

# Configurable Aperture Space Telescope

Readiness level:  
 TRL 1-3: Concept  
 TRL 4-6: Prototype  
 TRL 7-9: Demonstrated

NASA Ames Instrumentation Workshop

September 16, 2015

Technology / Application

## CAST Telescope

- An spherical telescope that can grow on space offering “unlimited FoV”
- The telescope can grow on space utilizing identical interchangeable segments:
- Spherical aberration corrector on each segment
- Configuration evaluated

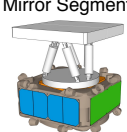
Apertures range	: 0.6m based on a 2.4m
F/#	: 22.3
FoV	: 2'
R primary	: 14,000mm
R sec	: 8,750mm
D Primary	: 600mm
D sec.	: 216mm
Primary to secondary distance	: 4,250mm

- **This could be a scalable way to replace Hubble in the visible regime.**
- Longer wavelengths NIR would relax alignment tolerances
- Challenges: Design correctors for 2x2' FOV that are Diffraction Limited
- Achieve structure stiffness enough to maintain the mirrors in place.

### Relevance for Ames

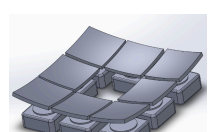
- Co-phasing segments algorithms has been developed
- Creating lager apertures based on small segments in space is key to enable astrophysics with cube-sats.
- Possible extension to adaptive spherical segments that can morph into aspheric segments.

THE BRICK

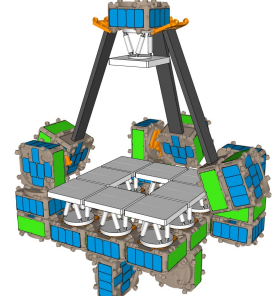


HiSat

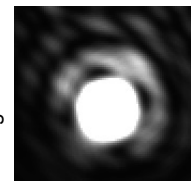
THE SET



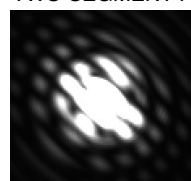
THE ASSEMBLY



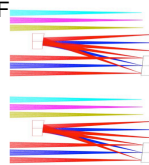
SINGLE SEGMENT PSF



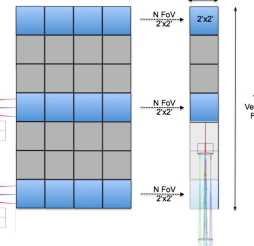
Lab demo with two segments



TWO SEGMENT PSF

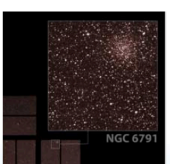


Correctors can be placed adjacent horizontally providing continuous FoV and spaced by 4' vertically




14' Vertical FoV

NGC 6791, 80yr Open Star Cluster Obs. by Kepler




Kepler (Dtel = 0.95 m)

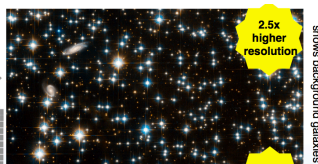
Grow the aperture



1 m



2.4 m



Hubble (Dtel = 2.4 m)

2.5x higher resolution

10 mag more sensitive

NGC 6791 obs. by Hubble shows background galaxies

Funding / Timeline

- **Sept 2014**, CIF for CAST awarded
- **April 2015**, Theoretical design work mostly completed
- **August 2015**, co-phasing lab demo completed
- **September 2015**, corrector implemented
- Possible application to APRA funding for next year

POC

PI: Kimberly Ennico  
**POC:** Eduardo Bendek  
 • **Email:** eduardo.a.bendek@nasa.gov  
 • **Phone:** 650-604-5850