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CONSTITUTION AND SHIELD: DILEMMAS, OBSTACLES AND CHOICES ON JAPAN'S PATH TO NAVAL BALLISTIC MISSILE DEFENSE

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The spread of ballistic missile technology in Northeast Asia over the past few years has underscored the serious threat that ballistic missiles pose to Japan's security. While Japanese constitutional limitations preclude the exercise of coercive diplomacy, Japanese policymakers are actively exploring the possible deployment of an anti-ballistic missile defense shield as a means to counter the missile threat. Development of a shield, however, remains at an early stage, and budgetary, strategic and constitutional concerns are substantial. This article recommends that, having taken the decision to move ahead with prototype testing, Japanese policymakers now need to transition from the research phase of missile defense to the development and acquisition phases. However, Japan must first make difficult decisions about amending, or at least reinterpreting, its constitution.

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On August 31, 1998, North Korea launched a three-stage rocket that over-flew Japan and landed in the Pacific Ocean. Though the third stage involved a failed attempt to place a 35-pound satellite into orbit, the success of the first two stages, believed to be a 2000-kilometers range Taepodong-1 missile, was sufficient to drive the Japanese government into a state of elevated anxiety.[1] Within a month of the launch, both houses of the Diet passed unanimous resolutions condemning the brazen act. Three months later, Japan decided to produce and deploy optical reconnaissance satellites. And within a year, Japan signed a Memorandum of Understanding (MoU) with the United States to conduct a five-year collaborative research program on ballistic missile defense.

In October 2002, and almost eight years to the day after the signing of the so-called "Agreed Framework" between the United States and North Korea, Pyongyang blithely acknowledged that it had sought uranium enrichment technologies and designs. North Korea has since threatened to revoke its pledge to abide by a missile-testing moratorium that was scheduled to expire later this year. The North Korean challenge, substantial as it is, may nevertheless pale in comparison to longer-term threats to Japan's strategic interests. China is currently believed to be at only an incipient stage in a major upgrading of its strategic missile forces. If military history is any guide, advances in offensive weaponry and strategy typically complicate existing defense dilemmas. For Japan this dilemma remains particularly acute, given that existing constitutional prohibitions and societal inhibitions make it difficult for Japan to exercise even collective self-defense, let alone to practice coercive strategic diplomacy.

While obvious considerations of security then argue in favor of a robust Japanese missile defense capability, important drawbacks to missile defense exist, too. For one, a technologically proven architecture for a missile defense system remains as elusive as ever. Despite successful recent tests, the contrived nature of the testing vis-à-vis real world conditions suggests that a vast distance remains to be traversed if even a minimally credible defense is to take shape. In turn, this concentrates attention on an important psychological cost—excessive dependence on an as yet unproven and possibly unfeasible defense that, rather than stiffening a resolve to deter, may actually prove psychologically destabilizing should the technology continue to remain inadequate.

Material costs constitute another important obstacle. From a 1998 General Accounting Office (GAO) estimate of $18-28 billion to deploy a limited U.S. national defense system, to a more recent estimate of $70 billion for a two-site National Missile Defense (NMD) system with 250 total interceptors, costs have been galloping upwards relentlessly. Moreover, they are expected to continue increasing rapidly with the Bush administration's plans for developing an expanded version of ballistic missile defense (BMD) in the decade ahead (Congressional Budget Office 2000, 10). Though Japan's potential participation in the expanded version of the system is limited and conservatively estimated to carry a price tag of between $10 and $15 billion, the estimate remains just that—conservative. Indeed, estimates vary from $10 billion for a rudimentary BMD system to $50 billion for a locally-produced, independently operated one, the latter amount equaling or exceeding Japan's current annual defense budget (Swaine et al. 2001, 67). U.S. participation in joint systems design, development, and deployment is likely to result in only moderate cost reductions. Extremely sensitive diplomatic, financial, and national security trade-offs will therefore have to be considered.

A final qualification relates to the inherent strategic and domestic political costs of missile defense. In addition to provoking potential adversaries into markedly expanding their ballistic missile and conventional arsenals that threaten the Japanese archipelago, a missile defense might place Japan in an unwanted spotlight as an accessory to the burial of the now-defunct Anti-Ballistic Missile Treaty, and intensify a delicate domestic debate on revision of Japan's "MacArthur Constitution" (Woolf 2000).[2]

It is in light of these limitations that this article assesses the likely benefits and burdens of Japan's participation in cooperative ballistic missile defense with the United States. Because Japan's overriding preference has been for a sea-based variant of the system, the article focuses on those types of defenses. The article's analytical objective is to explore the complex dynamic between the military and technological elements of sea-based missile defense on the one hand, and the political and constitutional elements on the other. Since the issue of ballistic missile defense has the latent capacity to shear the delicate fabric of strategic stability in Asia, the implications of this dynamic are of great importance.

Sequentially, this article: 1) outlines the constitutional, legal, and political obstacles that stand in the way of cooperative ballistic missile defense; 2) examines the strategic rationale, both stated and implicit, that continues to drive Japan's interest in such a system; and 3) provides a technical appraisal of the sea-based intercept options. The concluding section offers recommendations to Japanese policymakers about the preferred type of system and suggests a future course of action for its development, acquisition, and deployment.

CONSTITUTIONAL, LEGAL, AND POLITICAL CONSIDERATIONS

Japan faces unique constitutional, legal, and political obstacles to its pursuit of a ballistic missile defense capability. Because of its Constitution's limitations on collective self-defense, any endeavor or program that integrates Japan's use or prospective use of military force with that of another nation or security organization, and in likely defense of that ally or partner, is prohibited. U.S.-Japan ballistic missile defense architecture, including an integrated command, control, communications, and intelligence nerve center, would constitute exactly this sort of proscribed initiative.

The 1999 Memorandum of Understanding that formalized U.S.-Japan ballistic missile defense cooperation extends only to a limited program of research and prototype production. Its first phase envisages cooperation on "analysis, preliminary design, and certain risk-reduction experiments," leading to "design specification and technology selection for … four agreed missile sub-components due to be integrated into the SM-3 [interceptor missile]" (U.S. Department of Defense 1999a). Notably, it does not commit Japan to the development, production, or deployment of a BMD system either independently or in collaboration with the United States, though it is widely acknowledged that the natural successor phases to the authorized collaboration would be development and acquisition.

Furthermore, because Japan's Three Principles of Arms Exports prohibits the export or third-country transfer of Japanese-made weapons or components, Japanese transfer to the United States of weapons prototypes arising from collaborative BMD development is also likely to be proscribed. This prohibition exists despite exemptions granted for exports of some types of military technologies to the United States. Additionally, a 1969 Japanese Diet Resolution on Peaceful Use of Space prohibits the militarization of space—in turn suggesting that Japan's possession of space-based early warning assets may also constitute a violation. Recent events have suggested, however, that this resolution may be relatively malleable and open to reinterpretation.[3]

Most importantly, Japan, according to its current constitutional interpretation, possesses the right to collective self-defense but not the ability to exercise that right—defined as the use of force to protect another country in a situation where Japan itself is not under direct attack. This means that it is illegal for Japan to shoot down a ballistic missile headed toward the United States or toward U.S. troops in East Asia, unless Japan or Japanese assets were simultaneously attacked. More curiously, even the transmission of tactical radar intelligence to the United States might be construed as a putative violation of the Constitution if that intelligence provided critical assistance to a U.S. intercept of an incoming missile that was not destined for the Japanese archipelago or Japanese assets in the immediate periphery.

Given the constraining effect of constitutional restrictions on BMD development, it is helpful to understand the historical context in which those restrictions evolved and the ways in which they have been, and may continue to be, eased. Such an analysis can advance understanding of the various collective security-impinging political decisions that the ballistic missile defense debate will inevitably confront.

Article 9: A Perplexing Legacy

> *Aspiring sincerely to an international peace based on justice and order, the Japanese people forever renounce war as a sovereign right of the nation and the threat of force as a means of settling international disputes.*
> *In order to accomplish the aim of this preceding paragraph, land, sea and air forces, as well as other war potential, will never be maintained. The right to belligerency of the state will not be recognized.* (The Japanese Constitution, Article 9)

The most striking feature of the Japanese Constitution, enshrined in Article 9, is its renunciation of war. The Article's ambiguous language, however, has made it a topic of unending controversy. According to what became the authoritative Japanese interpretation (the so-called Ashida Amendment), the first paragraph, cited above, established the maintenance of international peace as the Article's objective. As a result, the clause that introduced the second paragraph—"*in order to accomplish the aim of the preceding paragraph"*—was interpreted to indicate that the war potential being renounced referred to the capacity to maintain a capability for aggressive war that would disturb international peace. That interpretation led to a broader conclusion that since the Article was meant to apply to wars of aggression, its provisions did not renounce war and the use of force for self-defense (Dower 1999, 394-98).

With questions relating to the right to national self-defense thereby resolved, provisions pertaining to the exercise of collective self-defense subsequently took center-stage in Japanese debates. Against the backdrop of the Korean War (and American calls for Japanese rearmament and support), the principle of collective security became falsely associated in the minds of most Japanese with the notion of overseas deployment during the 1950s. Extremely reluctant to countenance any dispatch of troops abroad, given the still-searing memories of war, the Japanese government reached a consensus by the late 1950s that Japan would not engage in collective security or overseas deployments. The

1960 U.S.-Japan Treaty of Mutual Cooperation and Security did not refer to the possibility of Japan engaging in collective security, and a 1983 Cabinet Legislation Bureau interpretation explicitly stated that Japan could not engage in collective security missions, even though it had the right to do so. This interpretation stands to this day. It is only since the early 1990s, and under the newly benign global dispensation of international peacekeeping operations, that the limitations relating to the overseas dispatch of Self Defense Force (SDF) personnel have been reduced. And it is only post-11 September that SDF personnel, for the first time since the Second World War, have been deployed abroad (in non-combat roles) during a period of active hostilities.

Yet when viewed through an alternative prism with a timeline that begins with the end of the Cold War, one can argue that Japan's military posture is already in a modestly advanced stage of cutting through the thicket of constitutional constraints. Executed mostly in response to a perceived deterioration in its security environment, this change has been largely quiet and imperceptible. In the early post-Cold War period, Japan's participation in peacekeeping missions in Cambodia and the Golan Heights, albeit on a limited basis, began to dissipate societal inhibitions towards dispatching troops overseas. In the mid- to late-1990s, the U.S.-Japan Defense Guidelines were enacted, enabling the SDF to provide military emergency-related logistical support to U.S. forces in "areas surrounding Japan"—an important evolutionary change that expanded the geographical scope of military activity from pure homeland defense. In doing so, it also helped to erode the "exclusively defensive defense" nature of the SDF's posture. Post-11 September, and under the guise of anti-terrorism legislation, the geographic scope of rear area support duty has been further expanded to encompass not just "areas surrounding

Japan," but the widest possible geographic realm of operation.[4] Restrictions on the transport of ammunition and the use of weapons have also been loosened.

It is hardly surprising that in light of these developments there have been growing calls in Japan for consigning the last remaining defense anomaly—Japan's inability to exercise the right to collective self-defense—to the dustbin of history. A parliamentary Research Commission on the Constitution, already midway through its five-year tenure, is almost certain to return a majority affirmative verdict on revising Article 9 (Report on Constitution 2002). A recently constituted high-level panel of Japanese strategic experts has been equally forthright in suggesting the amendment of the constraining article (National Institute for Defense Studies 2001).

Despite a deeply ingrained pacifist streak in Japanese society, it seems likely that restrictions on exercising the right to collective self-defense will be reinterpreted, if not amended outright, by the latter half of this decade. Constitutional revision may require a combustive development on Japan's immediate security perimeter, as many of the defense-related legislative initiatives in the recent past have been crisis-driven. The Defense Guidelines saw light of day in the aftermath of China's mid-1990s missile bullying in the Taiwan Straits, and cooperative BMD research and development with the United States was hastened only in the wake of the Taepodong launch.

Strategic Considerations

The security dilemma remains one of the most important concepts in the field of international relations. Whereas the *deterrence model* suggests that revisionist actors, such as Hitler, failing robust deterrence, will exploit weaknesses and opportunities to precipitate conflict, the security dilemma, or *spiral model*, posits that insufficient reassurance of state actors, as with the “cult of the offensive” that precipitated World War I, is the trigger that drives generally peace-minded states into avoidable conflict (Jervis 1976). Theorists of international relations have mostly judged policies that focus on defensive capabilities buttressed by offensive arms control efforts as stabilizing, given that defensive weapon systems require no response from other status-quo defenders of the existing order. To the extent, however, that defensive systems enhance the security of an already powerful offense and tip the existing strategic balance in that state’s favor, such systems can also be intensely destabilizing. By stimulating arms racing to overcome defenses and by making pre-emptive attack ever more rewarding, defensive systems can exacerbate the security dilemma for all states within the international or regional order.

The debate on strategic missile defenses in East Asia has evolved within this larger theoretical super-structure. Because the region includes a jumble of states with plausibly conflicting motivations—aggressive, possibly revisionist, status quo, and nominally pacifist—arguments for and against strategic missile defenses have been compelling to various degrees in different countries. As the region is increasingly dominated by offensive force structures and strike capabilities, including ballistic and cruise missiles and guided munitions, recourse to a missile shield is, in a fundamental way, a deeply reactive posture to a developing strategic threat not of Japan’s own making. In fact, the most frequently stated view in support of Japanese participation in missile defense is that, far from exacerbating the regional security dilemma, it has the potential to restore the equilibrium that has been lost due to the proliferation of offensive weapon systems. However, it should be recognized that strategic missile defenses are incapable of dealing with the threat of cruise missiles, which have become over the past decade a far more prominent instrument of warfare.[5] The quantum leap in dual-use technologies supporting cruise missile development and notable shortcomings in defenses against cruise missiles makes them a significant independent proliferation threat.

With respect to the North Korean ballistic missile threat, supporters of missile defense argue that it would not only protect Japan from a missile-delivered chemical, biological, or nuclear attack, but would also disabuse Pyongyang of any misperception that it could split the U.S.-Japan alliance by threatening an attack on Japan or Japan-hosted U.S. bases at a time of crisis. Assuming that Pyongyang retains its current number of missiles, estimated to be 100 medium-range ballistic missiles (MRBMs) and 500 short-range ballistic missiles (SRBMs), North Korea might be tempted to threaten U.S. and Japanese targets if the new American emphasis on preemption and anticipatory use of force is seen by the regime as threatening (Schwartz 2000).

South Korean capabilities also provide reason for caution, independent of the dangerous possibility of a North Korean collapse or a North-South conflict. In addition to the poisonous legacy of Japan's occupation of Korea, South Korea and Japan remain at odds with each other over an unresolved territorial issue—the Tokdo-Takeshima island dispute.[6] South Korea's burgeoning ties with China over the past decade provide an additional worry about its possible future strategic orientation. In January 2001, the United States and South Korea agreed that Seoul could develop missiles with ranges up to 300 kilometers and corresponding payloads up to 500 kilograms, the upper limits under the Missile Technology Control Regime (U.S. Department of State 2001). In 2004, Seoul is expected to receive a delivery of 300-kilometer range missile systems and their multiple rocket pads. And more ominously, in November 2002, a first indigenous South Korean liquid-fueled three-stage rocket was successfully launched from a site on that country's west coast (Agence France-Presse 2002).

A limited defense against Chinese intermediate-range ballistic missiles (IRBMs) might also be beneficial. By serving as a hedge against a militarily stronger future China, a missile defense shield could be used as an effective bargaining chip to negotiate reductions in Chinese strategic missile forces. In a specific Taiwan-related war-fighting scenario, missile defenses could also thwart Beijing's threat to strike Japanese and forward-deployed U.S. forces in an attempt to scare either country out of giving Japan-based military assistance to Taiwan. Even if Aegis-equipped vessels were transferred by the United States to Taiwan, they would not be capable of stopping more than a limited volley of Chinese SRBMs because China is capable of saturating those Aegis defenses with fewer than 100 missiles.[7] While Japanese sea-based missile defenses would be unlikely to alter the offense-defense military balance between the countries, they would add a layer of uncertainty to Chinese war plans and signal Japan's intent to be a significant factor in any ensuing scenario. The 1997 U.S.-Japan Defense Guidelines have reinforced this assumption by expanding the geographical scope of Japan's military activity.

A more robust missile defense capability vis-à-vis China, however, may come at a steep price. China's long-term evolution as either an economic competitor with shared regional interests or as a hostile power with expansionist ambitions remains uncertain. Furthermore, China has a legitimate fear that Japan-aided ship-based radar and sensors, particularly near Chinese waters and cued to a layered defense architecture, could appreciably degrade the efficacy of its strategic deterrent. In such circumstances, it is not difficult to foresee China enhancing the scope and pace of its missile-modernizing program, particularly by deploying additional IRBMs targeted at Japan. Because offensive-defensive missile competition is generally stacked in favor of the former, a rush to defenses could leave Japan worse off in the future, rather than the other way around (Wilkening 2000, 18-19).

Strengthening the U.S.-Japan alliance is a final motivation for missile defense. Mature alliance relationships are believed to rest on three pillars: 1) strategy and policy; 2) operational requirements; and 3) the network of industrial and technological interactions known as armaments cooperation (Rubenstein 2001). The armaments cooperation pillar remains, thus far, relatively weak and disconnected from the rest of the U.S.-Japan security relationship. Therefore, the intellectual property protections, military information-sharing agreements, and flexible technology transfer and export procedures that are inherent in missile defense collaboration could add qualitative depth to bilateral security cooperation. Furthermore, Japan's determination to pursue an anti-missile shield, and the concomitant political investment in fairer burden sharing, would strengthen the political bond between Tokyo and Washington immeasurably (Umemoto 2002).

NAVAL MISSILE DEFENSE TECHNOLOGY

On May 1, 2001, and thereafter in a series of subsequent policy statements, the Bush administration outlined plans for an enlarged and redirected ballistic missile defense program. Departing significantly from the Clinton administration's proposed ground-based mid-course intercept-driven national missile defense architecture, the Bush administration reduced the distinction between theater and national missile defense (Cronin 2002, 4).[8] Although the administration's 2003 budget does not appear to give increased priority to any particular program or research direction, a breakdown of the proposed multi-year allocation of resources suggests a modest shift in emphasis towards the boost defense and sensor segments (Kadish 2002).

In support of its redirected development plans, the administration has also instituted an evolutionary policy for the acquisition of components (O'Rourke and Pagliano 2002).[9] However, since such a missile defense strategy and acquisition policy does not dictate any particular configuration at the outset, it is difficult to assess the viability of any final missile defense architecture. For instance, the type of defense (boost phase, mid-course, or terminal), the lethal mechanism (lasers, blast fragmentation warhead, or hit-to-kill interceptors), the basing mode (ground, naval, airborne, or sea-based), and the character of the sensor architecture (upgraded early warning radar, X-band tracking radar, and/or optical infrared tracking sensors) remain unspecified. However, Japanese industry and the Japan Maritime Self Defense Force (JMSDF) have consistently preferred a sea-based variant of mid-course interception (along with the land-based PAC-3 for "point" defenses).[10] The technical analysis of Japan's options that follows is therefore restricted to the two sea-based configurations—sea-based mid-course defense (SMD) and an as yet undetermined sea-based boost phase defense.

Advantages and Disadvantages of Sea-basing

With three consecutively successful test flights of the Standard Missile (SM-3) interceptor, most recently in November 2002, sea basing of national defenses against ballistic missiles has become the focus of much interest (DefenseNews.com 2002). Because a sea-based boost phase intercept could improve the prospect of defeating a rogue state's missile attack without materially aggravating the strategic balance vis-à-vis Russia and China, the Pentagon’s influential Defense Science Board has gone so far as to recommend that it be one of just two narrowed down experimental BMD development approaches (Graham 2002). Conversely, the sea-based mid-course variant currently under development has also been described as “the least mature” of the various BMD systems, primarily because technological mastery of its numerous constituent units remains considerably more challenging than mastery of the relatively simpler land-based defenses and theater defenses (Wilkening 2000, 47).

Various advantages and disadvantages of sea-based intercept systems have been articulated by analysts. A major advantage is that sea basing allows for flexibility, both in terms of improved intercept capability and reduced vulnerability to preemptive strikes. Since sea-based platforms are mobile, they can be deployed at various “velocity fans,” or points, in international waters close to their intended targets, with potential operating points determined by the type of defense (boost phase or mid-course) and the velocity of the interceptor missile (Cooper and Williams 2000). Second, by not requiring basing of the defense system at fixed sites on land, particularly on a crowded island like Japan that is bereft of geographical depth, sea basing diminishes the system’s vulnerability to a preemptive strike. Options for altering the architecture in response to changed geographic threats are also expanded. Furthermore, S-band and X-band radar currently being developed with maximum detection and tracking ranges of 500-1000 kilometers and 2000-4000 kilometers, respectively, could provide land-based systems with earlier engagement information for a mid-course intercept if they were adapted for use at sea and placed on board a ship (Binnendijk and Stewart 2002, 201-2).[11]

For Japan, another particularly important advantage of sea basing is the unambiguous control that can be exercised over a (mostly) independent standing missile defense system. Depending on the sensor support, the interceptor fly-out speed, and the location of the ship relative to the missile trajectory, a single SMD ship could protect almost all of Japan (U.S. Department of Defense, 1999c). Though supported by U.S.-owned sensor architecture, such sea-based capability could allow Japan's targeting choices to overlap but not necessarily be coincidental with American targets. This is a subtle yet important consideration given Japan's peculiar constitutional restraints and its growing desire for greater independence in security policy-related decision-making.

Sea-based defenses geared towards intercepting rogue states' missiles in boost phase possess the added advantage of being non-destabilizing to larger interests of strategic stability, given their inability to be deployed close enough to all possible Russian and Chinese inter-continental and intermediate range ballistic missile launch sites. However, the degradation of either country's submarine launch deterrent by sea-based boost phase defenses would in all likelihood be construed by China or Russia as threatening. Sea-based boost phase interception, like all boost phase intercept systems, also has the advantage of attacking a ballistic missile during the most vulnerable portion of its trajectory. Boost phase interception is more effective than mid-course interception in the face of countermeasures for three main reasons: 1) at boost phase the missile is still a large object with a bright booster plume; 2) damage can result in total destruction of the system; and 3) booster decoys are hard to build. Fast-burn solid-propellant ballistic missiles, which would be more difficult to intercept, are not readily available to emerging missile states (Wilkening n.d., 5-7).

Juxtaposed against these advantages of sea-based defenses are a host of disadvantages. With respect to naval boost phase interception, since the interceptors need to be positioned near an enemy's launch sites, their naval platforms are highly susceptible to anti-ship cruise missile or diesel submarine attack. Additionally, boost phase interception might require launching interceptors on azimuths towards both the aggressor country (possibly North Korea) and uninvolved third parties (possibly China). Given the short time window for interception (three to five minutes), authority to shoot towards China would have to be delegated to the local theater/ship commander, surely an awesome and dangerous responsibility. Debris from the engagement, such as a damaged warhead or spent interceptor booster, might land on those uninvolved third parties, and in a worst case scenario might land with the warhead still live (Wilkening n.d., 10).

Moreover, for both the boost phase and mid-course variants, operation of even a single BMD defense site would require multiple ships. Because BMD-capable ships would eventually need to return to port for maintenance, more than one ship for each "velocity fan," or point of deployment, would have to be procured if a continuous presence was desired. The issue is particularly delicate for Japan because it currently possesses only four Aegis-equipped destroyers, which all have multiple missions, including the protection of the sea lines of communications in the northwest Pacific.[12] Extending the ships' stay in home waters to serve as platforms for missile interception would probably constitute a lower defense priority than keeping them prepared to engage potential aircraft or cruise missiles.

A related disadvantage pertains to the time and cost concerns raised by the need to integrate missile defense with the ships' existing combat systems. Because Aegis vessels are extremely complex platforms that perform multiple missions, the difficulties of resolving shipboard integration can be enormous. These include repositioning interceptor launch platforms to maximize battle space; threat prioritization and changes to software logic to collect, manipulate, and display strategic threat information in real-time scenarios; and modification of firing logic to provide unambiguous weapon target assessment (U.S. Department of Defense 1999b). Although special-purpose ships designed to host the missile defense system or its components can overcome the integration and opportunity cost problems, they would add to the overall system's costs.

Sea-based Elements of BMD Architecture

The main components of a sea-based mid-course ballistic missile defense are: 1) sea-based interceptors employing kinetic kill vehicles (small rockets using sensors to home in on targets); 2) sea-based radar including upgraded shipboard radar and new X-band tracking radar; 3) upgraded early warning radar, to provide warning and cueing information to the X-band radar, and to track data on missile trajectories beyond X-band range; 4) space-based sensor systems, including Space-Based Infrared System-High Orbit (SBIRS-High) and Space-Based Infrared System-Low Orbit (SBIRS-Low) satellites; and 5) battle management and command, control, and communications systems, with up-link to sea-based interceptors.

The SMD system currently being researched by Japan is based on the capabilities of the Aegis weapons system and SPY-1D radar, which are located on four JMSDF

Kongo-class destroyers. The system is designed to intercept medium and intermediate range ballistic missiles during their ascent, along their trajectory, or during their descent using the latest derivative of the Standard interceptor missile and its kill vehicle. Although a single SMD ship is currently estimated to "be able to defend an area as large as 2000 kilometers in diameter against a 1000 kilometer range threat," it is estimated that the latter range could be extended to 1500 kilometers or more with the development of new High-Power Discriminating (HPD) radar and an upgraded Aegis SPY-1D radar (Henry L. Stimson Center Working Group 2000, 8). According to the U.S. Department of Defense, the SMD system is expected to achieve an initial capability against medium and intermediate range missiles by 2006, with an ICBM capability to follow later. Such timelines have been, however, notoriously inconsistent in the past, and are heavily dependent on test results and other factors (Kadish 2001; U.S. Department of Defense 2003).

Japan's current contribution to cooperative SMD research and development is important, even though it remains limited to the research phase. Current plans envisage design specification and technology selection on four missile sub-components that are to be integrated later into the ballistic missile defense system's SM-3 interceptor missile. Those four missile sub-components are: 1) design, development and production of an advanced, lightweight, high-strength missile nose cone using advanced composite materials and technologies; 2) design, development and production of the interceptor missile's lightweight, high-strength kinetic kill vehicle; 3) design, development and production of advanced, lightweight solid rocket motors at reduced cost, using weight reduction techniques and materials; and 4) design and development of multicolor focal plane array technology for the interceptor.

Although it was originally scheduled for completion by 2003, the joint study has been extended until 2006, reflecting a serious deficiency that continues to bedevil all missile defense efforts—the slippage in timelines for development and deployment, itself a symptom of the tremendous technical challenges being encountered.

Technical Deficiencies

There are major technical obstacles to the development of the ballistic missile defense systems under consideration. For instance, even PAC-3, an endo-atmospheric (inside the earth's atmosphere) 40-60 kilometer "point" defense that is the simplest system under development, does not seem completely ready for deployment, even after ten years of work (Snyder 2002; Boese 2001).[13] Functionally, SMD deficiencies can be classified in the following categories:

Detection and Tracking**:** The ability of the warning and tracking system to provide over-the-horizon information to the interceptor missile determines how much of the footprint of the interceptor can be used for defense engagement. As presently constituted, naval SPY-1D radar are not capable of supporting mid-course engagement due to limited detection, decoy discrimination, and tracking capability with respect to strategic ballistic missiles and their re-entry vehicles. Even with upgrades, such functionality will remain dependent on the array of early-warning sensor systems currently planned for development. The existing Defense Support Program (DSP) satellites, in operation for the past three decades on missile-warning missions, lack the capability to detect and characterize missiles beyond the four to five minute boost phase. The more sophisticated SBIRS-Low system will theoretically be able to discriminate between targets and decoys, cue radar over-the-horizon and during the mid-course segment, and provide data for intercept hit/kill assessments. But its first satellite launch is not expected until 2006, and its full deployment is not expected until 2011 at the earliest (U.S. Department of Defense 2002).[14] Robust detection and tracking capability for SMD is a long way off.

Additionally, if existing Aegis-radar was linked via SBIRS (High and Low) to an integrated missile defense network, all such multi-purpose Aegis-equipped ships could become likely subjects for future arms control negotiations. The inter-connected Aegis radar could be construed as ceasing to operate in a theater mode and beginning to operate as part of a larger inter-continental range ballistic missile defense network, thereby making it vulnerable to future strategic limitations (Binnendijk and Stewart 2002, 202-5).

***Interceptor velocity*:** The interceptor velocity determines the maximum area that can be defended by an interceptor. As currently constituted, the design characteristics for the Standard SM-3 interceptor missile, currently procured for SMD testing, are deficient in the burnout velocity needed for ascent phase or mid-course intercepts (3.1 kilometers per second compared to the desired 6.5 kilometers per second) (Boese 2001).[15] Since it is likely that the interceptor missile may be launched from a position that requires it to chase down an incoming missile from behind, especially if the vessel carrying the interceptor missile is located near the adversary's territory, major propulsion upgrades and replacement of the interceptor boost stage with larger, more capable stages will be required (U.S. Department of Defense 1999b). The former will require development of a far more compact warhead to leave more room for propulsion, as well as lighter materials to keep overall weight in check. The latter would require: 1) improved second stage engines, currently in development, and improved electronics density and warhead miniaturization to make room for bigger boosters; and 2) engineering modifications to current naval launch platforms to accept missiles with larger diameters. Alternatively, new vertical launch system tubes could be designed to accommodate larger and more powerful missiles, but that would also significantly increase the system's cost and complexity, almost to the point of rendering it impractical (Hildreth and Woolf 2002, 41-2).

***Kill vehicle tracking and divert*:** The kill vehicle of the interceptor missile currently being developed does not possess sufficient lateral thrust and divert capabilities to reach and engage relatively sophisticated ballistic missile targets. Direct hit-to-kill, as opposed to blast fragmentation, is the only method of destroying targets in space (because there is no air concussion, or pressure wave, in space). Additionally, since the kill vehicle's homing system will likely have to discriminate among possible decoys and debris, as well as avoid being blinded by its own propellant plume, advances will have to be sought in two areas: 1) cooling systems so that the kill vehicle's infrared sensor can counter cooler, more advanced BMD threats; and 2) color, as opposed to mono-chrome, imagers, for possible decoy discrimination and target acquisition (Cataldo 2002).

Naval boost phase interception also poses track-and-divert complexities, but of an entirely different nature and order of magnitude. The kill vehicle would be operating against a large and hot-burning target, rather than against a smaller and relatively colder one in space. Yet it must be able to switch in-flight from homing on the brighter rocket plume to homing on the missile body. Perfecting such capability will require significant advances in understanding the science of rocket plumes (Wilkening n.d., 10). Consequently, an altered kill vehicle, as well as early detection and sensor technology of a different kind—for instance, to distinguish a missile's heat signature from that of a large fire or terrestrial explosion—will likely have to be developed for boost phase interception.

Kill vehicle hardening**:** Kill vehicle hardening may be necessary because the interceptors may be required to perform their mission in a nuclear environment, particularly in a "salvage fusing" scenario (Tanks 2000).[16] Without such hardening, the thermal energy, nuclear radiation, and electromagnetic pulse effects from nuclear detonation of a first warhead could incapacitate the kill vehicle's seeker, guidance, and control systems, and in the process preclude any chance of intercepting an accompanying second warhead. As currently envisioned, the kill vehicle does not possess sufficient hardening to handle such a situation.

OPTIONS AND RECOMMENDATIONS

With the political portents for Japanese participation in an anti-ballistic missile system being, on balance, modestly favorable, attention needs to be focused on energizing U.S.-Japanese cooperation on missile defense development and systems integration. The integration of command, control, communications, computers, and intelligence remains a problematic element in U.S-Japan BMD cooperation, in part because of Japan's trepidation in moving aggressively beyond the research phase of missile defense. While the continued technological immaturity of the proposed system is a considerable obstacle, one can expect that the most difficult problems associated with implementation of a Japanese BMD system will arise in the diplomatic and political arenas.

For a workable ballistic missile defense system to take shape, Japanese policymakers will need to address a number of near-term collective security-impinging BMD policy decisions. Japan must proceed from the research and prototype phase to the cooperative BMD development phase, as envisaged by the 1999 MoU. Restrictive technology control, technology sharing, and technology transfer-related legislative stipulations should also be relaxed. A timeline of action for determining levels of effective integration in air defense systems, sensors, doctrine, command, control, communications, intelligence, surveillance, and reconnaissance capabilities will also have to be worked out. Doubtlessly, Article 9-related constitutional limitations will have to be amended, or at the very least reinterpreted, as the movement towards systems integration gathers steam.

Japan's dependence on U.S. space-based early warning capabilities in any near-term sea-based BMD system must also be formalized, given the prohibitive cost of authorizing development of an independent space-based early warning capability (Swaine et al. 2001, 37). This need not clash with expanding Japanese military options in space, particularly the possible deployment of Japanese electro-optical military reconnaissance satellites. But Japan must recognize that while a Japanese-produced BMD system with independently operated interception capability remains the ideal, the leeway to choose between a cooperative BMD system and an independent one may be less than anticipated.

In terms of sea-based configurations, two main options exist. The first option is to develop a boost phase interceptor capability that will possess rogue state deterrent and defense capability but would not be able to counter a Chinese threat. This option would require the unambiguous elimination of Article 9-related restrictions. The second option is to develop a mid-course defense system, which would be in many respects independently operable and would have latent capability to intercept Chinese missiles, but would be incapable of responding to a North Korean short- and medium-range missile threat. This second option would also almost certainly lead to a regional strategic arms race. Given the hair-trigger nature of this system, as well as the political disadvantages and technological difficulties with which it is associated, cooperation on boost phase defenses between the United States and Japan in all likelihood will continue to remain a non-starter. But there has not yet been an effort to develop and acquire a dedicated sea-based mid-course defense system, despite the extensive technical feasibility studies conducted. This slow-moving state of affairs will have to be altered.

Since a slew of BMD-related technical timelines will soon begin to conflict with cherished constitutional collective security prohibitions, Japan must move ahead proactively on the constitutional front. The way that Japan approaches and resolves the inherent contradiction between its strategic necessity and constitutional preference may provide an inkling of Japan's future geo-political orientation in the fast-evolving politics of East Asia. Specifically, Japan's decisions concerning missile defense will indicate whether it intends to: 1) remain a regional power essentially at ease with its sheltered status quo security posture, while making minor upgrades in its capabilities; 2) share the regional security burden more fairly with the United States and bolster the U.S.-Japan alliance by developing more comparable military and diplomatic weight; or 3) become an independent pole within the evolving regional order, determined to maintain and expand control of vital elements of its security while devolving lesser order priorities to alliance management.

NOTES

1 When a rocket is "staged", much of its bulk is disposed of after the rocket attains a reasonable speed and exhausts the fuel of the first stage. This allows the rocket to acquire speeds commensurate with reaching intercontinental range. Though the North Korean malfunction prevented deployment of the satellite into orbit, the launch demonstrated North Korea's success in separating the first and second stages, and the second and third stages, respectively.

2 The interceptor speed and advanced sensors of Japan's preferred missile defense system (sea-based mid-course defense) will have to be tested in a way that would breach the now-defunct Anti-Ballistic Missile Treaty, as defined by the U.S.-Russian Negotiated Agreed Statements on ABM/TMD demarcation. Sea-based testing and deployment would also constitute a breach under the treaty.

3 The resolution's weight should not be overstated. The ease with which dual-use reconnaissance satellites were approved by the Diet following the North Korean Taepodong launch may indicate that the resolution can easily be reinterpreted if necessary.

4 Despite the extension of its geographical coverage, the scope of Japanese cooperation is limited by the statement "a line is drawn between a region and the region in which hostilities occur," suggesting the inability to cooperate, let alone integrate, with the exercise of American military force in a hazardous external theater. The qualification, however, has more to do with considerations of practicality, given that it is well-nigh impossible to write rules of engagement in a shooting war while simultaneously delineating where individual self-defense ends and the exercise of collective self-defense begins.

5 Cruise missiles differ from ballistic missiles primarily in two ways: 1) the means by which they are propelled; and 2) their differing flight patterns. Cruise missiles are self-propelled guided vehicles, powered continuously by air-breathing jet engines and intended to strike a target after following a pre-programmed, and often terrain-hugging, route. By contrast, ballistic missiles are powered by rocket propellant, which also controls their trajectory. Following rocket burn-out upon reaching a high altitude at an accelerated pace, ballistic missiles fly by inertia and assume a parabolic trajectory as they fall onto the target area.

6 Called Tokdo (Lonely Islands in Korean), Takeshima (Bamboo Island in Japanese), and the Liancourt Rocks in English, the volcanic isles are situated some 90 miles off each nation's shore. Both countries claim the islands because their sailors and fishermen used them as rest stops centuries ago. South Korea has the advantage of controlling the islands now and Seoul has stationed Coast Guard officials on the rocky outcroppings since 1954. However, Japan has often asserted its rights to the islands and sent its own Coast Guard to patrol the area, and Japanese nationalists have periodically fanned the flames of this issue.

7 Aegis-equipped vessels are the U.S. Navy's most advanced surface combatants. AEGIS is a highly integrated battle management system, capable of engaging in simultaneous warfare on several fronts—air, surface and subsurface. Its versatile radar and missile system gives users the ability to simultaneously track and engage multiple aircraft as well as low-flying cruise missiles.

8 The logic is two-fold: (a) to seek synergies among relevant technologies applicable across a range of architectural designs and BMD threats, and (b) to develop a stop-gap near-term capability for homeland defense based on promising theater-range technologies deemed to have potential for enhancements. An

added benefit is the alleviation of allies' concerns of de-coupling—that a separate "national" missile defense might lead to the abandonment of allies during a serious crisis.

[9] The new evolutionary acquisition policy represents a departure from past U.S. Department of Defense procurement policy.

[10] PAC-3, or Patriot Advanced Capability-3, is a Theater Missile Defense (TMD) system intended to intercept cruise missiles, hostile aircraft, and short-range ballistic missiles within the atmosphere utilizing relatively slow-flying interceptors that maneuver to their targets.

[11] S-band and X-band are radar frequency bands, 'S' standing for short wavelengths (10 cm) and 'X' denoting a spot 'x' (3 cm wavelength). S-band radars perform surveillance (target detection and acquisition), tracking, object classification, and wide or narrow band data collection functions. X-band radars perform wide-band data collection on manually designated objects from the S-band radar.

[12] Japan's current Mid-term Defense Program *FY2001-FY2005* has set aside funds for procuring two new Aegis-equipped destroyers.

[13] While PAC-3 performed well in developmental tests, operational testing in real field conditions revealed previously undisclosed shortcomings. Unsurprisingly, most of the successful intercepts were conducted against what the Defense Department's Office of Operational Test and Evaluation called "limited threat representative targets".

[14] SBIRS program costs have jumped appreciably, from $11.8 billion to $23 billion.

[15] Burnout velocity is the speed of the missile at the end of its thrust, or 'engine burnout', phase.

[16] Attacking warheads may be equipped with sensors that detonate the nuclear charge contained within them just prior to being struck by a hit-to-kill interceptor. However, there is disagreement about whether a salvage fuse triggering the charge could be made to react quickly enough, following detection and before the integrity of the warhead is destroyed by the interceptor missile.

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