

	ID	Title	Description	Current Capabilities	Needed Capabilities
Diffraction and Scattered Light Control	S-2	Optical Perf Demo and Model Validation	Experimentally validate the equations that predict the contrasts achievable with a starshade.	3x10 <sup>-10</sup> contrast at 632 nm, 5 cm mask, and ~500 Fresnel #; validated optical model  9x10 <sup>-10</sup> contrast at white light, 58 cm mask, and 210 Fresnel #	Experimentally validated models of contrast to < 10 <sup>-10</sup> in scaled flight-like geometry with Fresnel numbers ≤ 20 across a broadband optical bandpass.
	S-1	Solar Glint	Limit edge-scattered sunlight and diffracted starlight with optical petal edges that also handle stowed bending strain.	Machined graphite edges meet all specs but edge radius (10 μm); etched metal edges meet all specs but in-plane shape tolerance (Exo-S design).	Integrated petal optical edges maintain precision in-plane shape requirements after deployment trials and limit solar glint contributing < 10 <sup>-10</sup> contrast at petal edges.
Precision Structural Deployment	S-6	Petal Deployment	Demonstrate petals deploy without edge contact.	Model simulations predict uncontrolled petal unfurling produces edge contact (Exo-S design).	Full-scale controlled petal deployment mechanism demonstrated to secure petals throughout launch and deploy with no edge contact.
Lateral Formation Flying Sensing	S-3	Lateral Formation Sensing	Demonstrate lateral formation flying sensing accuracy consistent with keeping telescope in starshade's dark shadow.	Centroid star positions to ≤ 1/100 <sup>th</sup> pixel with ample flux. Simulations have shown that sensing and GN&C is tractable, though sensing demonstration of lateral control has not yet been performed.	Demonstrate sensing lateral errors ≤ 0.30m accuracy at scaled flight separations (mas bearing angle).  Estimated centroid positions to ≤ 1/40 <sup>th</sup> pixel with limited flux from out of band starlight.  Control algorithms demonstrated with scaled lateral control errors corresponding to ≤ 1m.
Precision Structural Deployment	S-5	Inner Disk Deployment	Demonstrate that a starshade can be autonomously deployed to within its budgeted tolerances after exposure to relevant environments.	Petal deployment tolerance (≤ 1 mm) verified with low fidelity 12m prototype and no optical shield; no environmental testing (Exo-S design).	Demonstrate deployment tolerances are met to ≤ 1 mm with flight-like, minimum half-scale inner disk, with simulated petals, optical shield, and interfaces to launch restraint after exposure to relevant environments.
Diffraction and Scattered Light Control	S-4	Petal Shape	Demonstrate a high-fidelity, flight-like starshade petal meets petal shape tolerances after exposure to relevant environments.	Manufacturing tolerance (≤ 100 μm) verified with low fidelity 6m prototype and no environmental tests.  Petal deployment tests conducted but on prototype petals to demonstrate rib actuation; no shape measurements.	Demonstrate a flight-like, full-scale petal (~ 7m) fabricated to within 200 μm tolerance and maintains shape after multiple deployments from stowed configuration.