

Uhuru Satellite



The first satellite devoted to X-ray astronomy, Small Astronomy Satellite-A, renamed Uhuru (Swahili for "Freedom"), was launched into a near-Earth equatorial orbit from the San Marco platform off the coast of Kenya on 12 December 1970, the seventh anniversary of Kenyan Independence Day.

It was also known as the X-ray Explorer Satellite, SAS-A (for "Small Astronomy Satellite" A, being first of the three-spacecraft SAS series), SAS 1, or Explorer 42.

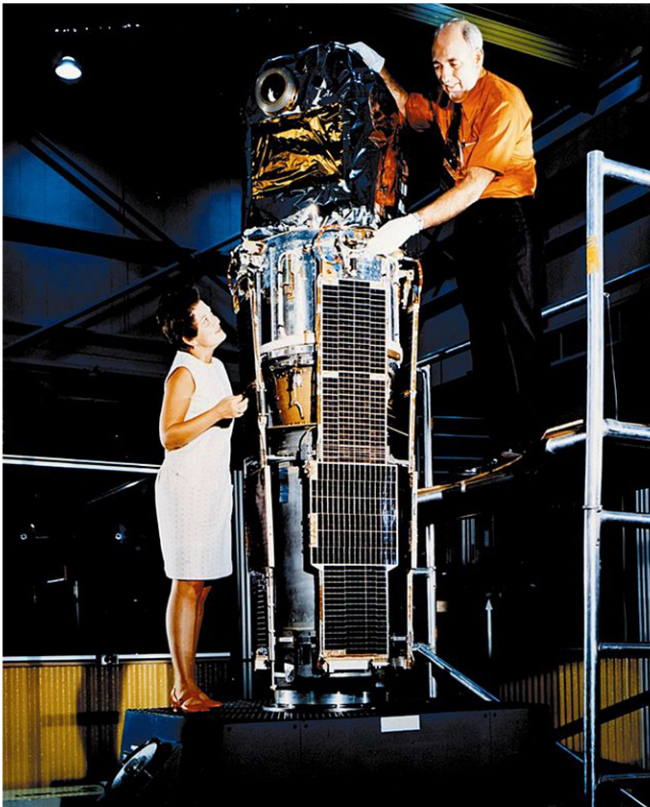
The mission ended in March 1973. Uhuru was a scanning mission, with a spin period of ~12 minutes. It performed the first comprehensive survey of the entire sky for X-ray sources, with a sensitivity of about 0.001 times the intensity of the Crab nebula.

The main objectives of the mission were:

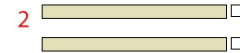
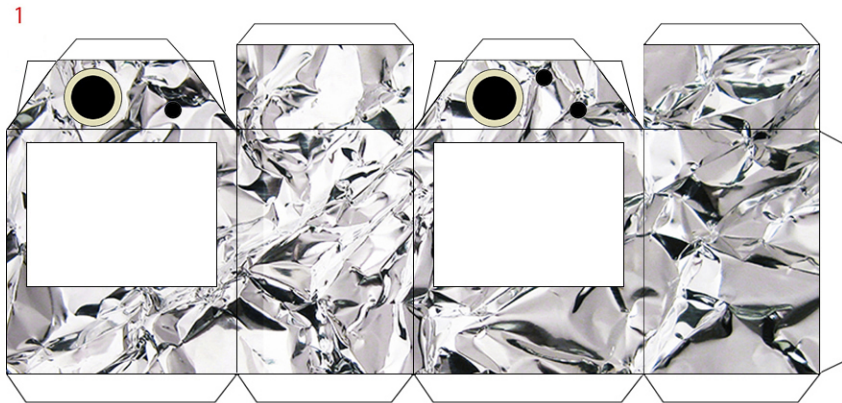
- ☒ To survey the sky for cosmic X-ray sources in the 2–20 keV range to a limiting sensitivity of 1.5×10^{-18} joule/(cm²-sec), 5×10^{-4} the flux from the Crab Nebula.
- ☒ To determine discrete source locations with a precision of a few square minutes of arc for strong sources and a few tenths of a square degree at the sensitivity limit.
- ☒ To study the structure of extended sources or complex regions with a resolution of about 30 arc minutes.
- ☒ To determine gross spectral features and variability of X-ray sources
- ☒ To perform, wherever possible, coordinated and/or simultaneous observations of X-ray objects with other observers.

The spacecraft was spin stabilized at 12 minutes per revolution. One detector had a field of view of 1 degree x 10 degrees, so it viewed each source for 2 s during each scan. A second detector had a field of view of 10 x 10 degrees and spent 20 seconds on sources during each scan. Uhuru scanned many times (typically about 60 in a given day after which the scan region was usually moved) over the same region thereby greatly increasing its sensitivity to weak sources. The net result of this was that Uhuru was able to detect X-ray sources 10 times fainter than the faintest detectable on earlier rocket flights to a limiting sensitivity of about 0.001 of the intensity of Crab Nebula. Although not uniform in sensitivity, 95% of the sky was scanned during the 2.5 year lifetime of the mission. A tape recorder failed early on, and the transmitter failed and then miraculously recovered.

The satellite's name, "Uhuru", is the Swahili word for "freedom". It was named in recognition of the hospitality of Kenya from where it was launched, from the Italian San Marco launch platform near Mombasa.



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Cut 3 pcs of plastic broom straws (or similar materials), colored grey, the length as the line above.



Cut 4 pcs of plastic broom straws (or similar Material) the same length as the line above. Make an "X" with one pair.

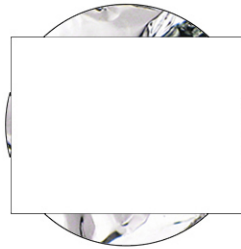
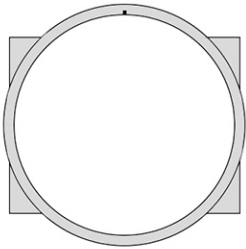
Glue the other pcs - one long, one short - to form the letter "T", make two of them.

Paint the three assembled antennas silver or grey when the glue is dry.

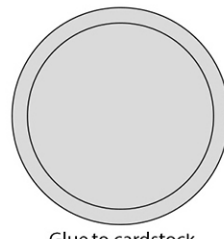


Color back Black

7 Bottom side Glue back-to-back 8 Top side



10 Bottom

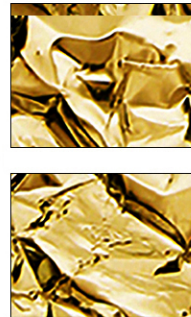


Glue to cardstock

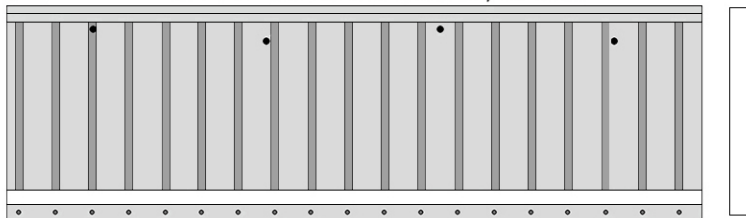
5 Top



6



9 Top Drill holes on the black dots for solar panel struts



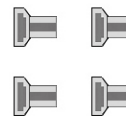
Bottom



Color back Black

After rolling and gluing 9 to a cylinder, add another layer inside for strength. Re-drill the 4 holes for the solar panels.

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Backside hinges

After gluing the solar panels to black cardstock for color on both sides, glue these to backside of the hinges on the solar panel front side.

Need 2 pcs of thin stiff wires -colored black - cut around 4 3/4 inches long to install the solar panels.

Can also use wood skewers 1.8mm dia cut the same length.

Glue solar panels to **black cardstock** - but **NOT** the hinges. Color edges black.

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