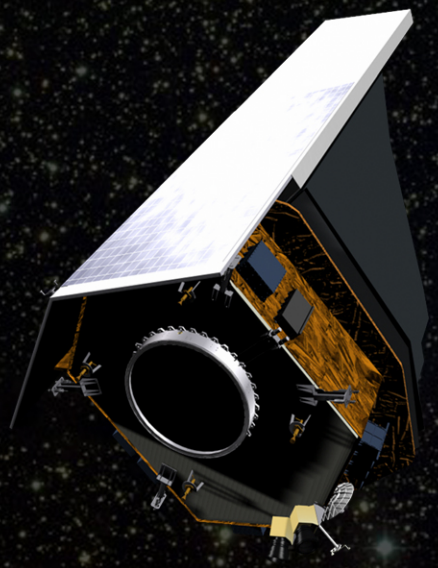
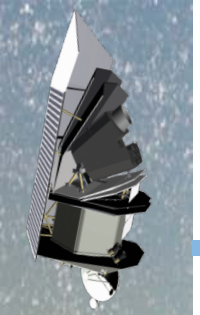
The Sentinel Mission

Small Bodies Assessment Group
10 July 2013



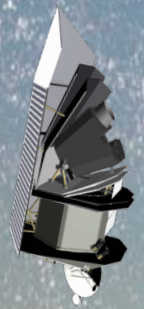
Harold Reitsema
Sentinel Mission Director
B612 Foundation



B612 FOUNDATION

The B612 Foundation

- Silicon Valley based nonprofit 501(c)3
- Founded 2002 by NASA astronauts Ed Lu and Rusty Schweickart
- Mission: Protect humanity by preventing future asteroid impacts on Earth



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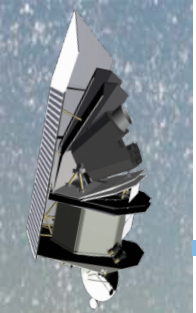
The Sentinel Space Telescope Project

- 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
- The Sentinel mission is being funded through private contributions



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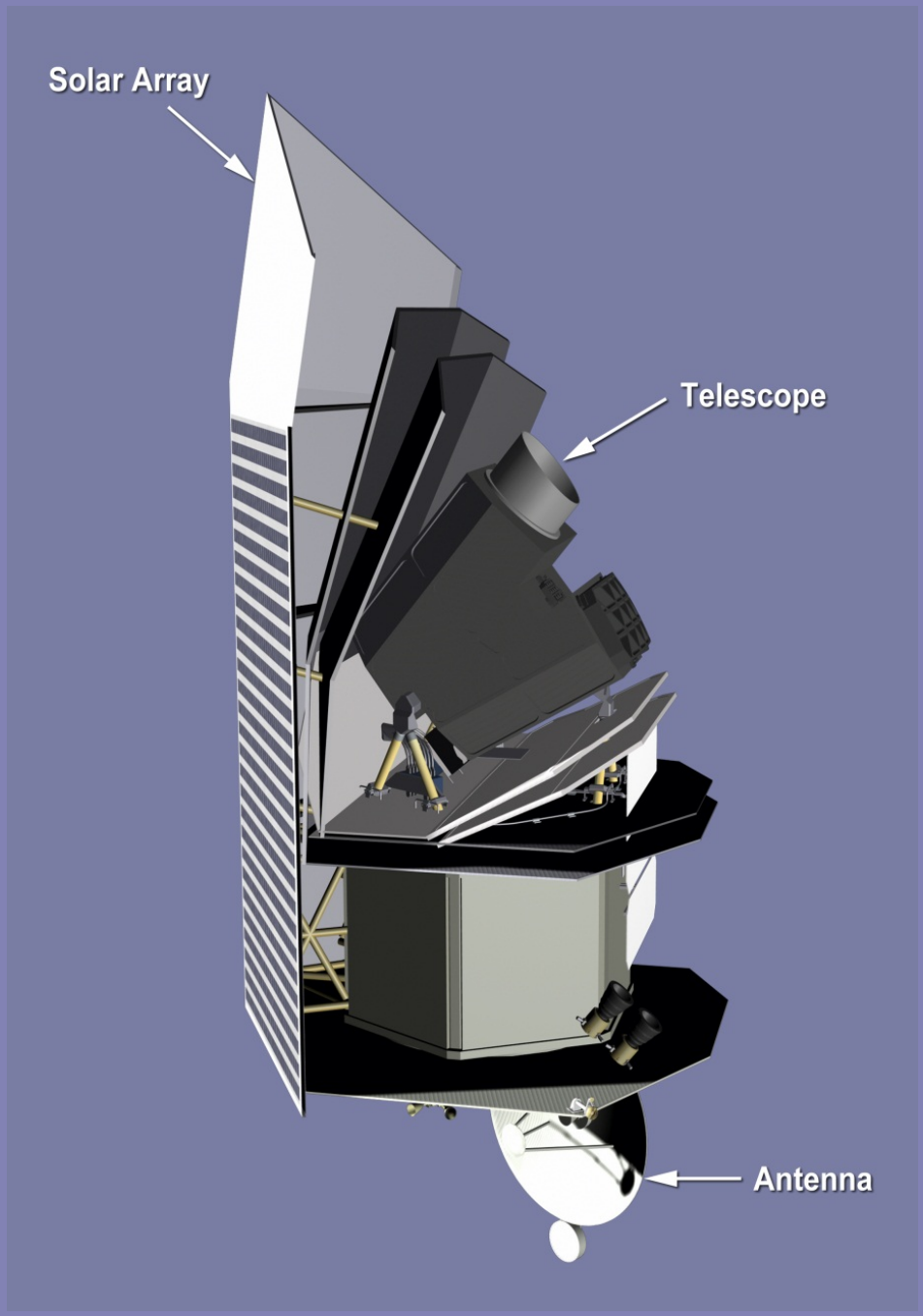
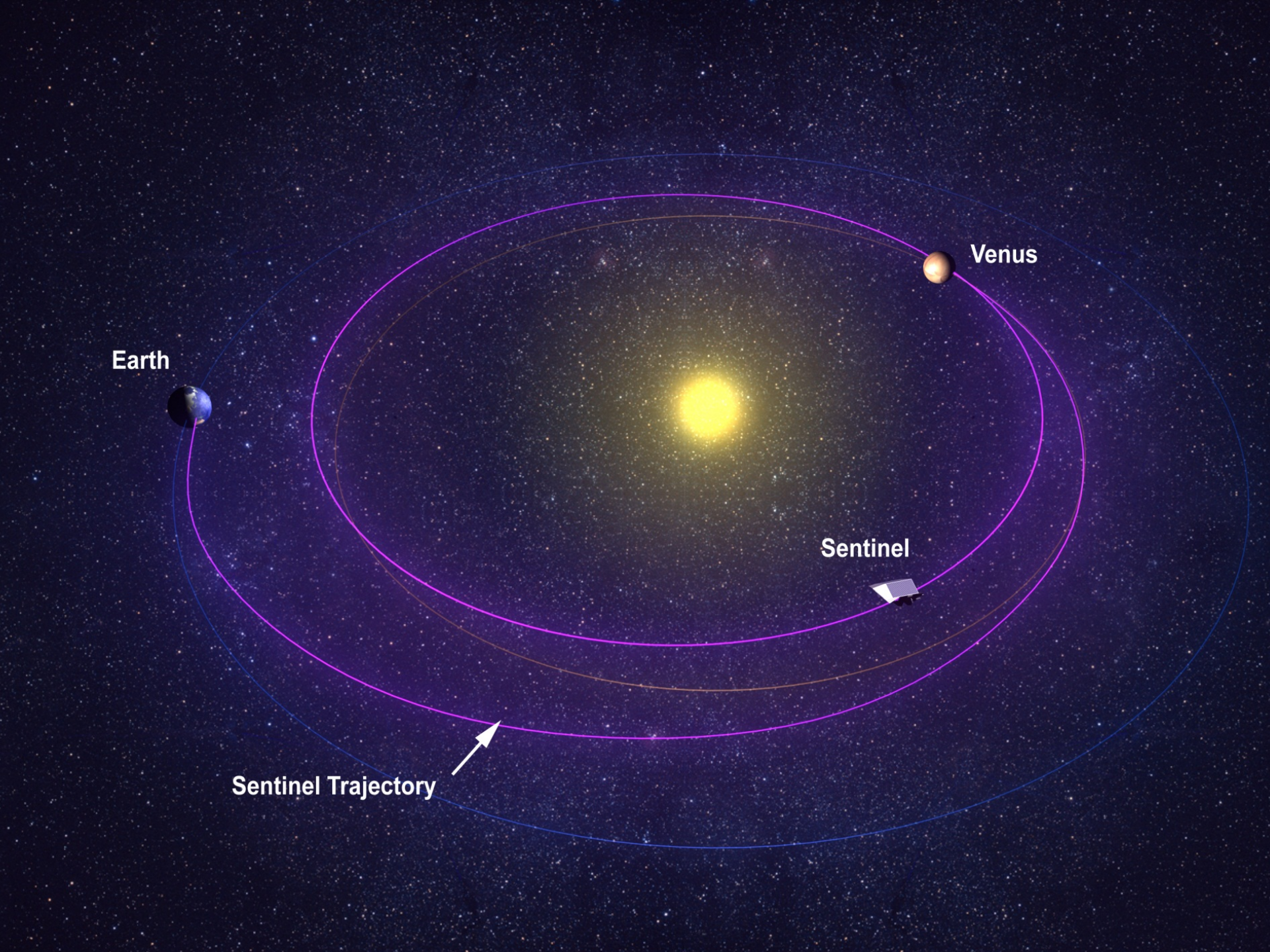
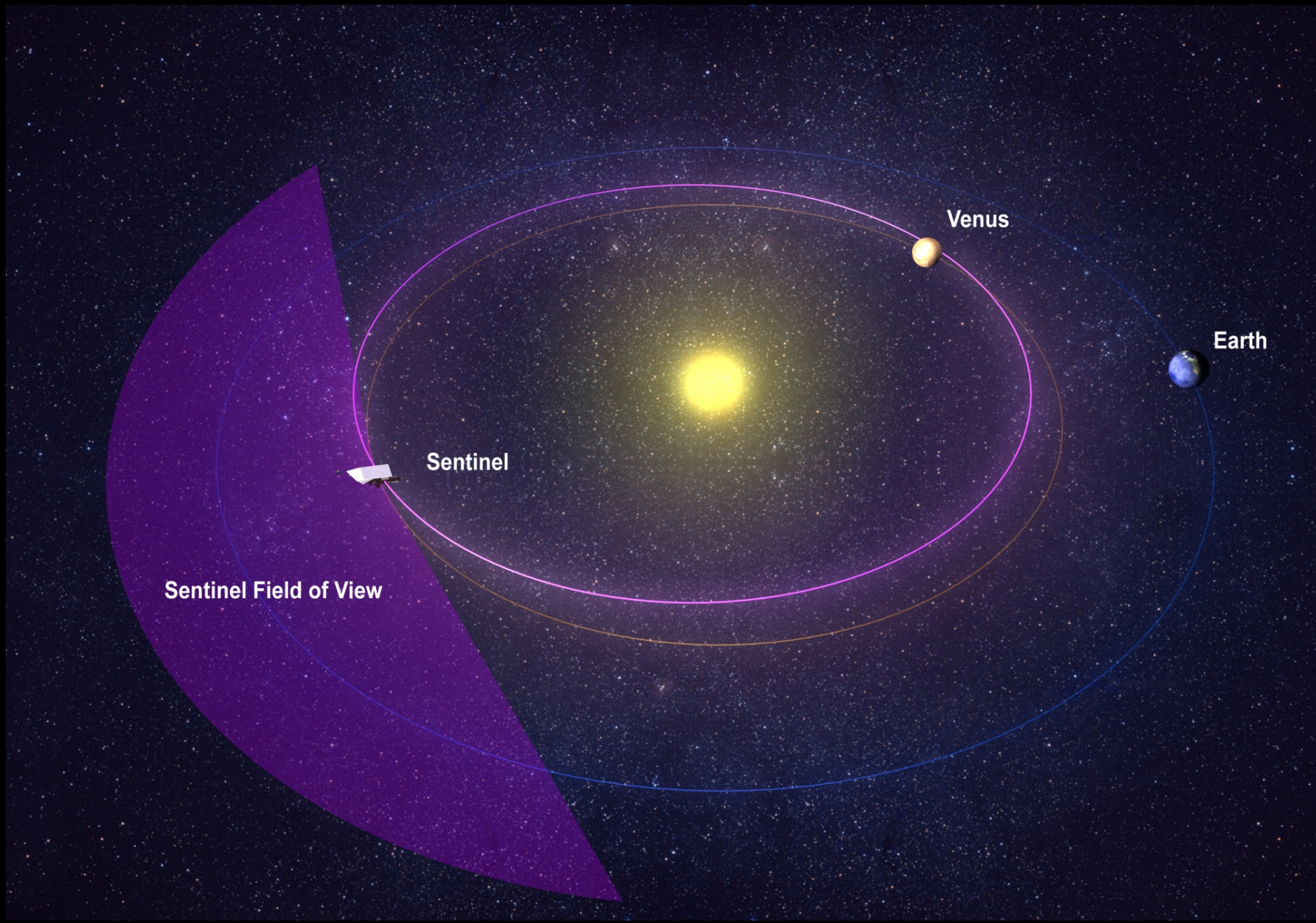
Sentinel Mission Description

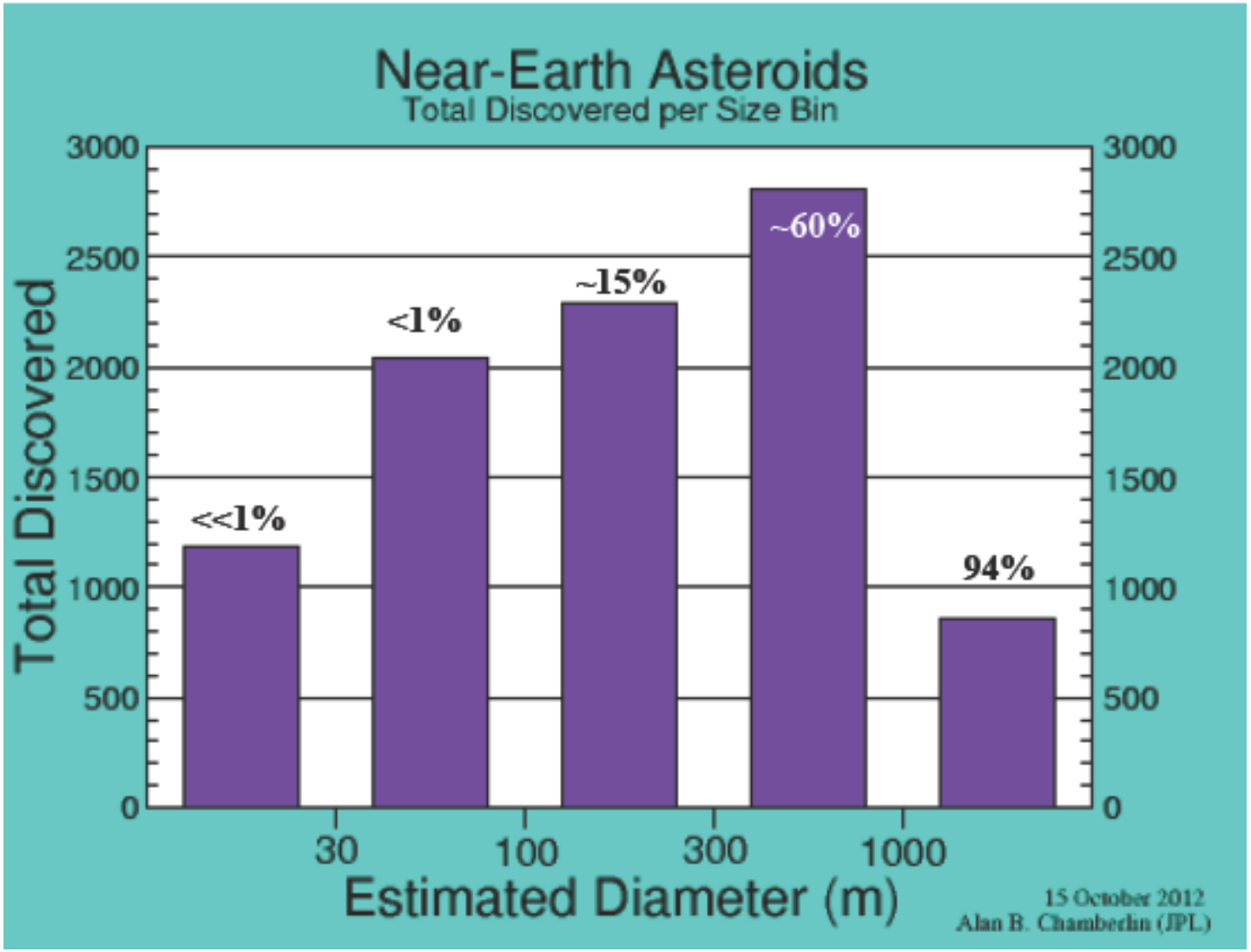
- 50-cm (20-inch) Infrared Telescope in an orbit around the Sun at the distance of Venus
- Launch in 2018, nominal 6.5 year mission lifetime
- Continuously scan the sky hemishpere opposite the Sun
- Sensitive to Near Earth Asteroids as small as 30-meter diameter
- Determine their positions and orbits to map their future locations to look for possible threats
- Will also enable a new era in characterization and permit exploration of the NEO population through discovery of NEAs that are easy to visit and return to Earth
- NASA collaboration through Space Act Agreement


Solar Array
Telescope
Antenna

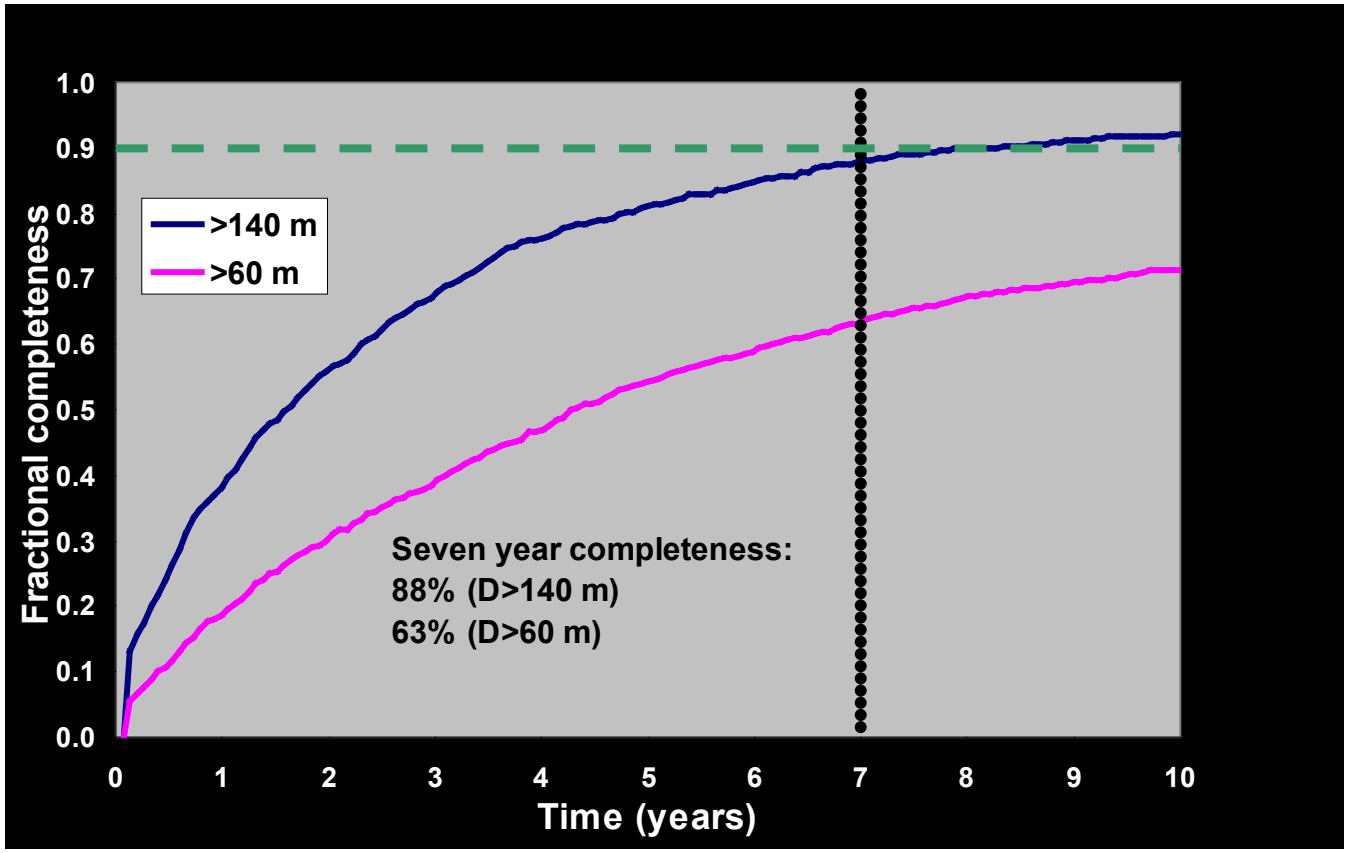

Venus
Earth
Sentinel
Sentinel Trajectory


Venus
Earth
Sentinel
Sentinel Field of View

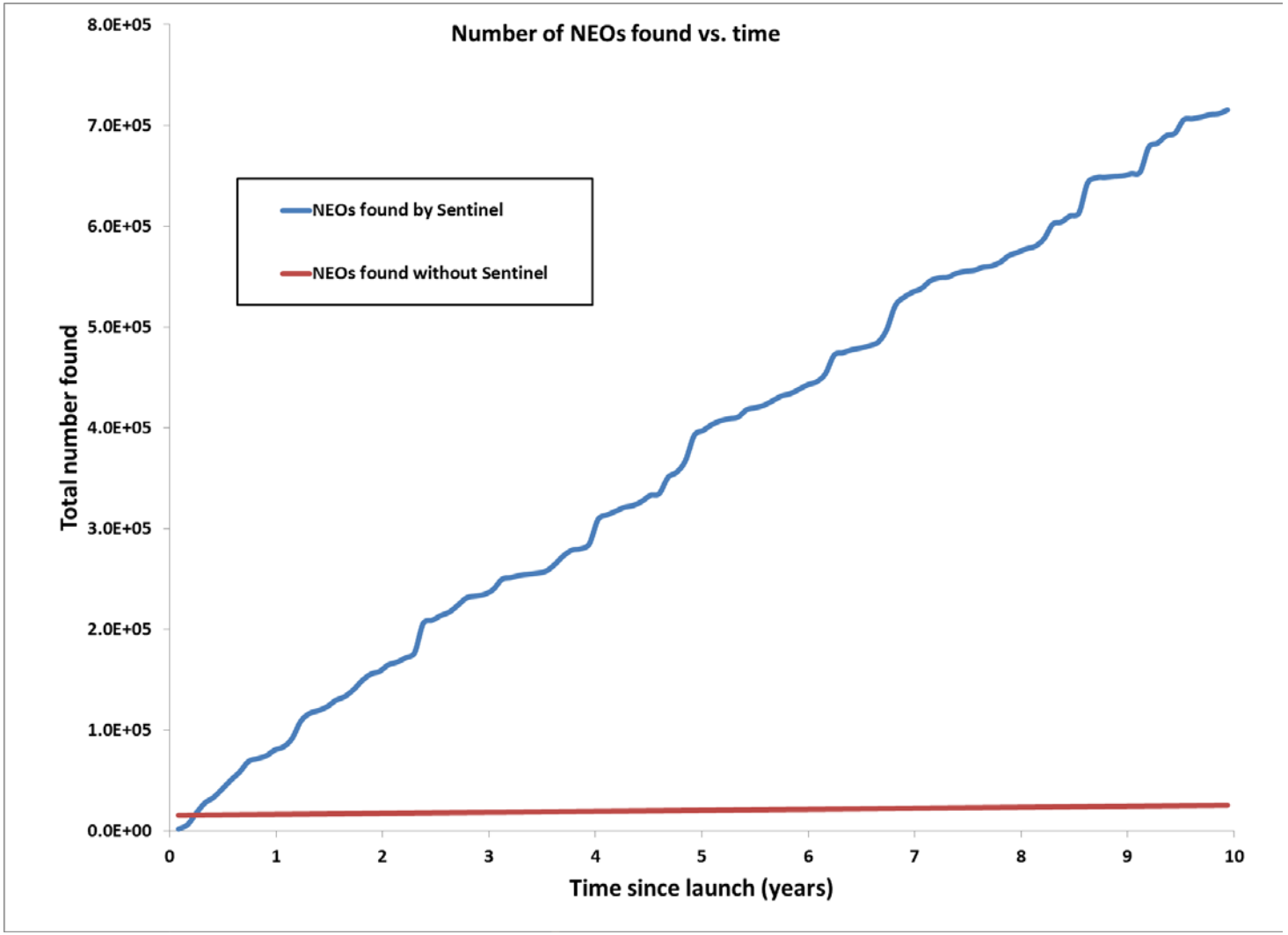
More Than One Million Unknown Near Earth Asteroids (NEAs)

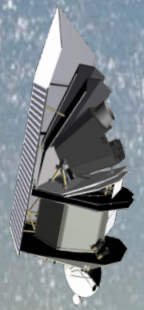


Sentinel Completeness For 140-Meter Diameter NEOs In Seven Years Is 88%



Sentinel Will Discovery Over 500,000 NEOs Larger Than 25 Meters In 6.5 years





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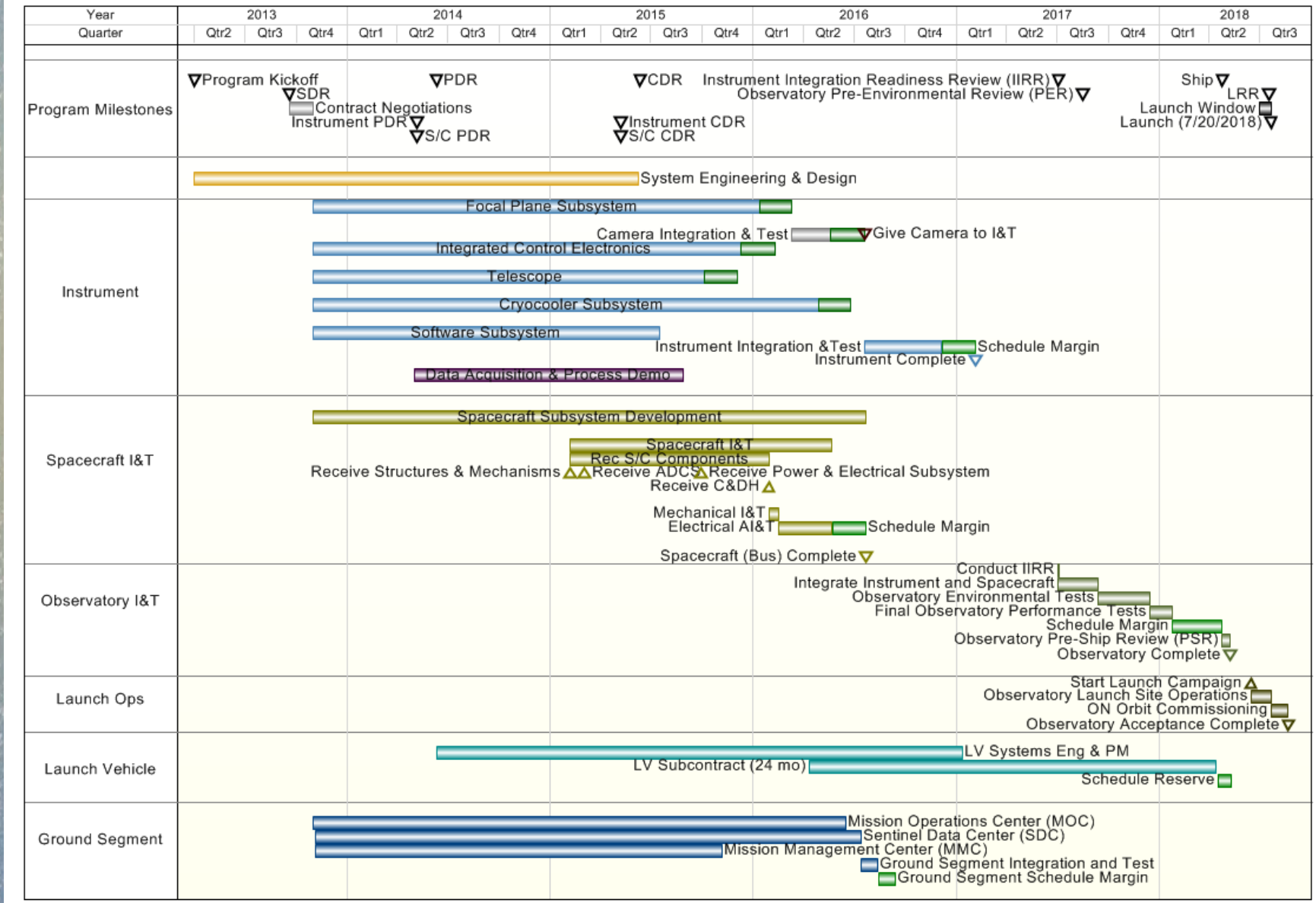
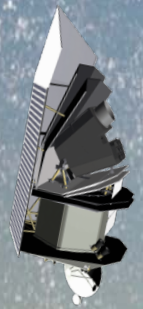
Sentinel Will Find ~300 NEOs Accessible To Rendezvous Missions

NEO Diameter Range	Number of NEOs Found
5-10 meters	83
10-20 meters	148
20-30 meters	85

One-way Delta-v less than 3 km/sec
“Found” requires ~30-day observation span
SNR cutoff 5, 6.5 years

Sentinel Program Schedule – Launch 2018





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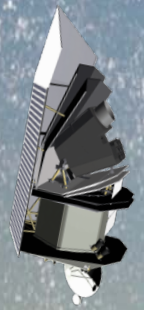
Sentinel Progress Milestones

- June 2012 – Space Act Agreement signed
- Sept 2012 – Program Concept and Implementation Review
- Dec. 2012 – Prototype detector study complete
- June 2013 – Initial meeting of Sentinel Operations and Data Analysis working group



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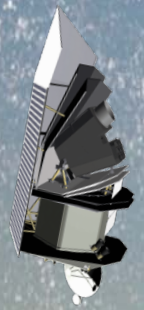
Sentinel/NASA Space Act Agreement

- **Unfunded Space Act Agreement signed June 19, 2012**
- **B612 Provides all track data from Sentinel mission to NASA's Minor Planet Center at Harvard-Smithsonian Astrophysical Observatory**
- **NASA provides**
  - Technical consulting, including participation in the Sentinel Special Review Team
  - Participation in Sentinel Operations and Data Analysis working group
  - DSN support for data, tracking and navigation
- **NASA participation contingent on assessment of potential data value at 4 milestones**
  - Detector risk reduction – anticipated completion Q1 2014
  - Preliminary design
  - System test
  - Initial data delivery to MPC



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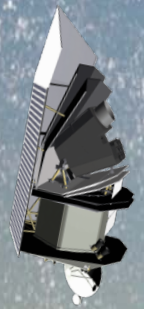
Much More Information Is Available At

B612Foundation.org



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Relative Odds 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 auto accident
40 Gigatons (1 kilometer)	0.01%	0.014% dying in an aircraft accident

* National Safety Council 2008