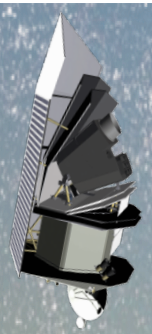


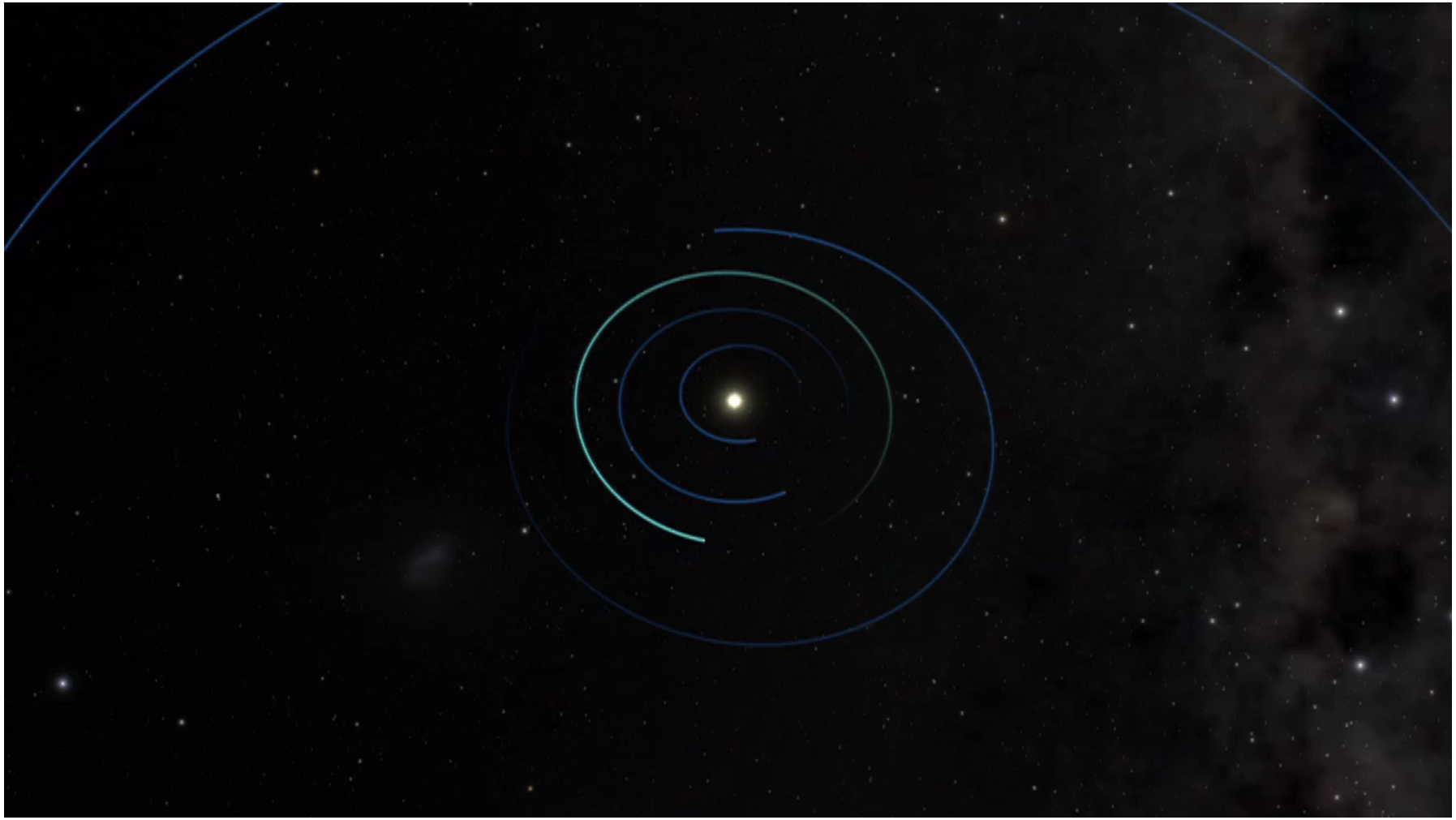
B612 FOUNDATION

The Sentinel Mission

Prof. Scott Hubbard, Stanford University

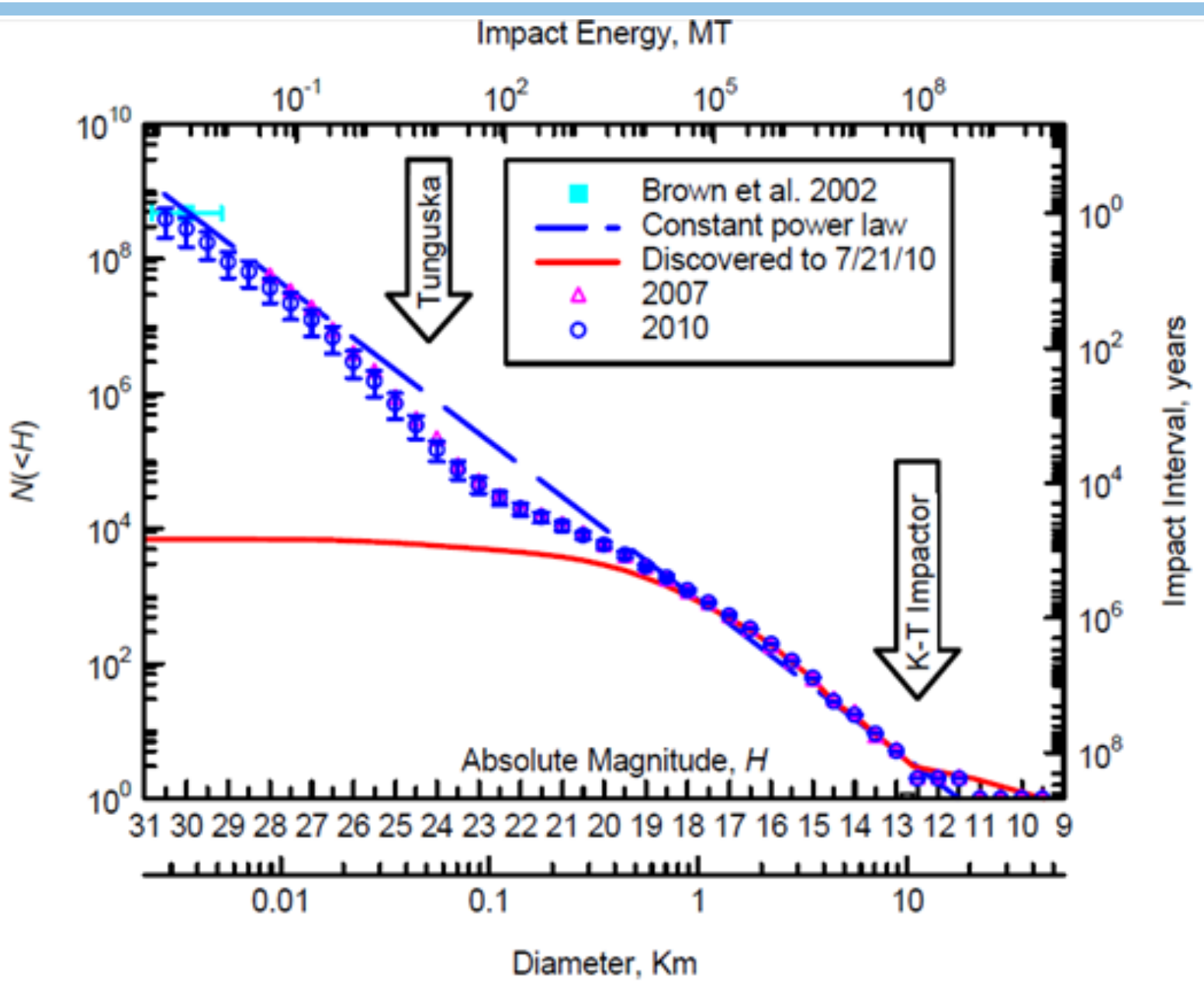
B612 Program Architect

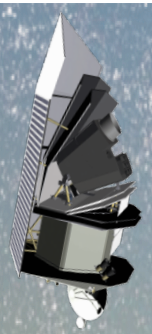
<1% of Near Earth Asteroids Currently Tracked




©Michael Carroll
background: Bernard Gagnon

Asteroid Impacts on Earth





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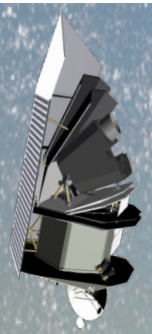
Relative Probabilities of Asteroid Impacts

Asteroid Impact Energy	Odds in 100 years	Your lifetime odds*
5 Megatons (Tunguska – 45 meters)	30%	23% dying of cancer
100 Megatons (140 meters)	1%	1% dying in an auto accident
40 Gigatons (1 kilometer)	.01%	.014% dying in a aircraft accident

* National Safety Council 2008

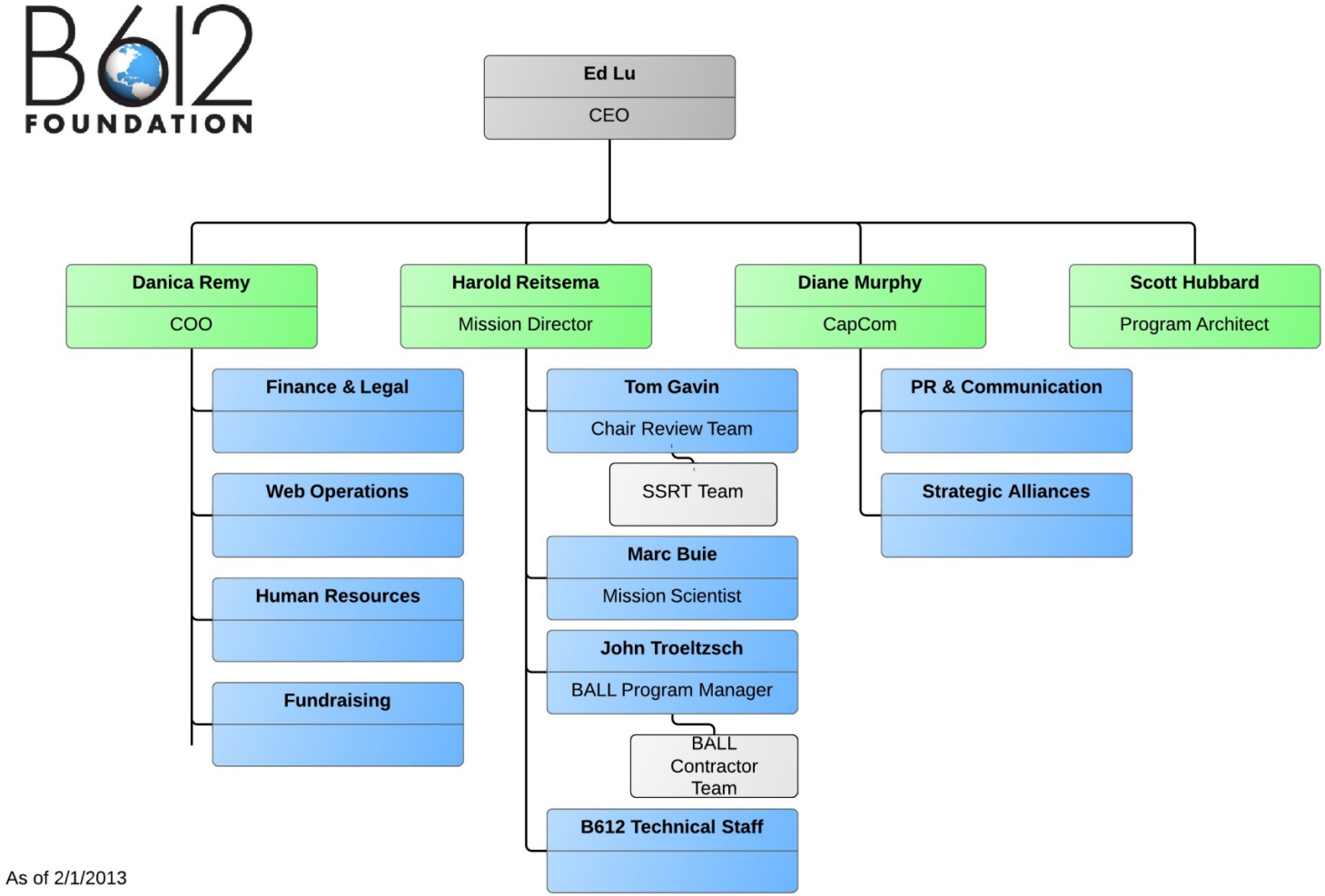


B612 FOUNDATION

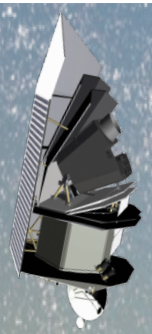
The B612 Foundation

- Silicon Valley based nonprofit 501(c)3
- Founded 2002
- Mission is to detect and deflect Near Earth Objects that represent a threat.
- B612 and ICES just signed an MOU, “to provide enhanced decision support to current and future policy makers and the general public, specifically with respect to the effects of asteroid impacts and the associated hazard reduction and risk mitigation solutions.”

B612 Foundation Leadership Org Chart



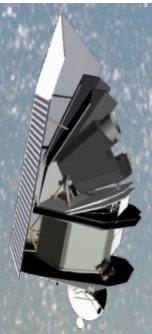
As of 2/1/2013



B612 FOUNDATION

The Sentinel Space Telescope Project

- Goal of B612 originally to do research on asteroid deflection – generally accepted to be possible given decades of advance warning
- Goal changed in 2011 to: Find and Track Asteroids that Threaten Earth
  - Extend surveys down to smaller, more numerous, and yet still dangerous asteroids
  - Track orbits accurately enough to give Earth decades of warning of an impending impact so that deflection is possible
  - Create the first comprehensive dynamic map of the objects in the inner solar system



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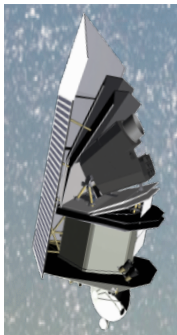
Sentinel Will Find and Track 500,000 Near Earth Asteroids



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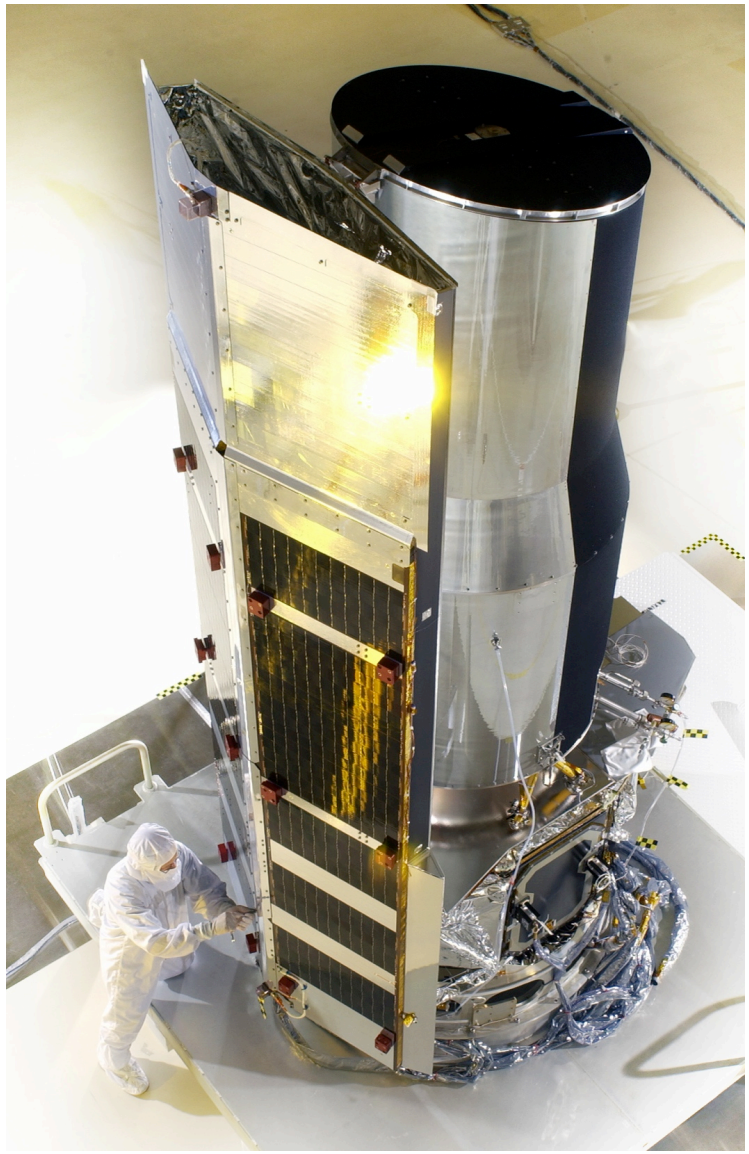
Spitzer Infrared Telescope Launched in 2003



Key Contractor: Ball Aerospace

Kepler: The Search for Habitable Planets

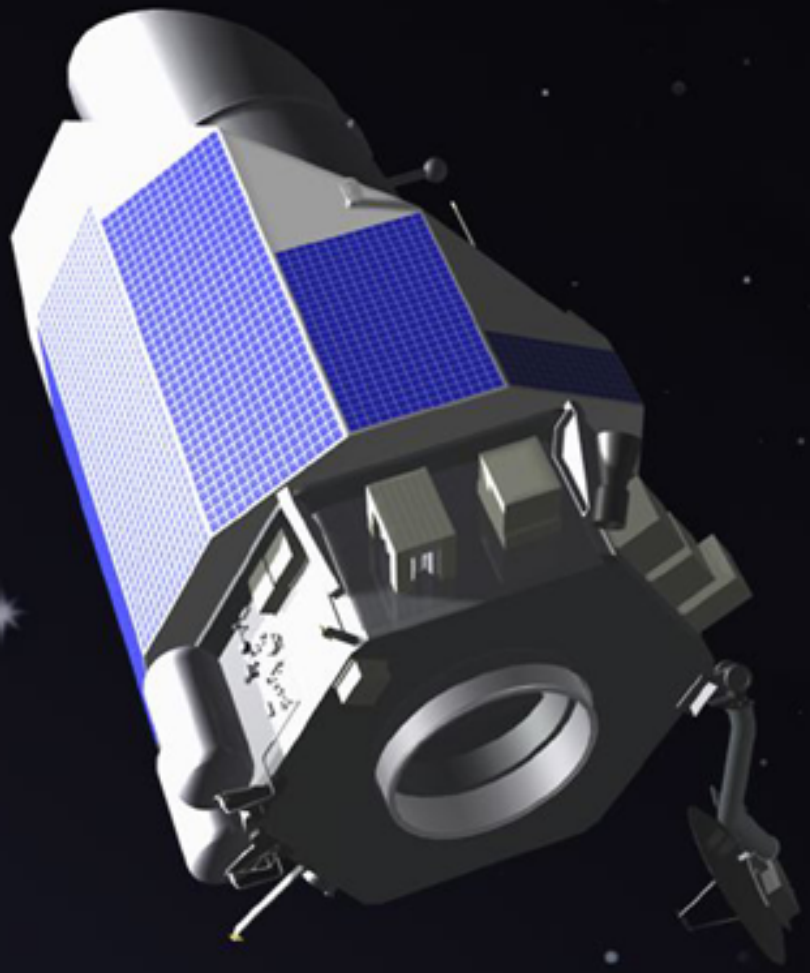
Principal Investigator:
W. Borucki, NASA Ames

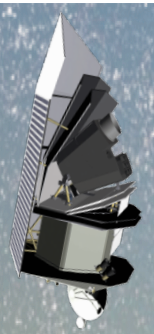
Center Director: Scott Hubbard

Prime Contractor: Ball Aerospace

Launched March 6, 2009

As of today 3,602 candidate planets found!

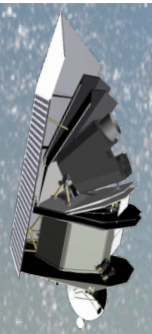




B612 FOUNDATION

The Sentinel Space Telescope Project – An innovative approach to managing an interplanetary mission

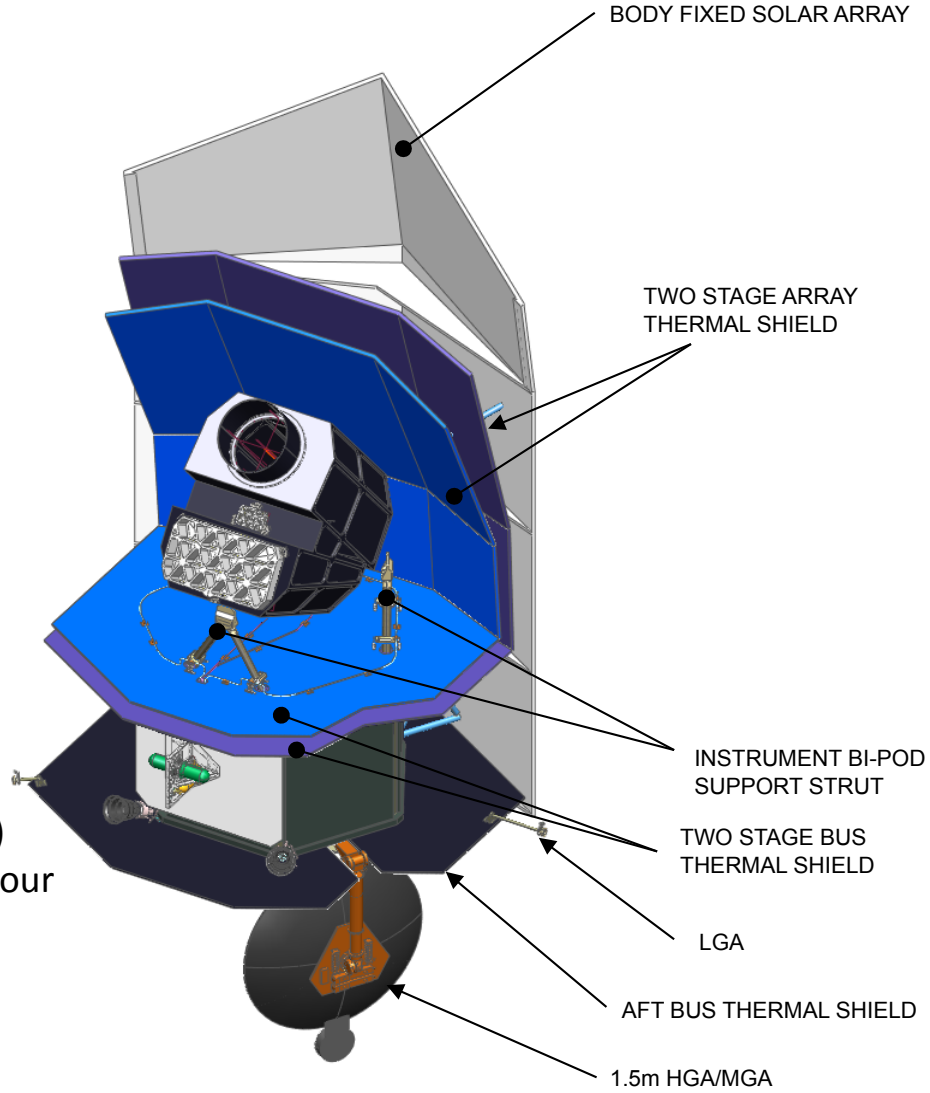
- Small experienced team focused on a single project
  - Rapid decision making as smart customer
- Stable high level requirements – find 90% of asteroids larger than 140 meters in 6.5 years (~50% down to 40m)
- Experienced contractor (Ball Aerospace)
- High heritage – based on Kepler, Spitzer telescopes
- Commercial terms procurement – firm fixed price
  - Benchmarked process with relevant experience (e.g. Worldview S/C)
  - Detailed milestone payment schedule key to FFP management
- Public-private partnership – NASA Space Act agreement
- All-star independent review team

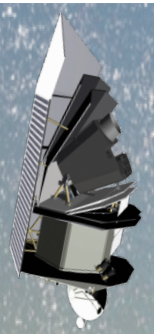


B612 FOUNDATION

Sentinel Key Features

Launch: July 2018
Falcon 9
Orbit: 0.6 by 0.8 AU Heliocentric
Mission Life: 6.5 years
Spacecraft: 7.7 m (25.4 ft) tall
3.2 m (10.5 ft) across
1,500 kg (3,300 lbs)
2.0 kW solar array
24 Ahr battery
3-axis stabilized
1.5 meter high gain antenna
Instrument: 50-cm telescope
5-10.2 µm wavelength
HgCdTe detector cooled to 40 K
24 million pixels
65 microjanskies sensitivity
Field of View 11 deg^2 (2x5.5 deg)
Sky Coverage Rate: 165 square degrees per hour
Astrometric Accuracy: 0.2 arc seconds
On-Board Data Storage: 96 GB





B612 FOUNDATION

The Sentinel Space Telescope Project – An innovative approach to an interplanetary mission

- A one-of-a-kind infrared space telescope
- First privately funded deep space mission
- Opening space exploration to the private sector.
- A treasure trove of 100,000's of NEOs with huge science value
- Trajectories good for 50-100 years
- Perhaps mining value of NEOs
- Perhaps human exploration value