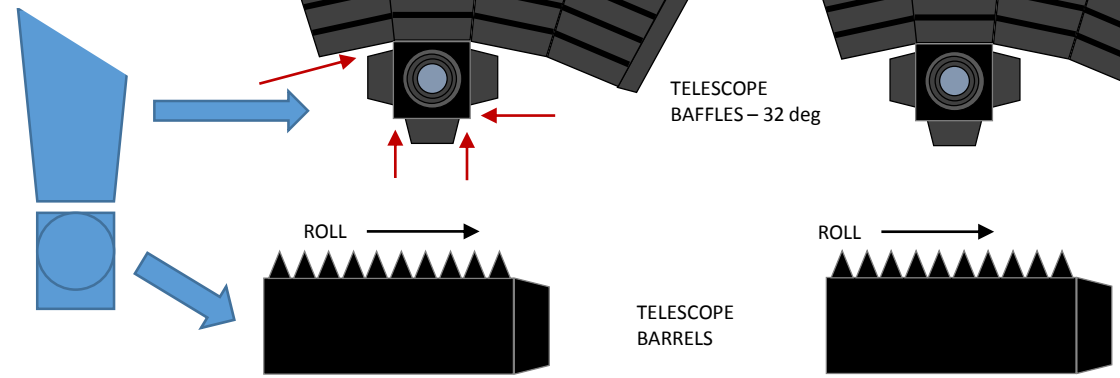
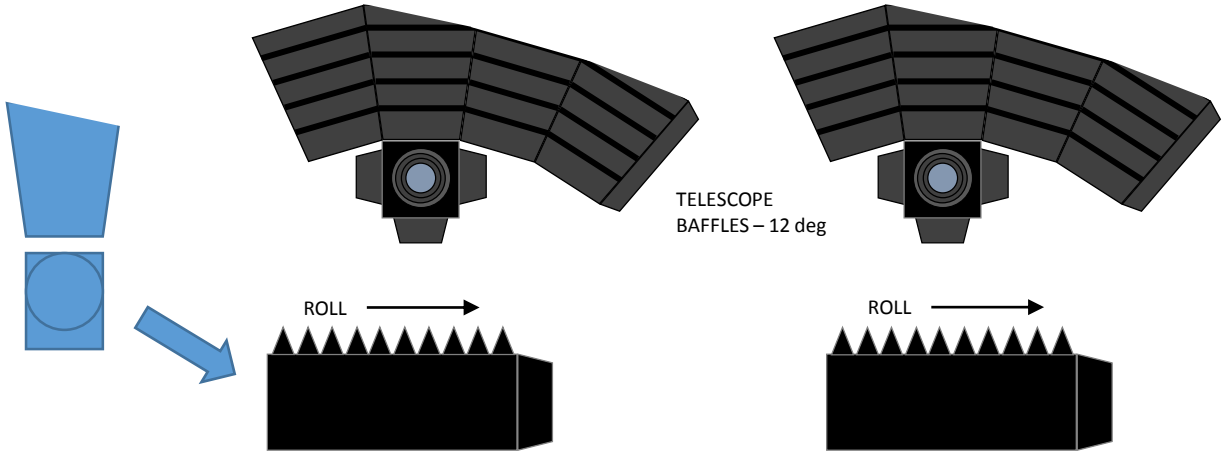
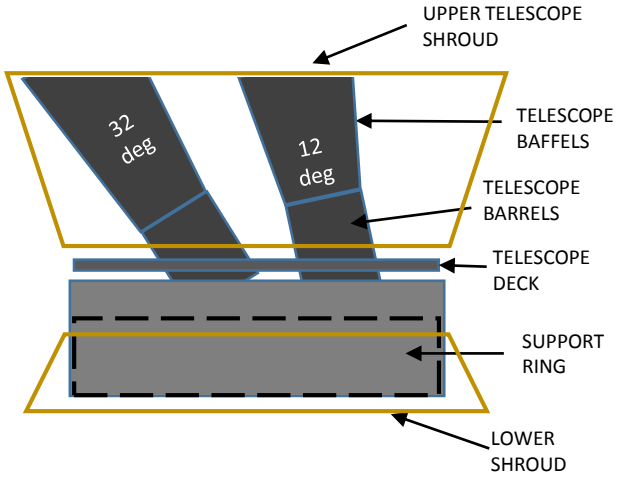
TELESCOPE DECK
Cut out blue circles.

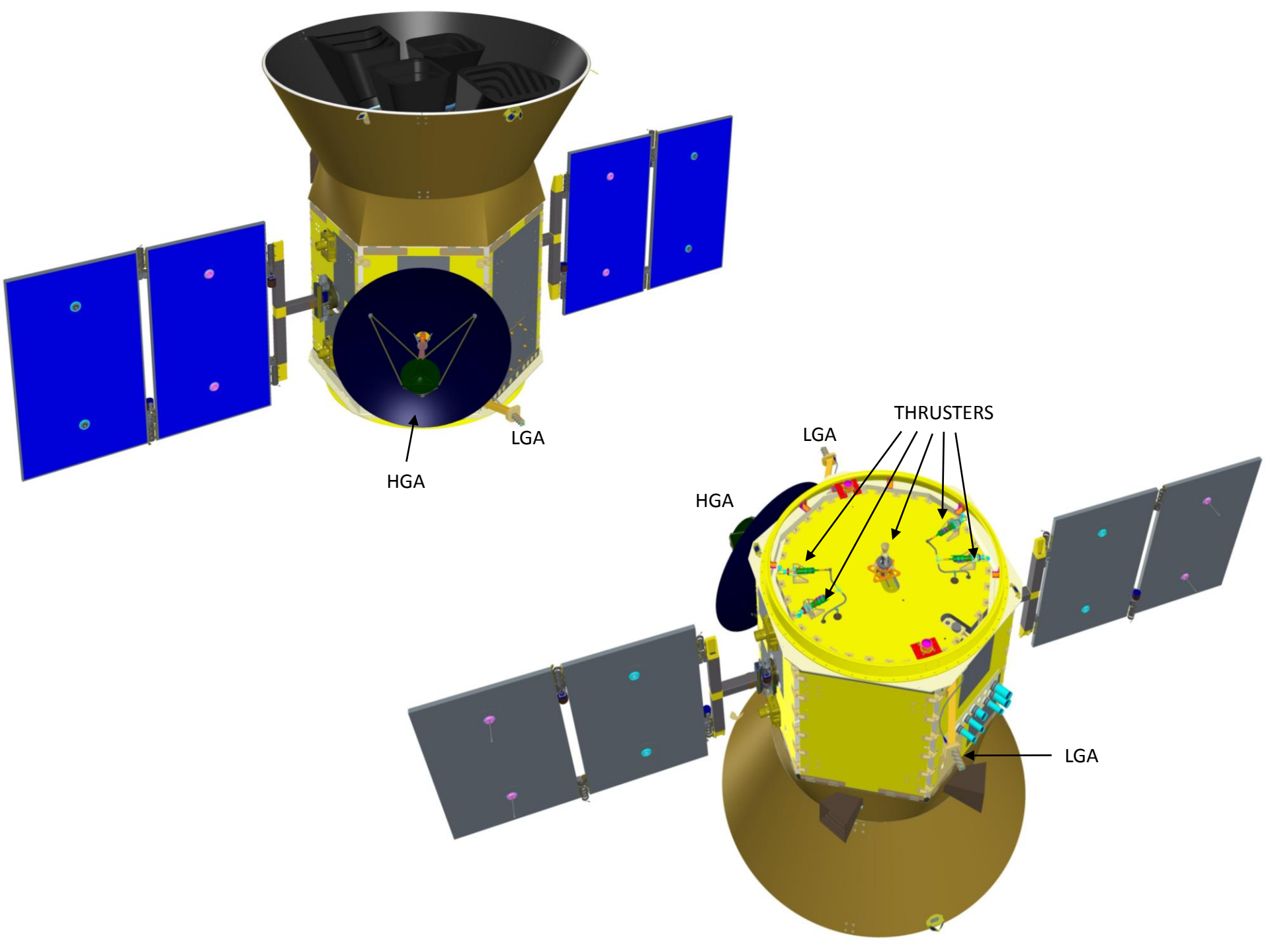











HGA
LGA
THRUSTERS
LGA
HGA
LGA