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Recommended Citation

DAVID C. WRIGHT AND ERYN MACDONALD, "JAPAN AND THE NAVY THEATER-WIDE MISSILE DEFENSE SYSTEM", nuke policy, June 25, 2000, https://nautilus.org/nuke-policy/japan-and-the--avy-theater-wide-missile-defense-system/

JAPAN AND THE NAVY THEATER-WIDE MISSILE DEFENSE SYSTEM

by David C. Wright and Eryn MacDonald (1)

EXECUTIVE SUMMARY

The United States is currently developing the first phase (Block I) of the Navy Theater-Wide (NTW) missile defense system. Japan has agreed to cooperate in developing the second phase of the system (Block II). Japanese involvement in the NTW program appears to be driven primarily by two things: concerns about Japanese vulnerability to missile attacks by North Korea and China, and a desire to be a good alliance partner by agreeing to US requests to cooperate on development of the system.

However, as the NTW program proceeds, Japan will be forced to conduct a cost/benefit analysis to decide what its involvement in the program should be. It will likely find that the monetary and security costs of helping to develop and deploy NTW are potentially quite high. At the same time, since NTW is an exo-atmospheric hit-to-kill system that could be defeated by threats employing submunitions or countermeasures, its real-world effectiveness is likely to be limited. As a result, its security benefits may be modest.

The current debate appears to overstate the potential benefits and understate the potential costs. When assessing its continued involvement in the project, Japan must include a realistic view of both its costs and benefits and consider whether other alternatives might better serve Japanese interests.

For example, it might be worth investigating whether another collaborative project could provide the same alliance benefits while avoiding some of the strategic costs. One possible alternative might be development of a boost-phase system, which could be less threatening to China.

INTRODUCTION

The United States is currently developing the Navy Theater-Wide (NTW) missile defense system,

which will be based at sea on Aegis cruisers. The system is intended as a theater defense against intermediate-range missiles. It would have the advantage that it is mobile and in some cases could be deployed near the launch site of a potential threat, thus allowing it to operate in different theaters and in principle to defend relatively large areas.

The NTW system will use an exo-atmospheric kill vehicle that can only attempt to intercept an incoming warhead at altitudes above 80-100 kilometers. The system is hit-to-kill, meaning that the kill vehicle is intended to destroy a warhead by maneuvering to collide with it. The interceptor would be launched based on information provided by the Spy radar on the Aegis cruiser, and the kill vehicle would home using on- board infrared sensors.

The fact that NTW could intercept only above 80-100 kilometers means that it would be unable to intercept short-range missiles. For example, on a standard trajectory, a 300-km-range missile such as a Scud would have an apogee of about 80 kilometers.

The initial NTW system (called Block I) will use a modified version of the Aegis Standard Missile (which will be called the SM-3) to launch the kill vehicle. A solid-fueled kick stage and a LEAP (Light Exo- Atmospheric Projectile) kill vehicle (called the Aegis-LEAP Interceptor, or ALI) will be added to the top of the SM-2 Block IV missile to make the SM-3. The interceptor was originally intended to have a burnout speed of 4.5 km/s, but the burnout speed is now reported to be roughly 3 km/s. This reduction is apparently due to the high cost of producing the kick stage required to achieve 4.5 km/s using the existing SM-2 missile. The Block I NTW is reportedly intended to be able to intercept missiles with ranges up to about 1000 kilometers, including the North Korean Nodong missile.

The Block I system, originally planned for deployment in 2007, was restructured in late 1999 and deployment is now planned to take place in three stages. Block IA would be a single Aegis test ship deployed by 2006, carrying up to six test missiles. Block IB, scheduled for 2008, would include two ships with 50 missiles. These ships would be "single-mission capable," meaning that they could be used for either missile defense or air defense, but not both simultaneously. Block IC, planned for 2010, would include the 50 missiles from Block IB, plus 30 additional missiles for a total of 80 missiles on four ships. The Block IC ships would be capable of performing all their missions simultaneously.(2)

A follow-on NTW system, called Block II, is expected to use a redesigned booster to give a burnout speed of about 4.5 km/s. It will also have an improved kill vehicle and an upgraded radar on the Aegis cruiser.(3) It is intended to intercept missiles with ranges up to 3500 kilometers. Japan has agreed to help develop this system by providing technology for some of the components. Japanese involvement is discussed in more detail below. This system is scheduled to be fielded at an as yet unspecified date after 2010.

Recent reports have also suggested that future systems capable of intercepting intercontinental ballistic missiles could be developed with interceptor burnout speeds of 5.5 or 6.5 kilometers per second.(4) The design of the Block II system has not been finalized and could be designed to have speeds in this range.

JAPANESE INVOLVEMENT IN NAVY THEATER-WIDE

Japan sees a number of potential benefits in cooperating on the NTW system.

Some in Japan would like to deploy a missile defense system against potential ballistic missile threats in the region. The threat that is most commonly sited is the North Korean Nodong missile, which is believed to have a range of up to 1300 kilometers. Such a range would allow it to reach all

of Japan. Supporters of the system argue that an effective missile defense could not only protect Japan from a Nodong attack, but would reduce North Korean perceptions that it could split the US-Japanese alliance by threatening attacks on Japan in a time of crisis. It would also help Japan carry out its role of protecting US forces in the region.

A second potential missile threat—from Chinese intermediate-range missiles—is rarely stated publicly as a rationale for NTW, although some in Japan argue that it is the real threat motivating Japan's involvement in the program. An effective missile defense system is seen as a hedge against a militarily stronger China in the future, and some argue it might be used as a bargaining chip to negotiate a reduction in Chinese missiles.

Japan is also interested in cooperation on NTW to respond to strong US pressure to assist with its development of the system. Japanese involvement in the program provides the United States with technical assistance, monetary assistance, and political support for the program.

A related reason for Japanese involvement is that cooperation on NTW is seen more generally as an important aspect of a healthy US-Japanese alliance. Even among Japanese officials who are skeptical of NTW's capability, there appears to be a strong feeling that Japan simply cannot say no to involvement in the program.

However, Japan was reluctant to formally commit to co-development of NTW until the August 1998 launch of a missile by North Korea over Japanese territory. This launch created a sense of urgency over the missile threat from North Korea. It both created political pressure to take action on the issue and provided a rationale for action that avoided mention of Chinese missiles. Even so, Japan did not move as quickly as the United States would have liked—shortly after the test, one US official said that the two sides planned to sign an agreement at a meeting in September 1998.(5)

The memorandum of understanding (MOU) was finally signed by Japan and the United States on August 16, 1999, and was the result of years of discussions and studies. The two countries had begun TMD working group meetings in 1993.

Japanese reluctance to move forward with the project appears to have come from several sources, including domestic political complications, such as concerns about Japanese restrictions on military systems; a reluctance to commit high levels of funding to the project; and the potential for negative reactions from Japan's neighbors in the Asia- Pacific region, especially China, as we discuss below.

The amount of money that Japan has currently committed to the project is relatively small—the Diet approved 963 million yen (about US$8.3 million) for cooperative TMD research in its FY-99 budget while it did not commit to an amount for future funding. The United States has committed $36 million to the three-year cooperative effort. US officials have stated that as the program goes forward the cost split is supposed to become more even. Reports have said that a five- to six- year program would probably cost Japan between 20 and 30 billion yen.

The MOU says that both countries will take part in a three-year project to conduct analysis, preliminary design, and some risk reduction experiments. The areas chosen for cooperative research are intended to yield improvements in the interceptor that would be used in the SM-3 Block II missile. These include using lightweight materials to reduce the weight of the missile components, improving the second-stage propulsion of the missile, and developing technology for the infrared seeker in the kill vehicle. In particular, according to a March 1999 briefing slide from the US Ballistic Missile Defense Office, the four areas for cooperative research are:

* Design, develop and produce an advanced, lightweight, high-strength nose cone using advanced

composite materials and nose cone removal technologies

* Design develop and produce an advanced, lightweight, high-strength kinetic kill vehicle using advanced composite materials technologies

* Design, develop, and produce advanced, lightweight solid rocket motors at reduced cost using weight reduction techniques and materials

* Design, develop, and produce multicolor focal plane array technology for the interceptor.

At the end of the three-year period either side would be free to leave the project or to continue on to the demonstration and validation phase.

Although both the United States and Japan have said they are interested in continuing to the next phase of the project, a Japanese report has said that the project would be "influenced by future developments in US-Russia, US-China relations."(6) Russian officials and other observers, notably former US Secretary of Defense William Perry, the US special envoy on North Korea, have said that Japan should also consider the status of North Korea's missile program in making any future decisions on participation in the system. Perry said that while he believes cooperation in research on theater missile defense makes sense for Japan, a future deployment decision should take into account the threat at that time.

Indeed, when considering longer term involvement in the program, Japan will have to compare the benefits of its involvement to the potential costs—both monetary and strategic. We first consider how large the benefits of deploying NTW against actual missile attacks might be, and then look briefly at some of the potential costs.

THE CAPABILITY OF NTW AGAINST THE NORTH KOREAN OR CHINESE MISSILE ATTACKS

The primary missile threat sited by proponents of Japanese involvement in NTW is the North Korean Nodong missile. While detailed information about this missile is not available, it is believed to be able to carry a warhead of 700-1000 kilograms a distance of 1000-1300 kilometers. A range of 1300 kilometers would allow the missile to reach essentially all of Japan.

North Korea tested this missile in 1993, and used it as the first stage of its Taepo-dong 1 launch over Japan in 1998. Reports of the 1993 test stated that it flew about 500 kilometers before splashing down in the Sea of Japan, but some later reports suggested that it may have overflown Japan. The Pakistani Ghauri missile, which is widely believed to be a version of this missile, has been tested twice. Because information about these tests is limited, it is unclear what they imply about the range/payload capabilities of the missile.

The Nodong is believed to have a separable warhead. It is expected to be quite inaccurate, with a CEP of several kilometers.(7)

NTW could in principle provide broad coverage of Japan against attack by Nodong missiles. Our calculations show that one or two NTW ships stationed near Japan would be sufficient to engage a Nodong missile launched against any part of Japan. Using NTW would also not require basing the defense system on Japanese territory, as would be required with ground-based defenses.

However, in practice the confidence that military and political leaders could have in the effectiveness of NTW against a real threat would be low, for several reasons. First, because the NTW kill vehicle is exo- atmospheric and hit-to-kill, it is susceptible to a range of countermeasures of the kind discussed in connection with the NMD system.(8) One must assume that North Korea is

developing countermeasures for its long-range missiles, and could develop countermeasures for the Nodong as well. If North Korea has the technology and expertise to successfully build ballistic missiles, it must also be assumed to be able to develop countermeasures, which can be built with simpler technology than that required for a long-range missile and nuclear warhead.

Second, a missile fired by North Korea may be more likely to carry a chemical or biological warhead than a nuclear warhead, for two reasons. First, some analysts question whether North Korea could build a nuclear warhead that is small enough and light enough to be delivered by the Nodong missile.(9) This would require that the mass of the warhead be kept below about 700 kilograms, and the diameter below about 1.2 meters. Unless North Korea tested its design, or was able to obtain design information from other countries, it might overdesign the high explosives in the warhead, leading to a large weapon. This point is controversial, however, and other experts argue that if North Korea has the fissile material and the desire to do so, it is likely to be able to build a warhead that could be delivered on the Nodong.(10) Moreover, it is possible that North Korea could receive information from Pakistan about its nuclear designs, in exchange for assistance on missiles.

A more compelling reason that a Nodong missile might carry a chemical or biological warhead is that even if North Korea could build a deliverable nuclear warhead, it is believed to have only a small amount of plutonium and therefore a very small number of nuclear warheads. Official estimates are that it has produced enough plutonium for "at least one, and possibly two, nuclear weapons."(11) It may therefore consider these weapons too valuable to attempt to deliver them on a relatively untested missile of unknown reliability. If North Korea decided to deliver such a weapon against Japan, it might be expected to use a more reliable means of delivery.

North Korea is believed to produce chemical and biological agents. If it does have this capability, it would be able to produce relatively large quantities of them. The relative availability of these agents compared to fissile material suggests North Korea would be more willing to attempt to deliver them by missile.

But if North Korea were planning to deliver, for example, anthrax by ballistic missile, it would have strong incentives to divide the agent into a large number of bomblets that would be released immediately after boost phase. The United States began developing bomblets in the 1940s and 1950s when it was developing chemical and biological weapons for short-range missiles, to avoid the problem that delivering these agents in unitary warheads tends to oversaturate a relatively small area around the impact point of the warhead. Thus, using bomblets would allow North Korea to distribute the agent more effectively and, since bomblets could spread the biological agent over an area several kilometers in radius, would help to compensate for the inaccuracy of the missile. But in addition, it would also defeat a missile defense like NTW since there would simply be too many targets for the defense to attack.(12)

Moreover, since the Nodong missile burns out at altitudes less than 80 km, NTW could not attempt to attack it in boost phase, before the bomblets could be released.

NTW is also unlikely to be effective against a missile attack by China. NTW Block II could in principle be used to intercept attacks by 1,800 km-range DF-21 missiles and 3,000 km-range DF-3 missiles. However, as noted above, NTW will use an exo-atmospheric kill vehicle that must attempt to intercept warheads above the atmosphere, and is therefore susceptible to the same kinds of countermeasures that China is developing to penetrate a US NMD system. China is known to already be developing such countermeasures; press reports state that US intelligence has observed Chinese testing of countermeasures during its missile tests.(13)

For these reasons, the benefits of NTW against an actual missile attack are likely to be lower than

commonly assumed.

POTENTIAL COSTS OF JAPANESE INVOLVEMENT IN NTW

As the NTW project moves into later stages, especially deployment, the cost to Japan is expected to rise considerably and become a significant percentage of Japan's military budget. This could force Japan to consider the trade-offs and decide whether to continue its support of the project.

In addition, NTW affects two important relationships that Japan must manage—one with the United States, which is pushing for the project, and one with China, which opposes it.

While China has made its opposition to the NTW system clear, Japanese officials appear largely unmoved by its concerns. Some argue that Chinese complaints are vague and unpersuasive. They argue that NTW is purely defensive, and unless China has plans to attack Japan it should not care about defenses. Some argue that China's modernization of its missile program will continue regardless of Japan's involvement in NTW, and that Japan should take steps to hedge against a militarily stronger China in the future.

China sees the situation differently, and does not view NTW as purely defensive. Many in China believe that Japan is using the North Korean threat as an excuse, when the real target is Chinese missiles. Those in China with lingering suspicions about Japanese militarism have expressed concern about Japan's growing plutonium stocks comprising a latent nuclear weapons threat, and see the acquisition of a missile defense as an attempt to acquire a shield to go with its latent sword. Some are also concerned that technologies involved in NTW or other systems could aid Japan in developing offensive tactical ballistic missiles.(14) Moreover, Chinese analysts have expressed concern that NTW interceptors will eventually be integrated into a US national missile defense (NMD) system, allowing basing of NMD interceptors near Chinese territory.

Thus, it appears that while China is currently modernizing its missile force, the scope and pace of that process will certainly be affected by its view of its security environment, including US and Japanese missile defenses. This could result in Japan facing more intermediate-range missiles than it otherwise would. On the other hand, such a missile expansion could result from US plans to build NTW, whether or not Japan is involved in the development, but Japanese involvement is certain to increase tensions between the countries.

An additional concern among Chinese analysts is that NTW technology could be transferred to Taiwan, or that NTW could be used during a crisis in the Taiwan Straits. Japanese officials argue that Japan's only role in a crisis in the Taiwan Straits would be protecting US troops, and not direct involvement in defending Taiwan. However, Chinese concerns arise in part from the ambiguity in the geographical extent of the 1997 revised defense guidelines between Japan and the United States, which refers to "situations in areas surrounding Japan" and does not exclude Taiwan. As a result, in the Chinese view, Japanese involvement in NTW seems to link Japan to the Taiwan issue in a direct way.

LEGALITY OF NTW UNDER THE ABM TREATY

Russia is also critical of Japan's involvement in the NTW program, saying that it will be destabilizing in the Asian region and that the system will violate the ABM treaty.(15) Indeed, co-development of NTW could become problematic for Japan since it will be helping the United States develop a missile defense that Russia considers illegal under the Anti-Ballistic Missile (ABM) Treaty.

Beginning in 1994, the United States began negotiations to convince Russia to amend the ABM

Treaty to allow its new theater missile defense systems, in particular the Theater High-Altitude Area Defense (THAAD) and NTW. These systems were designed with capabilities that are considered illegal under the treaty. In September 1997, the United States and Russia signed two such "demarcation" agreements intended to clarify the distinction between theater and strategic missile defenses. One agreement covers missile defenses with interceptor speeds of 3 km/s or less, and the second covers defense systems with higher speed interceptors. The first agreement states explicitly that, with certain test restrictions, the low-speed systems are considered legal under the treaty. Under this agreement, both THAAD and apparently NTW Block 1 would be legal.

However, the countries were unable to agree on the acceptability of higher speed systems. The high-speed agreement lays out what the two countries could agree on but does not specifically state that these systems are legal. A Clinton administration official who took part in the negotiations has said that the two countries reached a stalemate on the issue.(16) Indeed, the US Department of State released a fact sheet on 26 September 1997 about the high-speed agreement that states "Determining the Treaty compliance of a Party's own higher-velocity TMD systems will remain the national responsibility of each Party."(17) This statement makes clear the agreement does not specify the legality of high-speed systems. The same fact sheet states that the United States considers NTW to be treaty compliant; Russia has not agreed to that assessment.

The ABM Treaty issue is linked even more directly to NTW since there have been proposals to use NTW as a sea-based component of a US national missile defense system.(18) Doing so would be a clear violation of the ABM Treaty since the treaty explicitly forbids sea- based NMD components. Moreover, these proposals make clear that NTW would in principle be capable of intercepting strategic missiles. This is a source of concern to Russia and China, since if the hundreds of planned NTW interceptors could become part of the US NMD system by hooking them into the global sensor network planned in the current NMD architecture, they could convert a limited, "thin" defense to a considerably thicker defense.

Currently, this issue appears not to be a concern to Japanese officials, who argue that ABM Treaty issues should be resolved by the United States and Russia. However, the issue may become higher profile as development of the system proceeds. A similar concern has become an issue in the US NMD program, since US plans call for upgrading its early-warning radars in Britain and Greenland to allow them to provide information that could be used to launch NMD interceptors, and thus to act as ABM components. Such upgrades are prohibited by the ABM Treaty. Greenland's home-rule government opposes the upgrade for that reason, and may prohibit the US from proceeding. The issue has also been raised in England.

CONCLUSIONS

Japanese involvement in the NTW program appears to be driven primarily by two things: concerns about its vulnerability to missile attacks by North Korea and China, and a desire to be a good alliance partner by agreeing to US requests to cooperate on development of the system.

However, as the NTW program proceeds, Japan will be forced to conduct a cost/benefit analysis to decide what its involvement in the program should be. As discussed above, the monetary and security costs of helping to develop and deploy NTW are potentially quite high; the security costs appear to be understated in the current Japanese debate.

In addition, the benefits of having NTW in the face of an actual missile attack may be low if it cannot provide Japan with a reliable defense against missile attacks from either China or North Korea. The current debate appears to overstate these potential benefits.

Instead, the primary benefit to Japan appears to be maintaining the health of the alliance by agreeing to US requests for cooperation. From Japan's point of view, however, it seems that a fair question would be whether the two countries could instead collaborate on a different project that did not carry the same strategic costs and might be more useful to Japan.

For example, one interesting option might be cooperation on development of a boost-phase missile defense system, possibly also based on Aegis cruisers. Such a program could allow cooperation on many of the same technical areas already outlined for NTW, and could be more effective at intercepting North Korean missiles than NTW, since it would not be defeated by biological submuntions or exo-atmospheric countermeasures.

Moreover, such a defense system might have a relatively short range and therefore not threaten Chinese intermediate- and long-range missiles, which could be based at locations out of range of the interceptors.(19)

Of course, while developing such a system might reduce the strategic costs to Japan, it might also remove a key motivation for Japanese interest in missile defense, namely a defense against Chinese missiles. Indeed, discussing this option would require Japan to reveal whether it saw Chinese missiles as a real target of such a defense. Such collaboration may also not satisfy US desires to gain technical, political, and monetary support for its NTW program.

Japan will certainly continue to reassess the costs and benefits of its involvement in the NTW program. It is important in doing so that it include as realistic a view of both the costs and benefits as possible, and that it consider other options for cooperation that might better serve Japanese interests.

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(3) "Navy Kicks Off R&D Effort for Theater Wide Missile Defense Radar," Inside Missile Defense, 8/5/98

(4) "DoD Weighs Navy Interceptor Options," Defense News, 7/24/00

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(7) "David Wright and Timur Kadyshev, "An Analysis of the North Korean Nodong Missile," Science and Global Security 4 (1994), pp. 129-160.

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31 December 1999," 9 August 2000 (http://www.odci.gov/cia/publications/bian/bian_aug2000.htm).

(12) For a detailed discussion of bomblets, see Sessler et al, Countermeasures, pp. 49-58.

(13) Sessler et al., Countermeasures, p. 37.

(14) "Army Paper Warns of New Arms Race in Region," BBC Summary of World Broadcasts translation of Jiefangjun Bao article, "TMD Encounters Problems," 4/3/00.

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(16) Interview with State Department Official, 7 August 1997. See also "START II and III, TMD Demarcation, and Next Steps with Russia," Summary of Proceedings of a Seminar sponsored by the Carnegie Endowment Nuclear Non-Proliferation Project, 8 September 1997, available at: http://www.ceip.org/files/events/STARTIISem090897.asp?p=8#

(17) US Department of State, "Fact Sheet: Second Agreed Statement of September 16, 1997, Relating to the AM Treaty." This document, as well as the text of the agreements, is available at http://www.state.gov/www/global/arms/bureau_ac/factsheets_ac.html

(18) US Ballistic Missile Defense Organization, "Summary Report to Congress on the Utility of Sea-Based Assets to National Missile Defense," 1 June 1999; Heritage Foundation's Commission on Missile Defense, Defending America: A Plan to Meet the Urgent Missile Threat (Washington, D.C.: The Heritage Foundation, March 1999).

(19) Depending on the details, such a system could still cause Chinese concerns if it was capable of shooting down short-range missiles targeted against Taiwan.

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