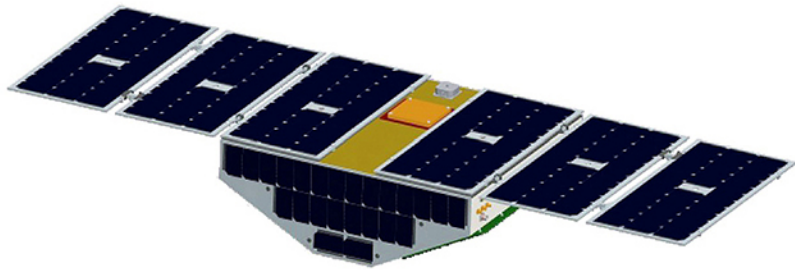


CYGNSS - Cyclone Global Navigation Satellite System



NASA has funded a new mission using a constellation of eight small satellites carried to low-Earth orbit on a single launch vehicle to make accurate measurements of ocean surface winds in and near the eye of the storm throughout the lifecycle of tropical cyclones, typhoons and hurricanes.

The Cyclone Global Navigation Satellite System, or CYGNSS, will be the first to probe the inner core of hurricanes in greater detail to better understand their rapid intensification. The goal is to improve hurricane intensity forecasts.



How Can You Measure Winds From Space?

Once in orbit, CYGNSS's micro-satellite observatories will receive direct and reflected signals from Global Positioning System (GPS) satellites. The direct signals pinpoint CYGNSS observatory positions, while the reflected signals respond to ocean surface roughness, from which wind speed is retrieved.

Many missions before CYGNSS have measured winds from space using radio waves.

Most wind measurements from a satellite use the idea of backscatter to measure the amount of ripples on the oceans, which tells them the wind speed. In order to do this, the satellites have a big transmitter on board, which sends radio waves down to the surface where they are scattered by the waves.

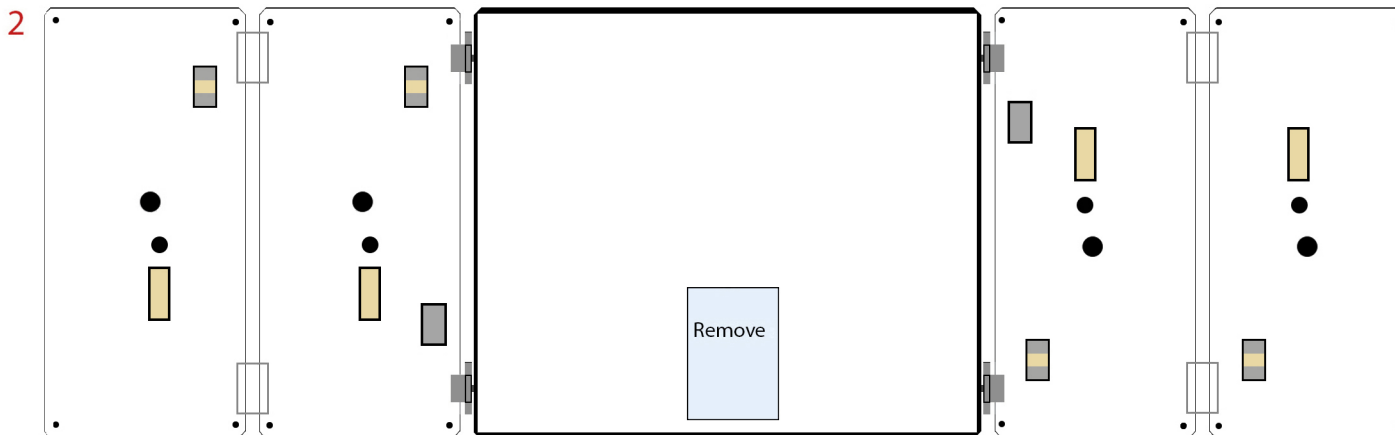
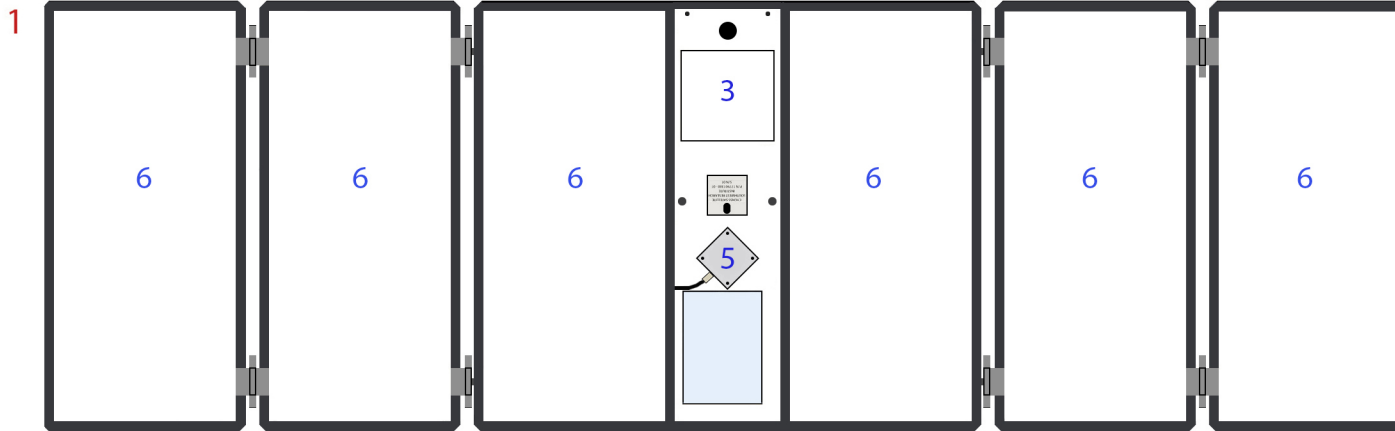
There are a few problems with this technique. The first is that the satellite has to carry both a transmitter and a receiver. The transmitter is heavy, is big, and requires a lot of power, which means that the satellite has to be huge. Another problem is that the wavelengths of the radio waves that are used are absorbed by rain, so that the technique works well outside of hurricanes, but not within them.

One of the brilliant things about the CYGNSS satellites is that they don't carry a transmitter. Instead, they use GPS signals, which are being transmitted by GPS satellites all day, everyday, across the globe.

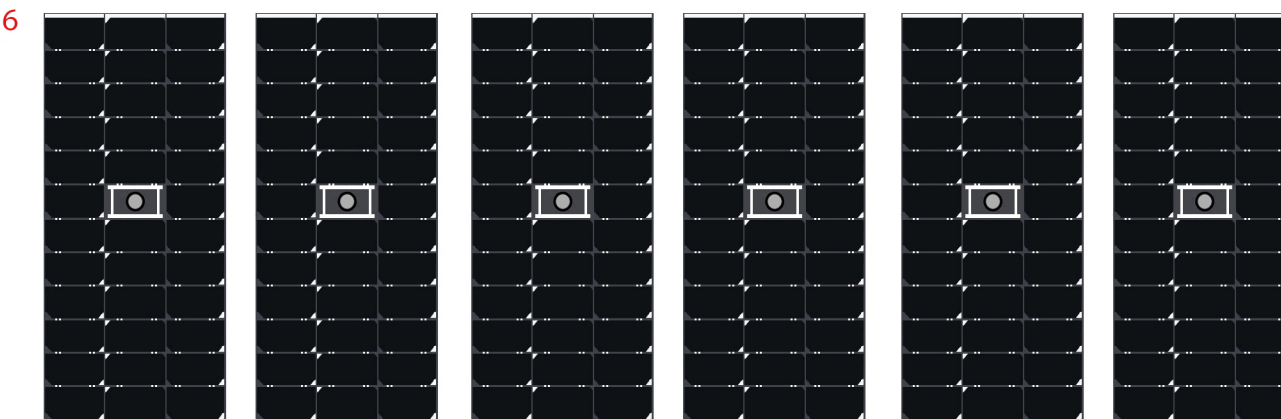
CYGNSS measures those signals that are reflected back to space. A benefit to using the GPS signals is that those radio waves go right through rain, so that CYGNSS can take measurements in the middle of a hurricane, just where other satellites don't work well.

CYGNSS was launched on December 15, 2016 from Cape Canaveral Air Force Station in Florida aboard a Pegasus XL rocket from an Orbital Sciences Corporation Stargazer L-1011 aircraft. CYGNSS is funded through NASA's ESSPO and developed by the University of Michigan.

CYGNSS - Cyclone Global Navigation Satellite System



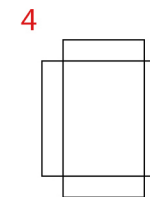
Glue 2 to cardstock, remove light blue areas, glue 1 to backside matching the cutouts - color edges **Black**



Glue to another layer of cardstock - color edges **Black**

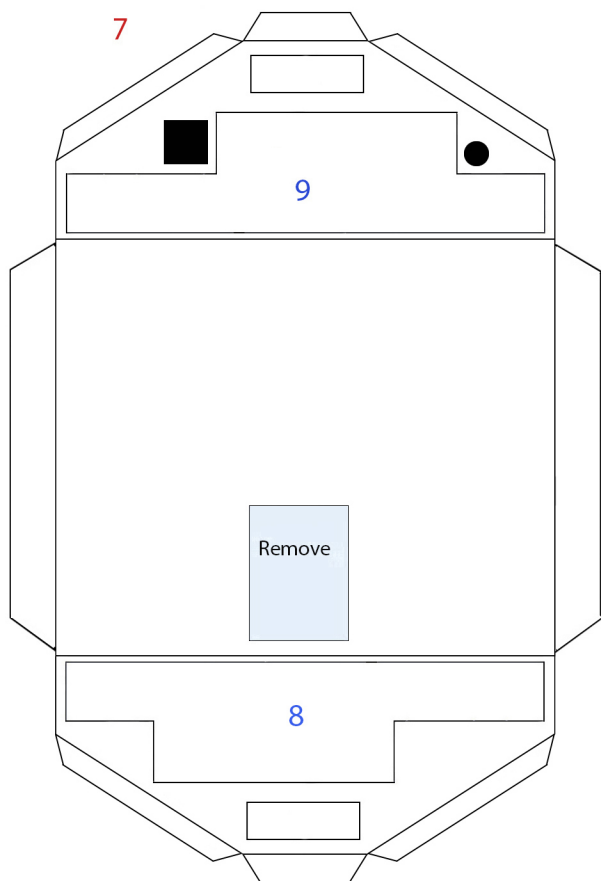


Glue to thick cardstock
Color edges light grey



Glue to thick cardstock.

CYGNSS - Cyclone Global Navigation Satellite System



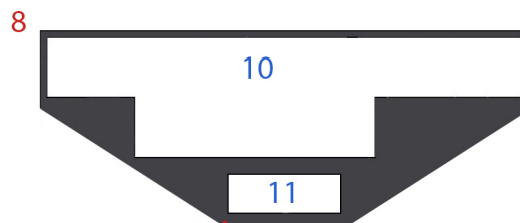
10



11



Glue to cardstock
Color edges grey



8

Glue to thick cardstock, color edges light grey.

13



Color otherside black,
fold to a square.

14



Roll tight

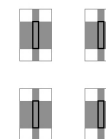
17



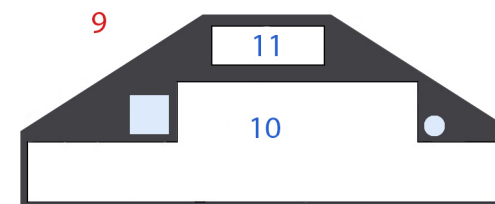
spare

Color otherside black,
roll into rings.

18

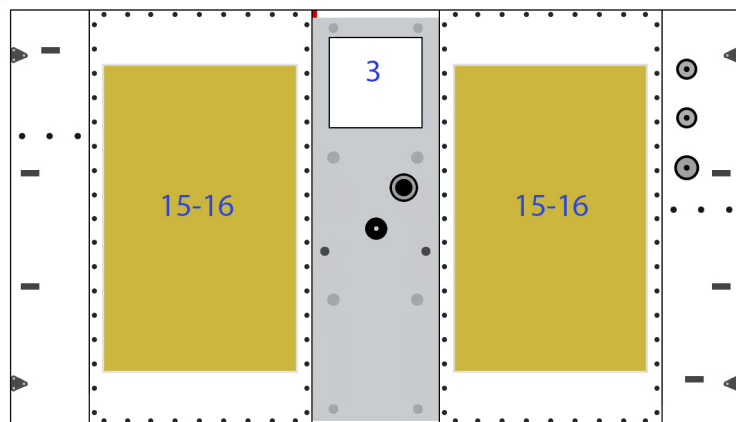


Cut out the light blue
areas



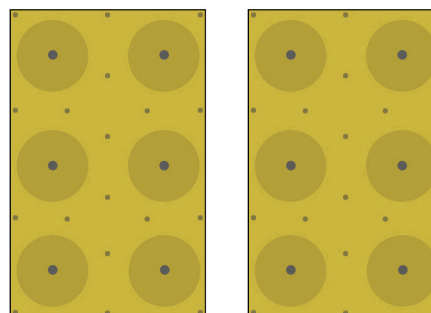
9

12

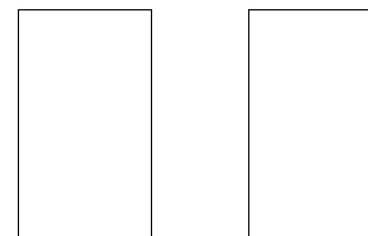


Glue to another cardstock
Color edges the same color

15



16



Glue to thick cardstock, then glue to the
center - backside of 15.