Asteroid Apophis Update: No Impact; a Call for Action

by Benjamin Deniston

Jan. 12—NASA's 70-meter-diameter Goldstone antenna in Southern California's Mohave Desert is now sending radio signals 15 million kilometers into deep space, aimed at a target only about 325 meters across. Traveling at 300,000 kilometers per second, the radio signals are reaching the target—the asteroid Apophis—reflecting off it, and returning back to Earth with crucial information about this rude invader of our Solar neighborhood.

How large is this asteroid? How precisely do we know its orbit? What are its rotational characteristics? How reflective is its surface? What is its mass? And, most importantly, where exactly will it be in 2029, and in 2036?

The first five questions directly play into determining the answer to the crucial last question: determining Apophis's expected position for the years when it will pass so close to the Earth, that an impact is considered a possibility.

Some of these answers are now being given as Apophis makes its fly-by this month.

These answers are vital, because currently, the world lacks any actually demonstrated methods of asteroid deflection, and while some nations, such as Russia, are calling for improving our ability to handle the inevitability of a future impact, the United States still suffers from President Obama's dismantling of NASA, and his policy of threatening war with the very nations with which we should be collaborating in the defense of Earth.

NASA/JPL

The Goldstone Deep Space Communications Complex, located in the Mojave Desert, is one of three complexes which comprise NASA's Deep Space Network (DSN). The DSN provides radio communications for all of NASA's interplanetary spacecraft, and is utilized for radio astronomy and radar observations of the Solar System and the universe.

Applying Mankind's Extended Sensorium

The "pinging" of Apophis by NASA's Goldstone antenna is helping to provide a more accurate understanding of its orbit, to reduce the uncertainties in the predictions of where exactly it will be at any given date, decades into the future. This includes considering the weak effects of Solar radiation, which can accumulate over years and decades to slowly change an asteroid's orbit, creating one of the most significant sources of uncertainty in predicting the position of an asteroid a few

decades into the future.[1]

In addition, observations of Apophis from the European Space Agency's Herschel space telescope have helped to recalculate its size.[2] Specifically, the infrared reading, which Herschel is designed to deliver, provides a less biased view than do optical observations, and has led to a significant increase in the estimated diameter, from the former 270 meters, to the current 325 meters—resulting in about a 75% increase in the estimated mass.[3]

These multi-sensory measurements, in addition to those from ground-based optical telescopes in Hawaii and New Mexico, have led the manager of NASA's Near-Earth Object Program Office, Don Yeomans, to place the chance of a 2036 impact at less than one in a million.[4]

This is just the most recent analysis of Apophis, which has appeared numerous times in newspaper headlines over the last ten years. Discovered in 2004, the initial uncertainty in Apophis' orbit (**Figure 1**) led to a predicted chance of impact of about 3% in 2029 (making it the highest threat prediction ever recorded). This generated significant concern at the time, and Russian Federal Space Agency officials even discussed possible missions to prevent an impact.

Over the following years, additional observations were able to reduce the uncertainty, and eventually ruled out the chance of a 2029 impact—concluding that it will instead pass extremely close on April 13, 2029. At a distance of 36,000 kilometers, Apophis will actually pass between the Earth and our geosynchronous satellites! Theoretically, it could even hit one or more satellites, though they are very small targets.

The 2029 pass will alter the orbit of Apophis, and the concern has been that this alteration might set it up for an impact in 2036. But now, according to the NASA assessment, that impact is unlikely. The Russian Academy of Sciences has also proposed landing a tracking device on Apophis in 2020, in order to understand its orbit even more precisely as it approaches its 2029 close pass.

1. Referred to as the Yarkovsky effect.

2. Because the Herschel space telescope is above the Earth's atmosphere, it can view certain critical wavelengths of light that are blocked by our atmosphere. See, "Herschel Spacecraft Eyes Asteroid Apophis," JPL News, Jan. 9, 2013. http://www.jpl.nasa.gov

3. The reflectivity of the asteroid's surface can vary depending on its composition, which affects the perceived brightness of the object, and thus, the size estimate.

4. Tariq Malik, "Whew! Huge Asteroid Apophis Won't Hit Earth in 2036," SPACE.com, Jan. 11, 2013.

FIGURE 1

Above image reproduced from NASA/JPL Small-Body Database Browser; below, from "Apophis Asteroid May Destroy Some Satellites in 2029," by Jesus Diaz, gizmodo.com.

Threats, Warnings, and Options

This is a very important development, as an impact from Apophis would release well more than 4,000 times more energy than the largest thermonuclear bomb ever detonated, causing immediate devastation on the scale of a small continent or large nation.[5]

Now that the direct threat looks to be minimal (at least for the next few decades), this should stand as a clear warning, and signal an imperative to develop the capabilities to handle these types of threats before they occur.

Russian government officials, for example, have made repeated offers for cooperation with the United States to tackle this challenge, even placing, for the first time, planetary defense on the agenda of their 50-nation

5. See, "Defending Planet Earth: Near-Earth Object Surveys and Hazard Mitigation Strategies," p. 19. National Research Council, 2010.

global security conference held in St. Petersburg in June of 2012. These offers for strategic Russian-U.S. cooperation on planetary defense have even come from some of the most adamant Russian critics of Obama's policy of military aggression in the Middle East, and of the placement of advanced missile defense systems on Russia's borders in Eastern Europe.

Russian Deputy Prime Minister Dmitri Rogozin is one such figure, along with Security Council Secretary Nikolai Patrushev, who first announced that the vital issue of asteroid defense was going to be taken up at the St. Petersburg conference.[6] At the beginning of this year, Patrushev, having just returned from a trip to China, announced that Russian and China have pledged to deepen security cooperation, as a direct response to the U.S. military buildup in Europe and the Asian Pacific.[7]

In the United States, a few dedicated groupings of scientists at NASA and at other locations have contin-

6. Rachel Douglas, "Strategic Defense of Earth: Russia To Put SDE at Top of Agenda," *EIR*, May 4, 2012.
7. "Russia, China Plan to Boost Cooperation on Missile Defense," RIA Novosti, Jan. 9, 2013.

Heavy-Launch Vehicles And Planetary Defense

Dr. Claudio Maccone is the Technical Director of the International Academy of Astronautics. This is excerpted from an interview with LaRouchePAC-TV on April 18, 2012 at the Astrobiology Science Conference 2012, "Exploring Life: Past and Present, Near and Far," in Atlanta, Ga. The full interview is available in EIR, May 4, 2012, or on video at http://larouchepac. com/basement.

LPAC-TV

Dr. Claudio Maccone

LPAC: If it weren't an issue of budgetary constraints right now, what, in your view, would be the next steps that would have to be taken, concrete steps, to do exactly that? What sorts of missions are we talking about?

Maccone: Let me first refer to the United States, since we are in the United States. But of course, this is a problem that affects the whole of humanity. In the United States, before 2011, which is one year ago, NASA was planning to build two launchers, called Ares I and Ares V. And I was part of a study in 2007, led by NASA, about this thing; essentially, we had to make an assumption, just to give you an idea about what we did.

We hoped that we could have a ten-year lead time, meaning we would come to know ten years in advance whether an asteroid was going to hit or not. So, on the basis of this, we would have planned two different space missions. The first mission to be carried forward by Ares I was a survey mission, sending the probe around the asteroid, picking up pictures, finding the mass, the shape, rotation, whatever.

After that, the second mission would have arrived, launched by Ares V, and that would have been a much more effective thing, shooting six projectiles, 1.5 tons each, against the asteroid, in order to move it away from the collision course. If this was not enough, then, we also considered the possibility of using nuclear weapons....

Now, the point is that, just one year ago, your President Obama decided to give up these two missiles, Ares I and Ares V, and replace them with a single transportation system. So this, in plain words, means that we have to re-do a whole lot of calculations, because we are using different missiles. And, at the moment, no such system is in existence at all, so if we discover that there is something on a collision course with the Earth, at the moment, we are unable to do anything against it.

ued to do what they can to address the asteroid threat, typified by the improved observations and predictions for Apophis.

However, the constraining context is that Obama has been gutting the space capabilities of the United States, both by systematically blocking the economic recovery measures desperately needed to rebuild the U.S. economy, and by direct cuts to NASA—such as his attempt to kill the manned-space and crucial heavy-lift rocket capabilities of the United States by cutting the Ares Rocket and the Constellation program.[8]

So, while Apophis no longer appears to be a direct-impact threat, it serves as a severe warning of the deadly consequences of allowing Obama to remain in the Presidency.

More Challenges, Known and Unknown

Apophis is just one asteroid of many. On Feb. 15, 2013, another warning shot will be delivered by asteroid 2012 DA14. Only discovered one year ago, this asteroid will also pass between the Earth and our geosynchronous satellites, raising an unlikely, but noteworthy chance of hitting one of our satellites. 2012 DA14 is smaller, on the order of 45 meters across, placing it in what can be called a "Tunguska-class" category (referring to the 1908 impact of a 30- to 50-meter asteroid in the Tunguska region of Siberia, releasing 1,000 times more energy than the atomic bomb dropped on Hiroshima, and leveling trees over an area of 2,000 square kilometers).

A small asteroid of this size could easily level a major city.

On Dec. 9, 2012, another "Tunguska-class" asteroid, 2012 XE54, was discovered, which then passed halfway between the Earth and the Moon only two days later. If this had been on an impact trajectory, we would have had absolutely no time to mount an effective defense.

In fact, for this small-but-deadly size range, we have currently only discovered about 2,000 asteroids, out of an estimated population of 500,000, or about half of one percent. In other words, for every one of these asteroids that we know about, NASA estimates there are another 200 that we don't yet know about. Taking all the size ranges that we should be concerned about, from large to small, we have only discovered about 1.5% of the estimated total population of near-Earth asteroids.

This is a threat that is not going away.

The only real solution is to rapidly expand mankind's space-faring capabilities, generally, with applications to both observation and defense. Nations with in-depth space and military capabilities, such as the U.S., Russia, and China, should engage in joint efforts to defend the planet against these threats, shifting the focus away from one of military and economic competition, towards one of common defense.

This is the warning being delivered by Apophis.

8. Only thanks to the Congressional backlash against Obama's actions, a new heavy-lift is now planned, the Space Launch System (SLS), although this is now much delayed and underfunded. The heavy-lift capabilities directly translate to planetary defense capabilities, because this limits what types of deflection or defense missions would even be possible.

Hypervelocity Asteroid Deflection

NASA, under its Innovative Advanced Concepts program, is providing a limited amount of funding to solve the challenges of intercepting small to medium-sized asteroids at very high speeds, and when there is minimal warning time available. This research is being led by Professors Bong Wie (Iowa State University) and Brent Barbee (NASA Goddard Space Flight Center), with their "Hypervelocity Asteroid Intercept Vehicle" concept, a two-part spacecraft, designed to operate at very high intercept speeds, utilizing a thermonuclear explosive device to break apart the threatening asteroid.

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LPAC's Benjamin Deniston interviews Professors Brent Barbee and Bong Wie at the NIAC symposium in November 2012.