

Near-Earth Object (NEO) Surveyor Update

Amy Mainzer
University of Arizona



NEO Surveyor: Finding NEOs Before They Find Us



- **NEO Surveyor is a mission designed to find, catalog, and characterize NEOs**
- **It responds to the 2005 George E. Brown law that requires NASA to find more than 90% of NEOs larger than 140 m in diameter**
 - This was supposed to be accomplished by 2020
- **NEO Surveyor is an infrared space telescope with a design and survey strategy optimized for discovering the NEOs that are most likely to impact the Earth**
 - No other science objectives

George E Brown
NEO Survey Goal



NEO Surveyor Project Overview

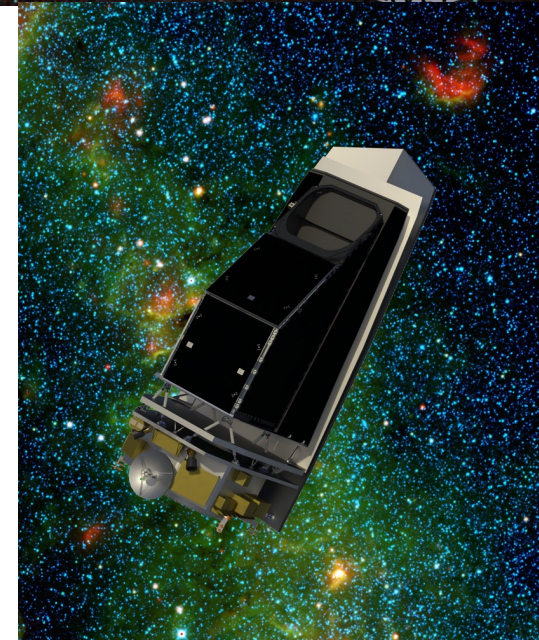


Salient features:

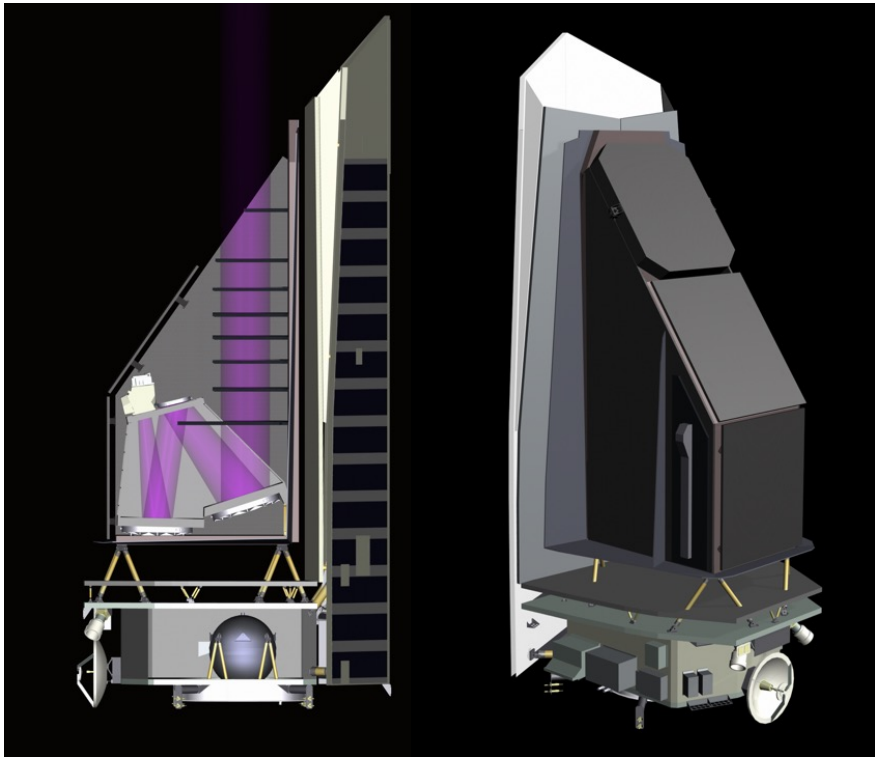
- NEO Surveyor is a planetary defense mission
- Key NASA priority to detect, track, and characterize impact hazards from asteroids and comets
- Will make significant progress toward George E. Brown, Jr. NEO Survey Act (Public Law 109-55, Sec. 321). Responds to National Research Council's report Defending Planet Earth (2010), U.S. National NEO Preparedness Strategy (2018), Planetary Decadal Survey (2022)
- Launch Readiness Date: September 2027
- Program Exec: Andrea Riley. Program Scientist: Mike Kelley. Mission Manager: Solveig Irvine
- Survey Director: Amy Mainzer (UA). JPL Project Manager: Tom Hoffman

Science requirements:

- Identify at least 2/3 of potentially hazardous asteroids >140 m in effective spherical diameter within 5-year baseline mission (Goal: $\geq 90\%$ completeness within 10-12 years)
- Collect and verify sufficient observations in order to calculate the frequency of impacts from asteroids >50 m in effective spherical diameter & comets
- Collect and verify sufficient observations in order to derive physical and orbital characteristics of specific objects of interest



Mission Architecture



Observatory will survey from halo orbit at L1 for 5 years with 12-year goal. Launch Sept 2027.

NEOS was confirmed to enter Phase C on November 29, 2022

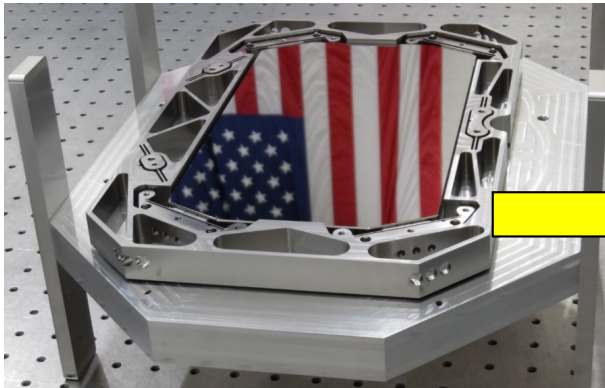
Instrument is passively cooled

- 50-cm telescope
- 2 IR channels imaging simultaneously
- 4-5.2 μm and 6-10 μm
- Field of view 11 sq deg
- Sensitivity:
 - $<110/280$ μJy 5-sigma in 3min @ 8 μm @ 120/45 deg from Sun
 - $<65/120$ μJy 5-sigma in 3min @ 4.6 μm @ 120/45 deg from Sun

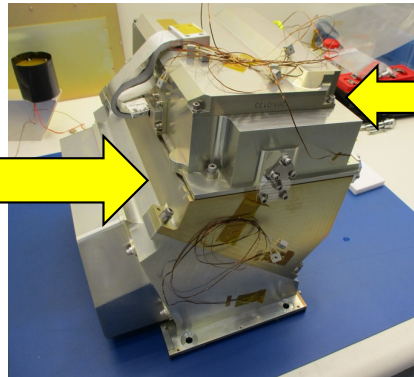
Spacecraft is based on Ball BCP2000 heritage

- 3-axis stabilized spacecraft
- Ejectable cover is the only deployment

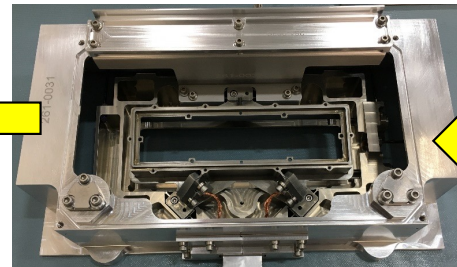
Hardware Progress



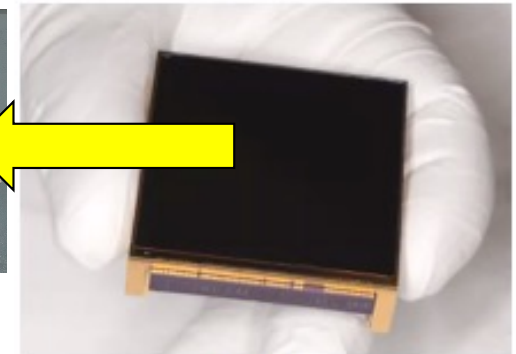
Qual unit beamsplitter



Camera enclosure assembly engineering dev unit

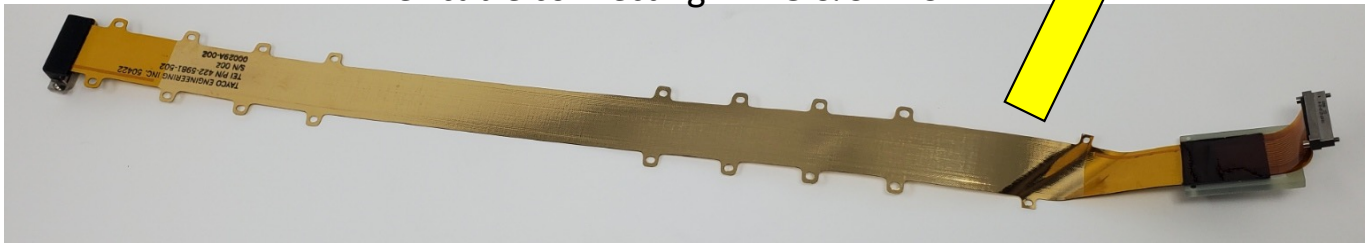


Focal plane module housing

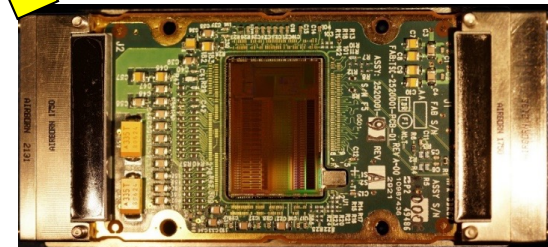


H2RG
(2K×2K, 18 μm pitch)

Flex cable connecting H2RG & SIDECAR



SIDECAR control ASIC



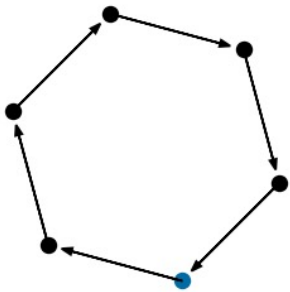
- All 16 flight + flight spare detectors have been selected, plus 8 engineering qual units.

Survey Plan



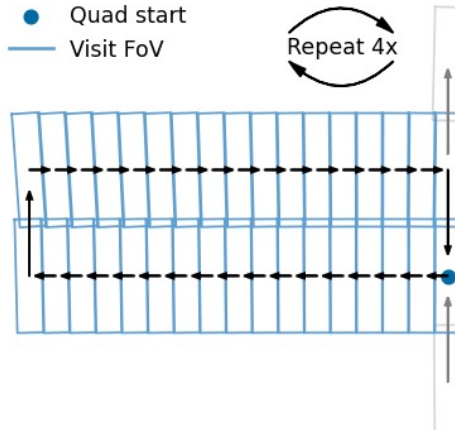
a) Exposures in Visit

- First Exposure
- Slew

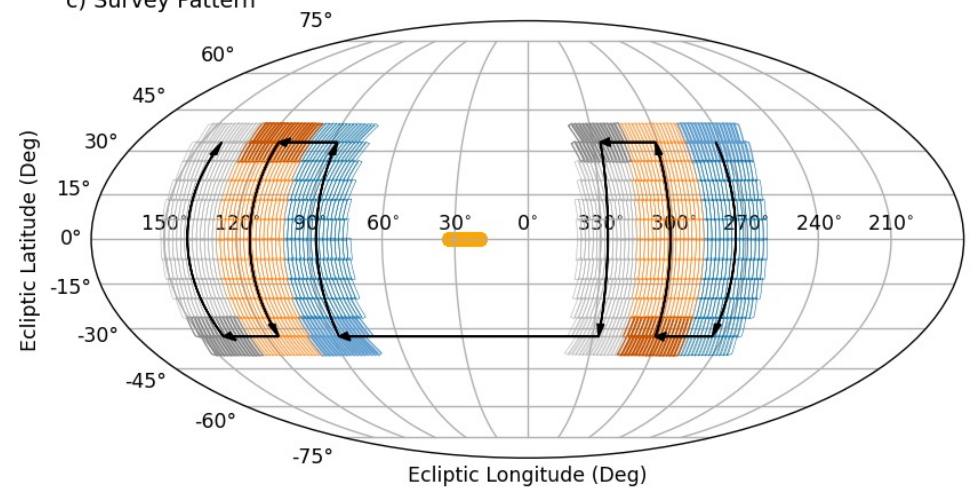


b) Visits in Quad

- Quad start
 - Visit FoV
- Repeat 4x



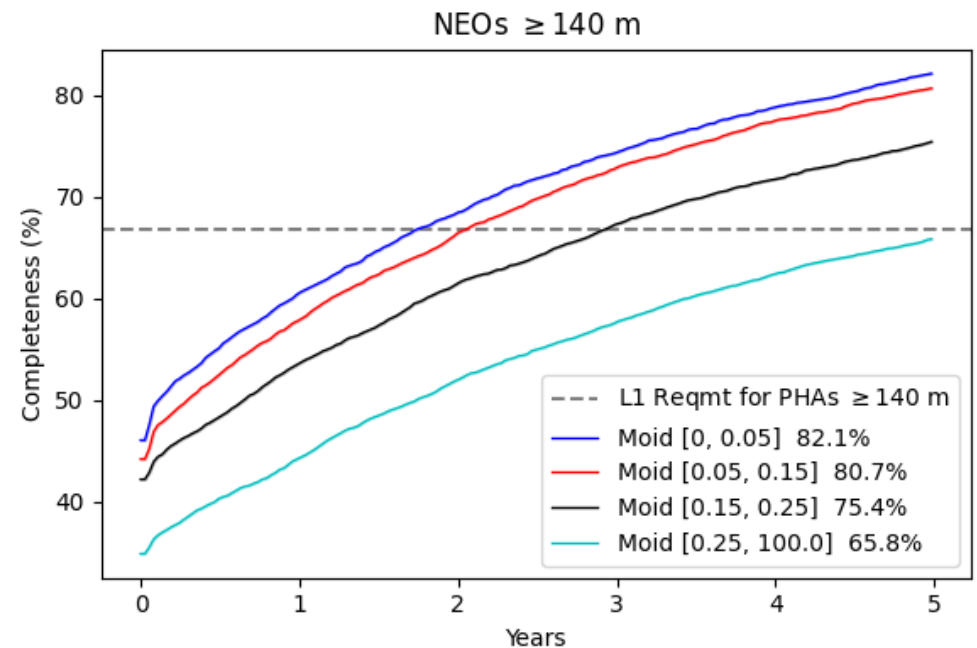
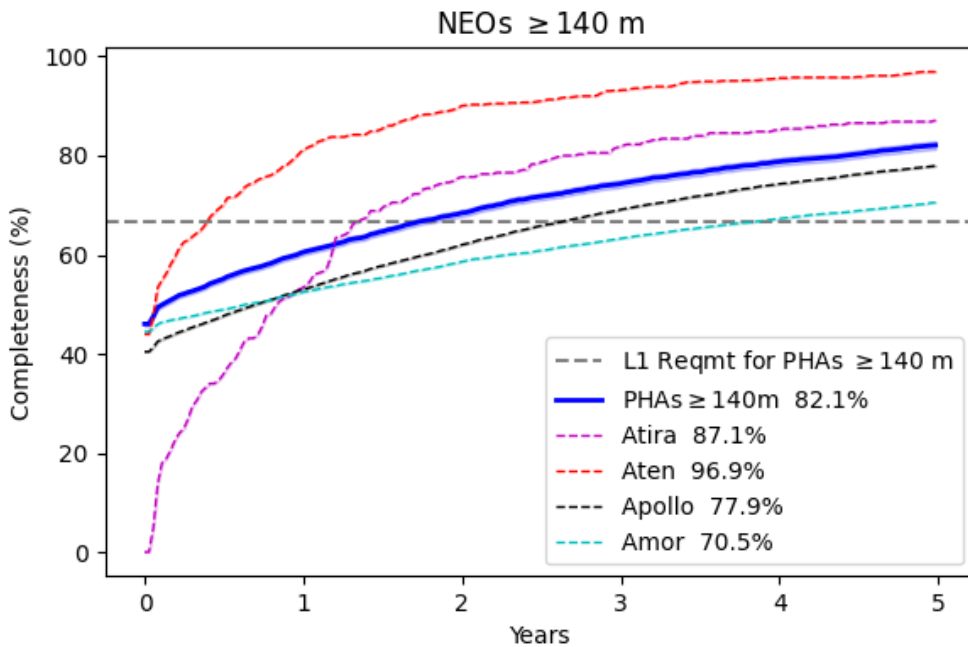
c) Survey Pattern



Survey Completeness vs. MOID & vs. Object Type



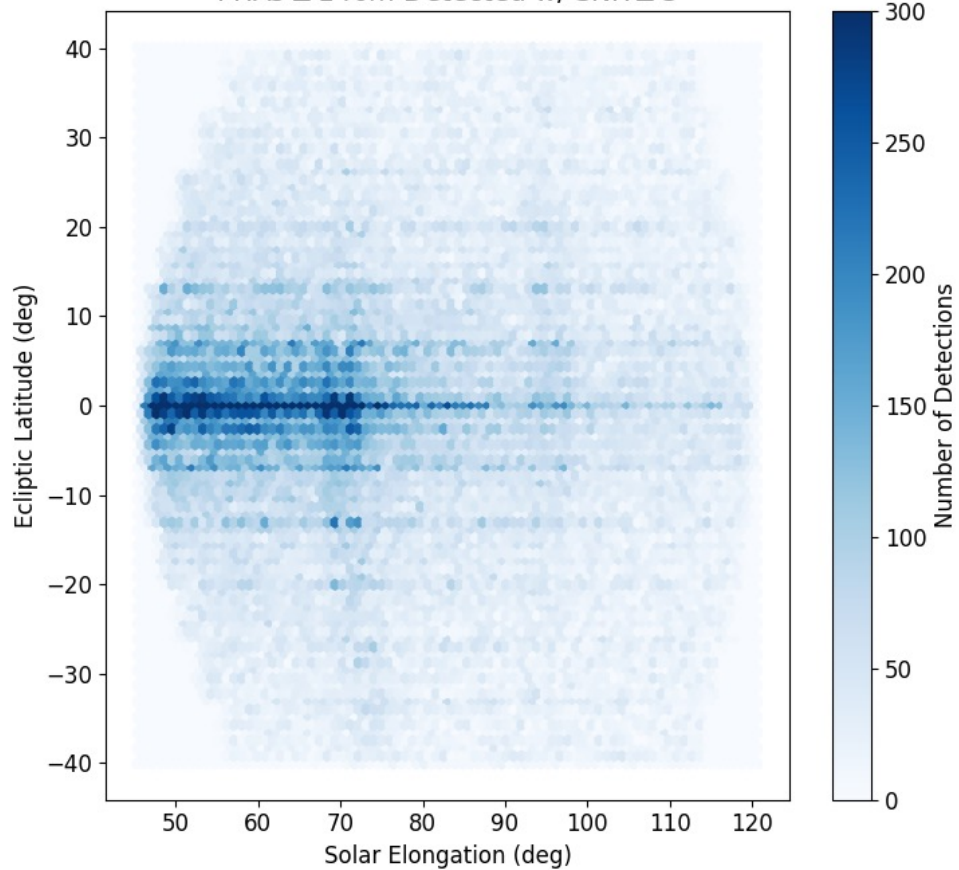
- NEOS will meet its baseline objectives within its 5-year nominal mission.
- It will reach >90% survey completeness for potentially hazardous asteroids >140 m in 10-12 years.
 - Survey is particularly effective at finding PHAs (MOID < 0.05 au), Atens, and Atiras.



Source Locations on Sky



PHAs $\geq 140\text{m}$ Detected w/ $\text{SNR} \geq 5$



MBAs Detected w/ $\text{SNR} \geq 5$

