DEPARTMENT OF DEFENSE
MISSILE DEFENSE AGENCY
7100 DEFENSE PENTAGON
WASHINGTON, DC 20301-7100

JUN 22 2011

The Honorable Jon Kyl
United States Senate
Washington, DC 20510-0304

Dear Senator Kyl:

Thank you for your letter of June 3, 2011, regarding the Institute for Defense Analysis (IDA) Congressionally-mandated study of issues associated with a space-based missile defense layer. As requested, I contacted IDA and they have provided responses to your specific questions. The responses are unclassified and enclosed.

We appreciate the opportunity to assist in this matter. Please contact Mr. Kimo Hollingsworth, Director for Legislative Affairs, at 703-693-9117 or via e-mail at Kimo.Hollingsworth@mda.mil, if you need further assistance.

Sincerely,

Patrick J. O'Reilly

PATRICK J. O'REILLY
Lieutenant General, USA
Director

Enclosure:
As stated

Responses to Questions
on the
Institute for Defense Analysis (IDA) Congressionally-mandated study of
Space Based Interceptor Element of the Ballistic Missile Defense System

Question: Would a space-based layer enhance protection of the United States against attack by [Intercontinental Ballistic Missiles] ICBMs?

Response: A space-based interceptor layer could contribute to the defense of the United States against ICBMs with varying degrees of effectiveness, depending on the sophistication of the threat missiles. (See Tables 1-3 and 1-4, on pages 1-13 and 1-14 of the Study, which provide analytical results in support of this response.)

Question: Specifically, would a space-based missile defense layer add to the missile defense of the United States against an ICBM launched by North Korea? How about the Islamic Republic of Iran?

Response: A space-based interceptor layer could contribute to the defense of the United States against ICBMs launched by both North Korea and Iran, with varying degrees of effectiveness depending on the level of sophistication of the threat missiles. (Tables 1-3 and 1-4, on pages 1-13 and 1-14, provide analytical results in support of this response.)

Question: Is there any program of record with an efficacy similar to that described by IDA for the boost-phase missile defense of the United States against an ICBM?

Response: There is no current program of record that could provide boost-phase missile defense of the United States against ICBMs. The space-based missile defense layer examined in the study could provide either global or regional boost-phase missile defense, depending on the satellite constellation design and the sophistication of the threat missiles. (Alternative ground-based boost-phase defenses against threat missiles launched from selected countries are considered quantitatively starting on page 11-5.)

Question: Can a space-based missile defense layer provide defense against other ballistic missile threats, such as an anti-ship ballistic missile threat to our naval forces?

Response: A space-based missile defense layer could engage the anti-ship ballistic missile threats examined in this study. (The effectiveness of a 24-satellite, spaced-based interceptor constellation optimized for carrier defense is discussed starting on page 8-18. Descriptions of effectiveness estimates can be found starting on page 8-24. Also, see Table 1-4 on page 1-14.) The kill vehicle designs would need to be optimized for midcourse intercepts, but this technology is currently available in other operational systems.

Enclosure

Question: Did the study conclude that the technical maturity of critical technologies necessary for a space-based interceptor layer was such that this could be a viable concept within the next ten years? What could near-term research and development activities do to reduce costs (i.e., by what percentage) of space-based missile defense such as that modeled in the IDA Study?

Response: The technological maturity exists such that the space-based interceptor layer that was considered in this study could be developed within ten years. To reduce costs, near-term research and development efforts could be aimed at reducing the mass of individual spacecraft components since launch costs would be the dominant factor in the cost of a space-based interceptor system. Plausible reductions of payload mass could reduce launch costs by as much as 25% relative to the baseline costing assumptions used in this study. (See "Reduction in Launch Costs," page 6-35.)

Question: Please compare the cost of a limited space-based interceptor layer, such as that modeled in the IDA study, with the current terrestrial-based long-range missile defense systems.

Response: A limited space-based interceptor layer of 24 satellites (with four interceptors each) is estimated to cost $26 billion, assuming a 20-year life-cycle cost with one full constellation replacement after the first ten years. The estimated cost of a global, 960 satellite constellation under the same assumptions is $282 billion. (See Table 6-19, page 6-33.) The study did not examine the costs of the current terrestrial-based, long-range missile defense systems.

Question: Are there any issues associated with the survivability of a space-based layer that would mitigate its contribution to the missile defense mission? In other words, is the space-based layer vulnerable to enemy attack or suppression? If so, did the study find that it can be designed to defend itself?

Response: A space-based interceptor layer would be vulnerable to attached by kinetic anti-satellite (ASAT) weapons or by nuclear detonations within a certain range. Space-based interceptors could be designed to defend themselves against kinetic ASATs and could be hardened to mitigate effects of natural and possible man-made radiation. (See discussions starting on page 9-4.)

Question: It has been speculated that space-based missile defense would generate significant permanent orbital debris. Is that what was found in the study?

Response: Debris resulting from the interception of a ballistic missile would simply continue on the same trajectory it originally had at the interception point and fall back to Earth. In addition, debris from the interceptor itself would move on a hyperbolic trajectory that would be fast enough to completely escape Earth's gravity. The small chance of creating persistent debris could be eliminated completely by imposing

reasonable operational limitations on the intercept geometries. (Chapter 10 provides detailed calculations and analyses associated with potential space-based interceptor-related orbital debris with a short summary of conclusions given on page 10-46.)

Question: I am aware of no treaty to which the U.S. is party that would prohibit the deployment of space-based interceptors. Did the study concur with this assessment?

Response: No current treaty language explicitly prohibits space-based interceptor systems. (Chapter 12 provides detailed discussions of potential policy and treaty issues with a five-page summary starting on page 12-1.)