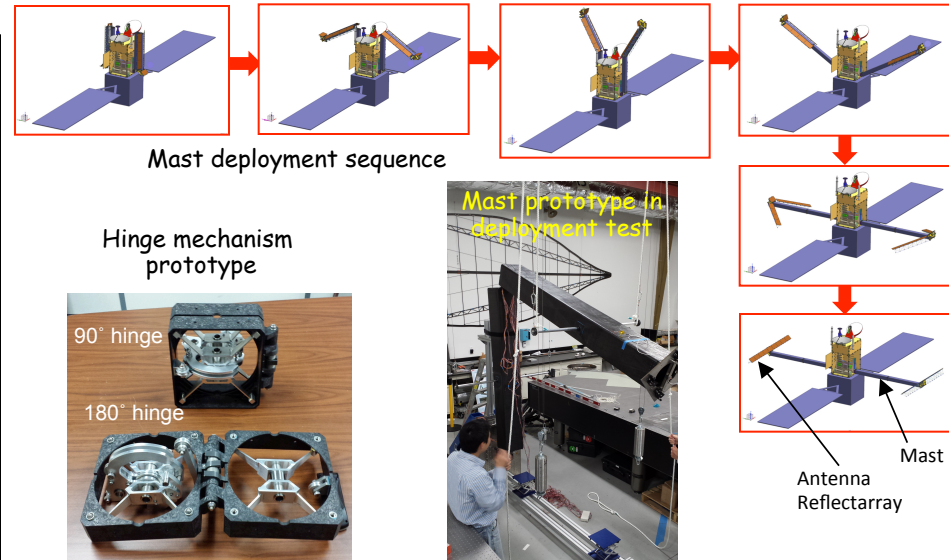


Precision Deployable Mast for the SWOT KaRIn Instrument

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Objective

- Design and prototype a lightweight, precision-deployable mast for the Ka-band Radar Interferometer (KaRIn) antennas in the Surface Water and Ocean Topography (SWOT) mission.
 - Performance goals are:
 - Hinge rotational accuracy/repeatability: $\leq \pm 2.5$ arcsec
 - Mast deployment accuracy: ≤ 7 arcsec RMS
 - First bending mode frequency: ≥ 7 Hz
 - Technologies include a precision deployable mast containing a multi-joint cable-driven precision latch mechanism and a pointing adjustment mechanism.



Accomplishments

- Designed the large, lightweight, deployable mast structure for mounting of the Ka-band interferometric SAR reflectarray antennas, and the optimized in-flight mast deployment sequence
 - Both the mast and the deployment scheme are the current baselines for the SWOT's KaRIn flight system
- Prototyped the 90-deg and 180-deg hinge mechanisms for mast deployment. Testing showed that these hinges achieved rotational accuracy/repeatability $< \pm 1.5$ arcsecond (meeting the ± 2.5 arcsecond requirement)
- Built a full-scale prototype of the 5-m deployable mast with flight-like materials and pedigree, consisting of both the inboard- and outboard-booms, and hinge attachments. Analysis showed the prototype met the 7-Hz modal requirement
- Conducted deployment repeatability testing to verify the mast pointing performance
 - Rotational deviation: measured 1.8 arcsec RMS (meeting the 7-arcsec requirement)
 - Twist deviation: measured at 7 arcsec range (vs. 7 arcsec requirement)
 - Confirmation of test setup and additional testing are planned to further improve twist performance

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TRL_{in} = 2

TRL_{out} = 4