

B612 Foundation Statement Regarding NASA's Analysis of Asteroid 99942 Apophis Impact Potential

The B612 Foundation expresses its gratitude to the National Aeronautics and Space Administration (NASA) for the thorough and thoughtful response to our request for analysis regarding the potential impact of near-Earth object (NEO) 99942 Apophis (formerly 2004MN4).

A summary of B612's correspondence with NASA is included below, along with our observations and general comments on the exchange. The complete correspondence is available on our Web site at: <http://www.b612foundation.org/press/press.html>

History of Exchange

In June 2005, the B612 Foundation submitted a letter to NASA Administrator Michael Griffin expressing concern that the specific circumstances regarding the potential impact of NEO 99942 Apophis (then 2004MN4) might warrant a near-term space mission to the asteroid. The purpose of this mission would be to place an active radio transponder on the asteroid in order to more accurately plot its orbit. (Such a mission would also carry out a number of scientific objectives.)

B612 requested that NASA thoroughly and cooperatively investigate the analysis we conducted and the assumptions we made in order to determine whether such a near-term mission was required. B612 saw a potential need for a near-term mission in order to provide adequate tracking information in time to support a deflection mission, in the unlikely case that such a mission is required.

Attached to the letter to Administrator Griffin was a more detailed technical letter to the two leaders of NASA's NEO Program: Mr. Lindley Johnson (NASA/HQ) and Dr. Donald Yeomans (NASA/JPL). This attached letter described in detail the B612 analysis and supporting assumptions for which we were seeking NASA review and analysis. (See <http://www.b612foundation.org/press/press.html>)

In October 2005, NASA provided its formal response to B612 in a letter from Dr. Mary Cleave, Associate Administrator for Science Mission Directorate, and an appended detailed analysis by Dr. Steven Chesley (NASA/JPL). Dr. Chesley's analysis covered the predicted future knowledge of Apophis' orbit (under varying conditions) and the NASA conclusions regarding mission timelines and other factors leading to their conclusions. (see B612 website)

In summary NASA's conclusions are:

1) Both a deflection mission (of the type required for Apophis) and a scientific/transponder mission to Apophis can be performed sequentially, if required, between the key radar apparition in 2013 and the Earth close approach in 2029. There is

therefore no need for a scientific/transponder mission to refine the Apophis orbit at this time.

Note: B612 assumed that 10-12 years would be required (end to end) to plan and execute the first asteroid deflection mission. NASA's 7 year estimate allows a potential pre-deflection transponder mission to be delayed until after the anticipated 2013 radar acquisition.

2) In 2021 when a deflection decision would have to be made, the size of the 2029 error ellipse (even without a transponder mission) will yield a maximum impact probability of about 20% (one chance in five), sufficient to justify launching a deflection mission if required.

Note: NASA agrees with B612 that a precursor transponder mission is appropriate prior to mounting a deflection mission. Nevertheless NASA also concludes that by the time a deflection decision would have to be made in 2021 the error ellipse will have been reduced sufficient to yield a maximum impact probability of 20%, twice the required minimum assumed by B612. This conclusion assumes that the Arecibo radar will be available and successfully acquire Apophis at each opportunity through 2021.

NASA also states that these conclusions do not preclude scientific missions to Apophis at an earlier time, and that in fact the specific characteristics of the 2029 Apophis encounter provide a unique opportunity to investigate NEOs. Any such proposals would be handled via the existing Discovery program, according to NASA.

B612 observations and general comments:

1) Radar tracking plays an extremely important role in being able to rationally determine the future likelihood of a NEO impact and potentially in planning for a deflection mission when required (as evident in the Chesley analysis). Yet the availability of NEO radar capability in the future is highly uncertain, even precarious. This is especially true of the most valuable NEO radar facility, Arecibo.

2) The Apophis potential impact is a highly unusual, even unique case. Due to its close encounter with the Earth in April 2029, and its Earth-like orbit, a relatively inexpensive low-technology deflection technique will suffice to divert it from an Earth impact in 2036, should that condition eventuate.

3) In the typical NEO impact scenario however, a much more sophisticated, costly and advanced technology mission would be required. Moreover, a low cost, quick mission to place a transponder on such an object would not be a viable option. Apophis is not typical of the NEO impact threat and should not be seen as such.

4) All parties to this exchange of ideas acknowledge having learned a great deal in the process of working through the issues. However, absent B612 Foundation raising the

question, the current understanding of the Apophis circumstances might not have developed. This is not an acceptable scenario. If instead, a specific US Government agency were assigned the responsibility of protecting the Earth from catastrophic NEO impacts, that agency would perform such an analysis as a routine matter for all potential NEO impactors.

B612 Foundation therefore recommends:

- 1) That reliable NEO radar capability be assured in order to support early warning of pending NEO impacts and rational deflection mission planning. (National Science Foundation)
- 2) That the development of advanced space power and propulsion technology capable of providing access to and deflection of the general NEO population be initiated. (NASA)
- 3) That the responsibility for protection of the Earth from future NEO impacts be assigned to a capable US Government agency. Such responsibility should include, inter alia, early warning capability, deflection capability and related policy development authority. (US Government)

About the B612 Foundation

The Foundation consists of a group of professionals, primarily scientists and other technical experts, who are involved in and concerned about the current lack of action to protect the Earth from the impact of near Earth objects (NEOs). While the probability of a highly destructive impact in the immediate future is slight, the consequence of such an occurrence is extreme, and mitigation efforts should begin now. For more information, please visit the B612 Foundation Web site at: www.B612foundation.org.