

# A Candidate *NEO Survey* Mission for Affordable Human Spaceflight Target Assurance

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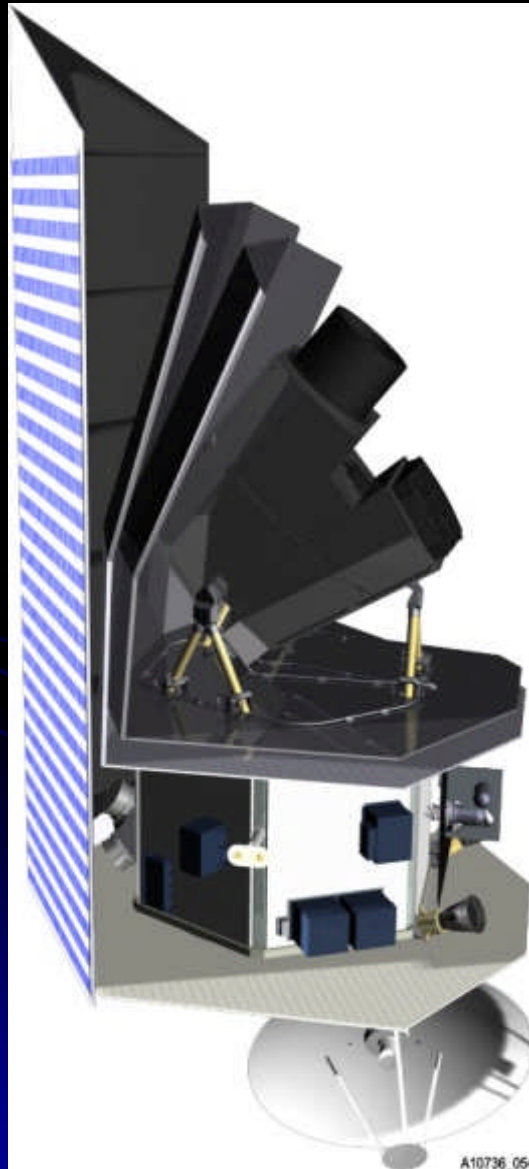
**Session 6: *Affordable Options for Increasing the  
Accessible NEO Catalog***

**Target NEO Workshop**  
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# Architecture Option Overview

- Spacebased. 0.8-AU circularized orbit. (Bi-prop orbit-insertion engine. No launch window.)
- IR: 5 to 9.2 microns. (Cooled Hg:Te:Cd)
- FOV: 2-square degrees. FOR: + / - 10 degrees of latitude, +/- 90 degrees of longitude. 2-hour, 2-day, 24-day repeat visits, entire FOR.
- Survey scheme: Continuously cover this 180 x 20 degree strip as we orbit the Sun.
- Completes the ESMD-relevant catalog down to ~30-meter objects in ~540 days on-orbit. Only does about 30% of George E. Brown charter.

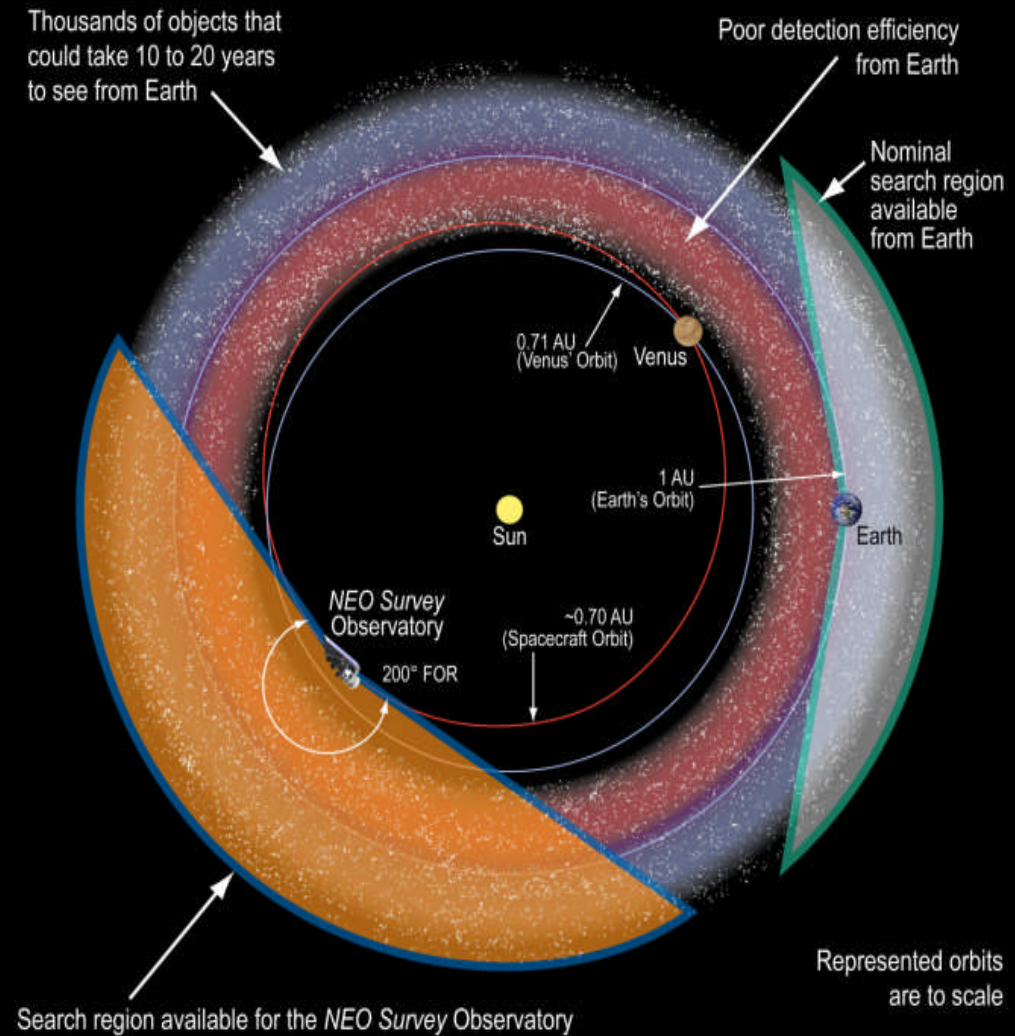
# Point Design (1 of 3 slides)



Thousands of objects that could take 10 to 20 years to see from Earth

Poor detection efficiency from Earth

Nominal search region available from Earth



# Point Design (2 of 3 slides)

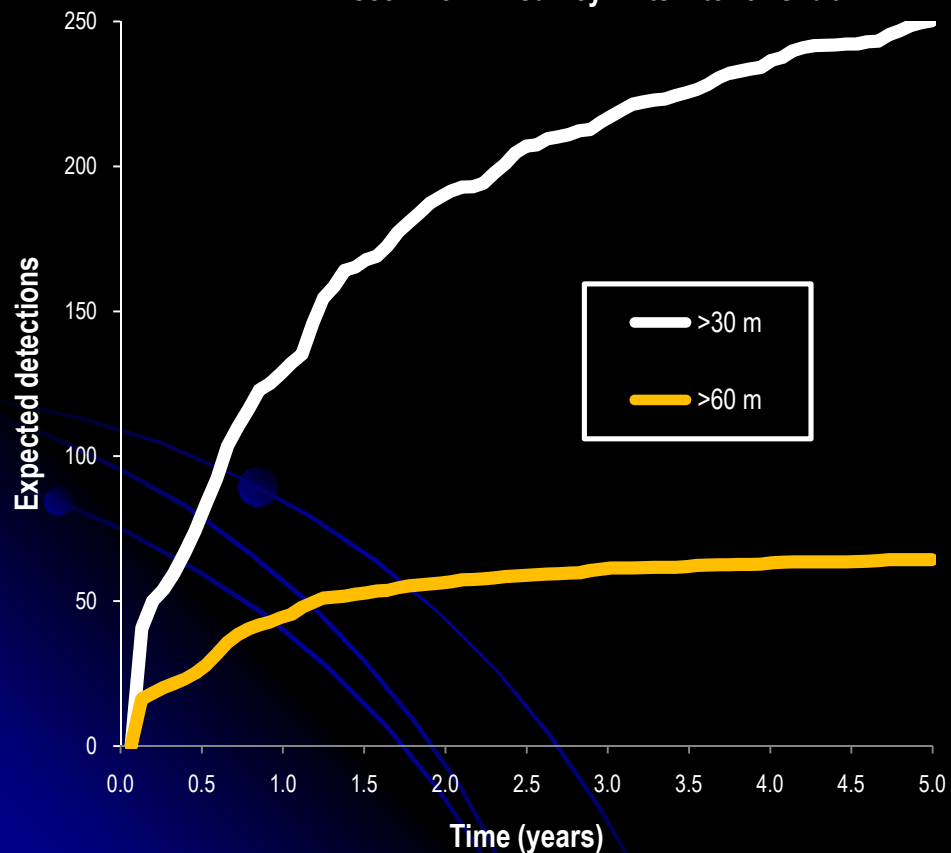
- Launch Mass: ~1370 Kg, wet. Power: ~1 kW. Data Rate: 1-each, 30-minute DSN contact *per week* transmits ~3.5 E9 pre-processed bits.
- EELV class: Delta-IV, Atlas-V, Falcon 9
- Thermal design at 0.8 AU not easy, but doable. Telecom driven by ~2-AU, worst case. Uses a dedicated on-board Instrument CPU, *plus* a S/C CPU. RAD-750s, mission headroom if 1 fails.
- Mission Duration: ~2 years for ESMD, ~7.5 years for GEB.

# Point Design (3 of 3 slides)

- Data pipeline: A new “science-like” center feeds formatted data to the MPC. From the MPC on, uses the existing NEO network.
- The S/C is a refly of *Kepler* plus selected design elements from *Spitzer's* Solar Array / Thermal Shield. Instrument: Leverages much of the *Cryogenic Telescope Assembly (CTA)* from *Spitzer*. (This is NOT another *Spitzer* mission.)
- Costs: \$500M for ESMD option. \$638M for GEB. Includes LV costs and reserves.
- 42 month program from ATP to launch.

# Effectiveness of This Option for an ESMD-relevant Survey

Expected number of Human accessible targets within 5 km/s (1 Way) as seen from IR survey in its Interior Orbit



Estimates of NEO population

	Total number (GEB)	<3 km/s one-way	<5 km/s one-way
>60 m	400,000	17	70
>30 m	2,000,000	85	355

How many NEOs this ESMD survey could find

	2.5 years of observation	7 years of observation
<3 km/s >60 m	16	17
<3 km/s >30 m	66	77
<5 km/s >60 m	51	58
<5 km/s >30 m	183	242

# Options for enhancements / simplifications

- This concept was tuned to meet ESMD's need for a human-compatible NEO-visit catalog. Cost ~\$500M.
- But – it fails to meet 70% of the precedent-setting GEB requirements from circa 2005 which are for 90% completion down to 140-meters in seven years on-orbit.
- For \$138M more, the GEB goal can be met.

# Summary

- An existence proof has been presented for a low-risk, moderate-cost, high-heritage, quick-start program that meets ESMD's need for an affordable human-spaceflight target-assurance catalog.
  - For an additional \$138M, the ESMD need plus the GEB charter can both be met.
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