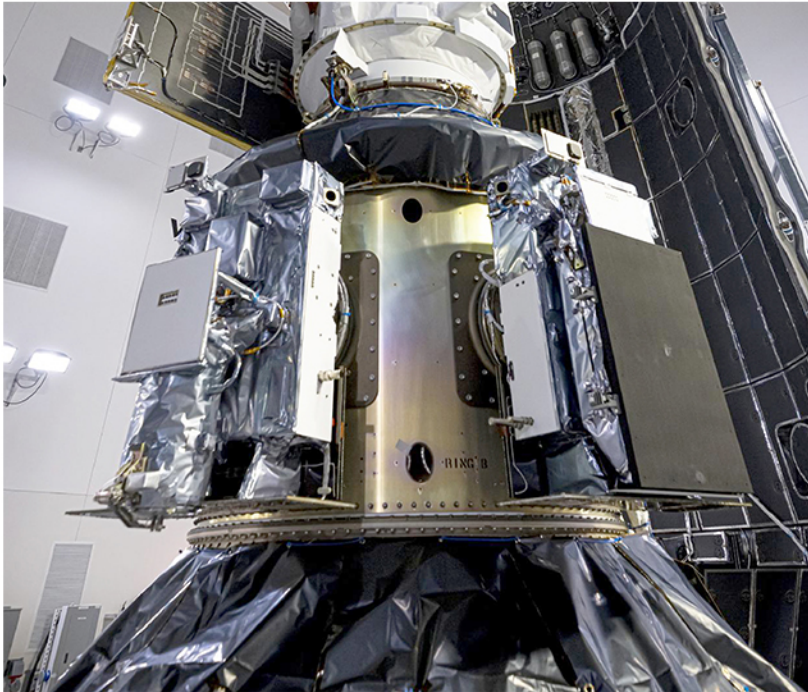


PUNCH (Polarimeter to Unify the Corona and Heliosphere)



PUNCH is a NASA Small Explorer mission that will make the first global, 3D observations of the young solar wind, from the outermost solar atmosphere to the inner heliosphere. Images of unprecedented quality will help to close a 60-year gap in measurement and understanding of what occurs in this region of space. PUNCH is scheduled to launch in early 2025.

The PUNCH mission consists of a constellation of four small satellites in Sun-synchronous, low Earth orbit that together will produce deep-field, continuous, 3D images of the solar corona as it makes a transition to the young solar wind. The PUNCH cameras sense normal visible light and its linear polarization which allows the 3D location of solar wind features to be measured.

Four satellites are necessary because PUNCH views the entire inner solar system continuously, and Earth blocks approximately half the view from any one location in orbit. The lone Narrow Field Imager (NFI) acquires an annular field of view (FOV) around the Sun. Three Wide Field Imagers (WFIs) acquire data in a trefoil on the sky. As the spacecraft orbit, the trefoil rotates on the sky and builds up the full 90° circular PUNCH FOV.

NASA's PUNCH will make global, 3D observations of the inner solar system and the Sun's outer atmosphere, the corona, to learn how its mass and energy become the solar wind, a stream of charged particles blowing outward from the Sun in all directions. The mission will explore the formation and evolution of space weather events such as coronal mass ejections, which can create storms of energetic particle radiation that can endanger spacecraft and astronauts.

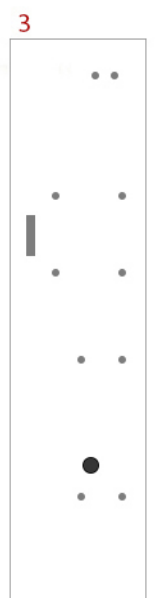
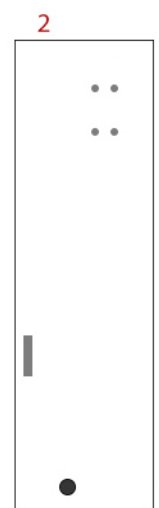
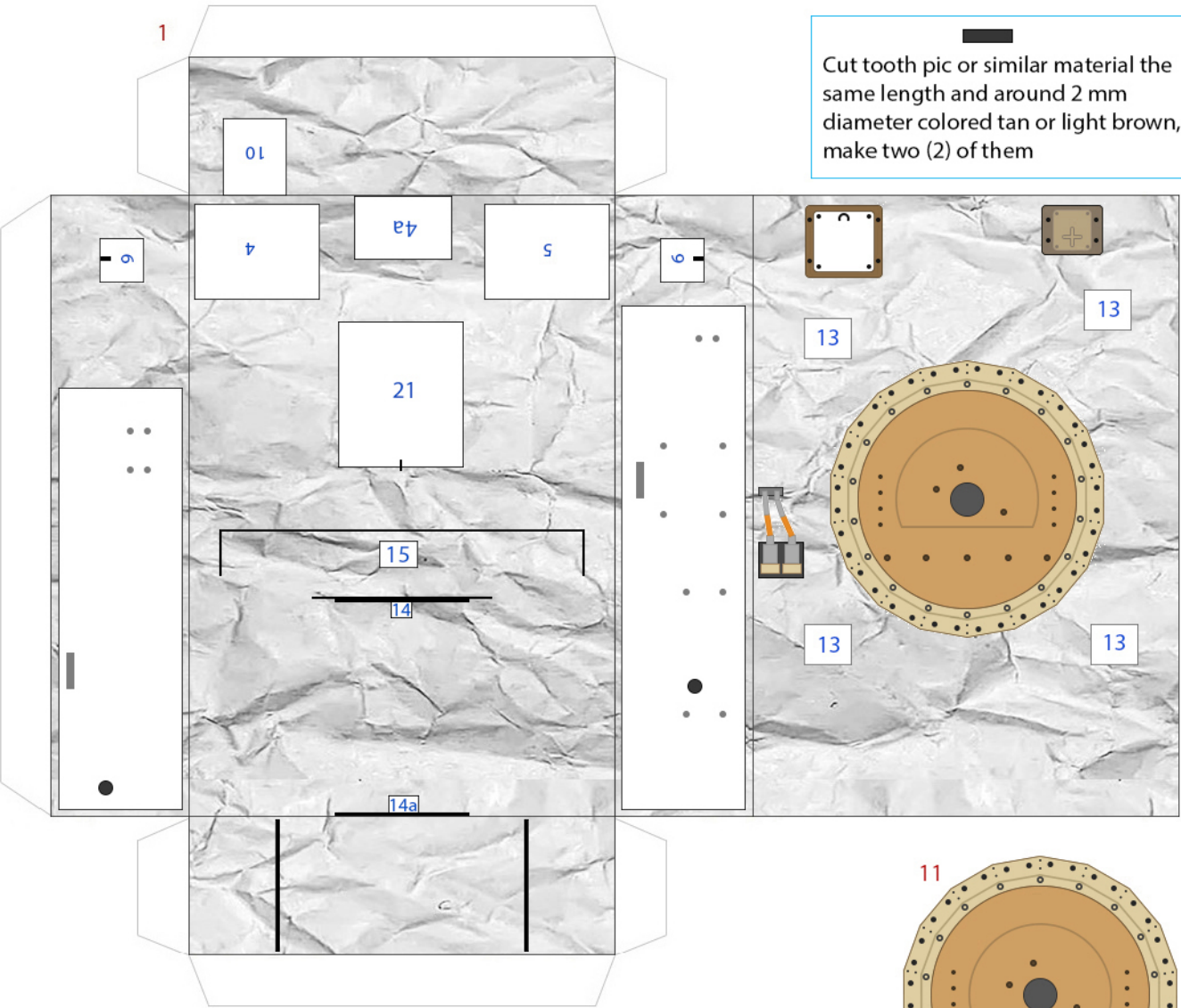
The PUNCH mission is designed to answer basic questions about how stars like our Sun produce stellar winds, and how they give rise to dangerous space weather events right here on Earth.

Three satellites will carry SwRI-developed Wide Field Imagers (WFI) heliospheric imagers providing views from 18 to 180 solar radii, or 45 degrees, away from the Sun in the sky. The WFIs use an artificial horizon and deep baffles to view the very faint outermost portion of the solar corona and the solar wind itself.

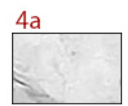
One satellite carries a coronagraph, the Narrow Field Imager developed by the U.S. Naval Research Lab, that images the Sun's corona continuously by mimicking a total solar eclipse for itself except on another level.

All four spacecraft are synchronized to serve as a single virtual instrument to capture roughly a quarter of the sky, centered on the Sun. Each spacecraft also includes a camera, developed by RAL Space, to collect three raw images, through three different polarizing filters, every four minutes. In addition, each spacecraft will produce a clear unpolarized image every eight minutes, for calibration purposes.

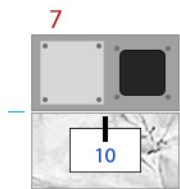




Glue to three (3) layers of cardstock



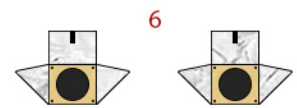
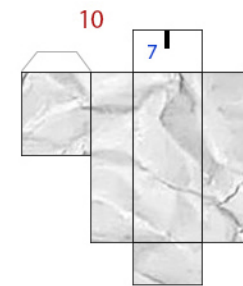
Glue to cardstock



Fold, glue back-to-back



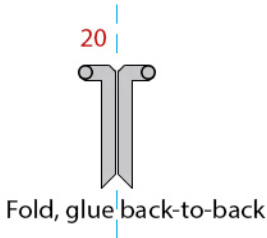
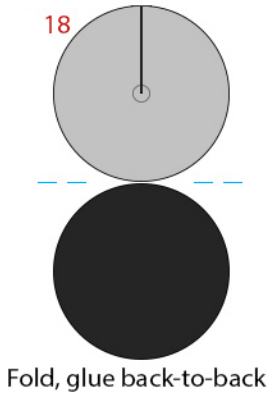
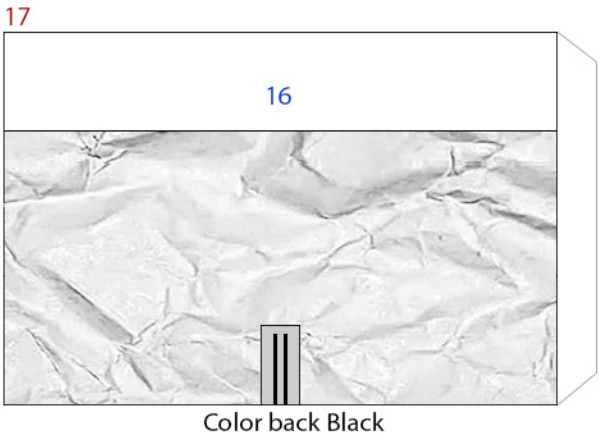
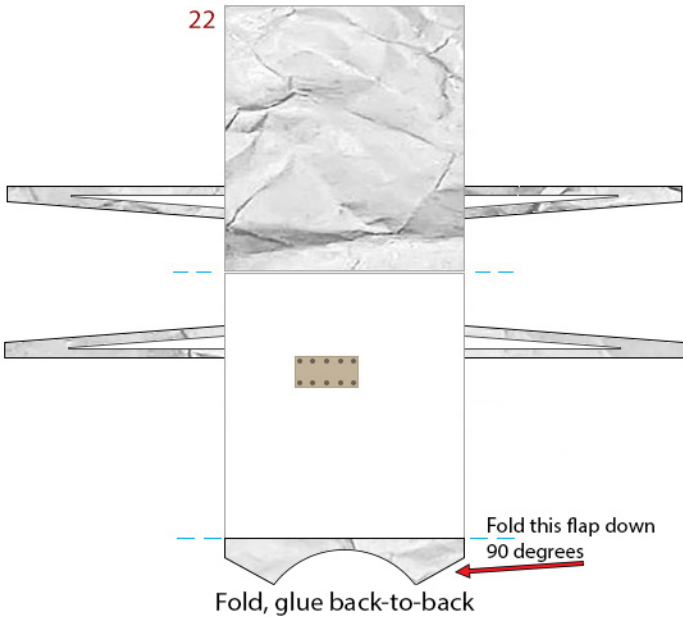
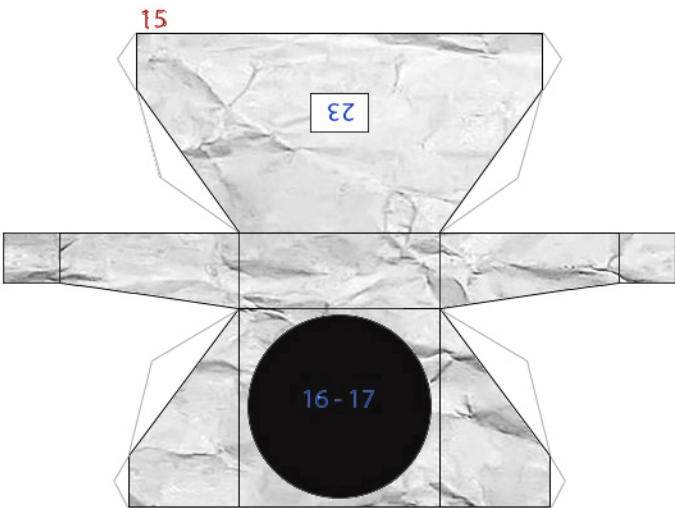
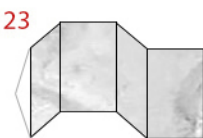
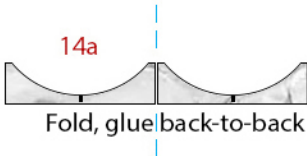
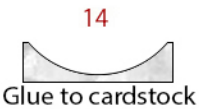
Glue both to cardstock

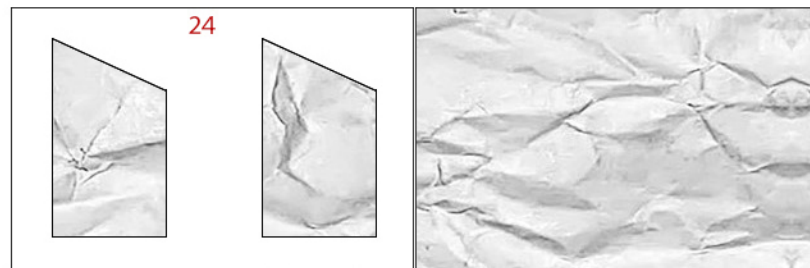
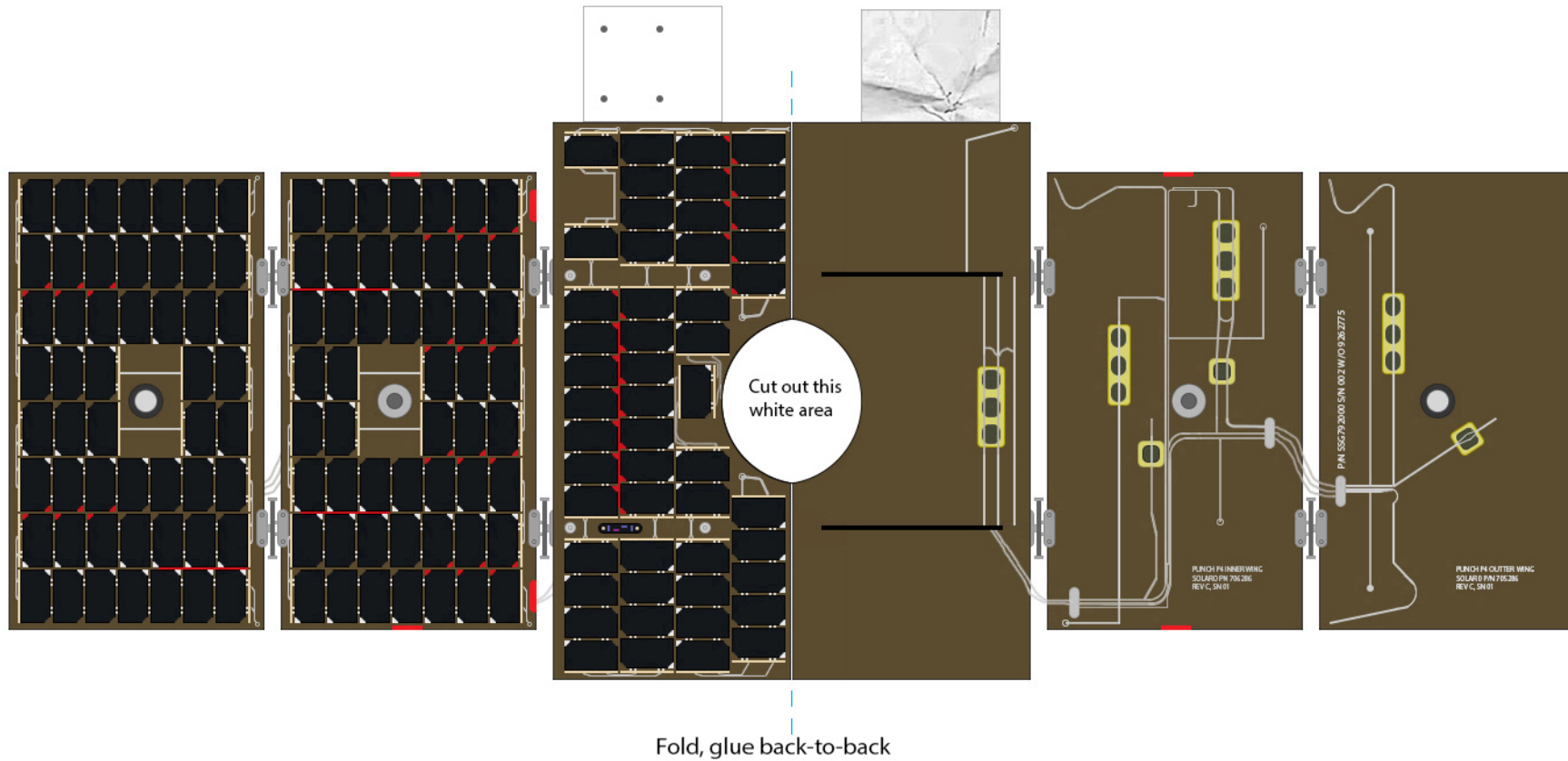


Color back the same color - Score and slightly fold at the 17 vertical lines



Internal Support Ring





Glue to cardstock, then fold, glue back-to-back