The Perception Gap in the THAAD Dispute – Causes and Solutions

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In recent years, the deployment of the THAAD system has become a thorn in China's ties with the United States and South Korea. This has undermined their capability and willingness to cooperate in addressing the growing challenge from the nuclear program of the Democratic People's Republic of Korea (DPRK). There is ample evidence to suggest that the three countries are fundamentally divided on the understandings, purpose, and strategic motives of the THAAD system in South Korea. For all of these countries, effectively narrowing their differences and addressing their dispute relies on a thorough understanding of how the others think. Without a persistent effort to develop an empathetic understanding of the others' real thinking, there would be no real prospect of progress.

To this end, the paper aims to analyze and compare respective perceptions toward the THAAD deployment in the strategic security communities in the United States, South Korea, and China, and to promote more nuanced and objective balanced understandings of this complex issue among the policymakers and experts in these countries.

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I. The Nature of the THAAD Dispute

China's Foreign Ministry officials have reiterated that THAAD is not simply a technical issue, but a strategic one. This is echoed by most Chinese experts, who argue that THAAD is an issue of major political and strategic importance to China.

American and South Korean officials and experts, however, tend to look at the issue through the lens of the technical details of the missile defense system, and have a difficult time to understand why China does not want to discuss the technical capabilities but insists on taking it as a strategic and political problem and exerts pressure on South Korea accordingly. The author has followed the THAAD-related discussions within the US strategic community and had in-depth discussions with American scholars and officials, including various Track II level dialogues. According to my observation, the US misunderstanding of China's stance has led to a common belief in Washington: China is fully aware that THAAD does not pose any serious threat to its security; it has no substantial concern over the system; and its vehement opposition is actually choreographed to serve other geopolitical objectives. Based on this view, the US concludes that since any good-faith discussion with China on THAAD is unlikely to get anywhere, it may as well ignore China's "unreasonable" and ill-intentioned demands and stick to what it deems perfectly "reasonable" deployment of THAAD. Judging from my discussions with South Korean scholars and officials, this view is widely embraced in South Korea as well. Most South Korean experts also believe that THAAD can provide useful protection against DPRK's missile threat, and it was not due to American coercive pressure that the South Korean government made the decision to install THAAD.

In comparison, China's understanding about the motives behind the THAAD deployment is fundamentally different. A very popular view is that dealing with DPRK's nuclear threat is just an American excuse and the main—or the real—target of THAAD is China; the objective is to implement a policy of strategic containment against China, through undermining China's strategic security interests and disrupting the regional strategic

balance. As for South Korea, China is convinced that the country fully understands that THAAD cannot effectively protect it; nonetheless, it is arm-twisted into approving the deployment by the US pressure. In other words, China has little doubt that South Korea made a decision to pick side in this China-US dispute to enhance its military alliance with the latter, despite knowing very well that THAAD would seriously undermine China's key security interests.

For the ease of writing in this paper, the US and South Korea, who share similar perceptions, are grouped together as one side in the THAAD dispute, while China is on the other side. For both sides, there is a clear difference between how one understands its own strategic intentions and how such intentions are understood by the other side. The deep perceptual gap has led to serious mutual misunderstandings that make their differences seem irreconcilable. If one continues resorting to pressure tactics in the hope to force the other side to change positions, there would be no way to settle the dispute. Now is the time for experts from the two sides to explore causes of such huge perceptual gap and develop a common strategy to solve it.

II. Divergent Perceptions about THAAD's Capability to Protect South Korea

Even those who regard the THAAD deployment issue as more of a political and strategic issue than a technical one would agree that understanding the technical capabilities of THAAD is the key for evaluating the level of threat the system poses to China. The reason why China has expressed the greatest concern over THAAD rather than any other US missile defense systems deployed in the region is precisely that China believes THAAD possesses a special technical capability to threaten China's key interests. Without a systematic effort to develop an in-depth understanding about THAAD's technical capabilities, fact-based and prudent strategic decision-making is impossible. The problem is, however, many policy analysts from the two sides often engage in geopolitical debates

independent from the technical context. Many experts are not even aware that the issue involves sophisticated technical details and that there are genuine disagreements between the technical experts of the two sides about the underlying technical issues. This disconnection between technology and policy has greatly contributed to the misunderstandings about each other's strategic intentions. In such a light, this paper explores the sources of some key technical disagreements to better understand where the perception gap comes from.

The first question is to what extent THAAD can protect South Korea. Chinese experts argue that THAAD can only provide limited protection, because the system is primarily designed to intercept medium- and intermediate-range missiles, but it is DPRK's short-range missiles[1] that pose a threat to South Korea; therefore the system is not in a position to defend Seoul from missile attacks; and even if it were deployed closer to Seoul, it would not be able to defend against DPRK's conventional military threats to the city, such as those from large-caliber conventional artillery and rockets. For these reasons, most Chinese experts don't think THAAD can provide any real extra protection for South Korea and this leads to the conclusion that the most important purpose behind the deployment must be to contain China, rather than to deal with DPRK's threat.

However, American and South Korean experts disagree. They hold that: THAAD can effectively address DPRK's missile threats, including those posed by short-range missiles; working together with the lower-tier Patriot system, THAAD contributes to a layered defensive shield that significantly improves the chances of successful interceptions against short- and medium-range ballistic missiles. For American and South Korean experts, there is little doubt that THAAD's target is DPRK's missiles.

Technically speaking, THAAD is capable of intercepting ballistic missiles of medium (1,000 – 3,000 km) and intermediate (3,000 – 5,500 km) ranges but is also designed to be capable of intercepting targets with shorter ranges. It can intercept targets at altitudes of 40-150 km and is capable of engaging most short-range missiles (with ranges longer than about 250 km). In fact, the system's intercept

tests during R&D stage primarily focused on short-range missiles.[2] This is also noted by Chinese technical experts, who point out that the 13 intercept tests conducted since 2006 used nine short-range and two medium-range targets[3]. Therefore, it is inappropriate to conclude that THAAD is for intercepting medium-range targets and cannot defend against short-range ones.

Then, there is the often heard argument by some Chinese experts that THAAD deployment is totally unnecessary because the current low-tier Patriot defense system alone can protect against DPRK's missiles. However, the fact is, with lower speed, lower intercept altitudes (up to 20 km), and shorter range, Patriot interceptors have limited interception capabilities, particularly against targets moving at high speeds in their final phase. Unfortunately, such threats are real, as DPRK has frequently test-fired missiles at highly lofted trajectories to shorten flying distance and can use the same tactics to defeat South Korea's Patriot system.

One advantage of THAAD is its ability to fill the gap left by the Patriot system. As some Chinese technical experts pointed out, "THAAD is designed to protect large areas—for example, American forces, allied forces, population centers, and critical infrastructure—against short- and medium-range missiles." As a result, "the THAAD and PAC–3 (Patriot Advanced Capability-3) systems constitute a layered-defensive system: the former is able to intercept missiles both inside and outside of the Earth's atmosphere at an altitude of 20 to 200 km, while the latter capable of hitting short- and medium-range targets in the terminal phase"[4]. Some Chinese experts acknowledged that THAAD comes as a complement to PAC–3. "Thanks to their light weight and small size, both PAC–3 kinetic energy interceptor and THAAD have great mobility and flexibility, but what makes THAAD different is that it is a regional defensive system that can hit targets at an altitude of 40 – 150 km to protect a large area, within a range of up to 200 km in diameter, while PAC–3 only offers point defense for key assets. In addition, THAAD enables multiple interception attempts. Given its intercept range and altitude, the system allows extra time to launch an interceptor first, assess the result, and then fire a second interceptor if the first one misses the target. Even when the

second attempt also fails, PAC–3 can then take over to have a third shot. The value of THAAD is that it offers a more flexible option to defend against large-scale missile threats. It complements, rather than replaces, the existing missile-defense systems and sensors, such as the land-based PAC-3, the sea-based Aegis, and Ground-based Midcourse Defense systems, as part of the US effort to develop a multi-layered ballistic missile defense capability.[5]"

Therefore, from the technical perspective, it makes sense that in response to DPRK's improving missile capacities, the US and South Korea choose THAAD to complement the Patriot system[6]. Admittedly, Seoul is too close to the border to be fully protected by THAAD, which is also acknowledged by both South Korea and the US. However, it is hard to imagine that under such grave security threats as possible nuclear attacks, a government would give up efforts to defend most part of its territory altogether simply because they cannot effectively protect the capital city. Besides, there are always other ways to reinforce the protection of Seoul, for example, through increasing the number of PAC–3 systems deployed around the city. In fact, a 1999 US Department of Defense report made the exact recommendation: to compensate the inadequate protection of Seoul from the possible deployment of THAAD by deploying more low-tier anti-missile systems.[7]

It is also true that anti-missile systems cannot counter conventional artillery threats from the DPRK, but for years South Korea and the US have been making efforts to develop and deploy both active and passive defense capabilities against conventional artilleries. Even if the threat from conventional artilleries cannot be adequately addressed at the moment, that seems no reason for South Korea to give up trying to defend against the nuclear threat.

Nevertheless, it is worth noting that however technically advanced they are, the American anti-missile systems have not been fully tested under real battlefield conditions. There is still considerable uncertainty about the effectiveness and reliability of THAAD's realistic battlefield performance. The US and South Korea do not seem to completely count on these anti-missile systems to successfully intercept all incoming missiles; without being seriously provoked, DPRK is also unlikely to launch a

missile attack on South Korea and/or US military bases there. Therefore, the THAAD system is more of an insurance against extreme scenarios. At the end of the day, even one successful interception of a DPRK nuclear warhead would save massive losses of life and property.

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III. Divergent perceptions about THAAD's impact on China's strategic security interests

Both sides agree that THAAD interceptors do not pose any significant threat to China's strategic security interests. What divides them is whether the AN/TPY-2 X-band radar of the THAAD system seriously undermines China's strategic security interests, particularly against the deterrent capability of China's nuclear weapons. Chinese experts argue that the radar can track the trajectory of China's intercontinental ballistic missiles (ICBMs) during their ascent phase, and can distinguish real warheads from decoys when they are released after the booster burns out. Here is how many Chinese experts believe the radar undercuts China's nuclear deterrence: during peacetime, the radar monitors China's missile tests and collects data on the warheads and decoys of Chinese ICBMs. During wartime, THAAD updates real-time warhead and decoy monitoring information for American homeland missile defense systems deployed in Alaska and California; such information is then analyzed and compared with previous data to ensure that interceptor directly hits the real warheads without being confused by decoys, increasing the success rate of interception. The odds are further improved by the advantageous location of the radar. Based in South Korea, it is close enough to enable early detection and warning, which contributes to increased response time for more than one intercept attempts.

On the other side, however, the mainstream American and

South Korean view is that the THAAD radar cannot have the capability of undermining China's strategic nuclear deterrent. They seriously doubt the alleged capability of the radar to distinguish ICBM warheads from decoys. They also point out that the US has already deployed a range of sensors and warning systems in the Asia Pacific region and ask why China is so much more concerned about the THAAD radar than any other. They often note that the US government repeatedly offered to provide China with technical briefings about this system, to which China did not respond. Despite the lack of official technical information about the system, in the public domain a number of American technical experts have conducted independent assessments on some key technical issues. Among them, Theodore Postol, a recently retired MIT professor and expert in missile and missile defense technologies, suggested that THAAD's ability to identify real warheads and increase warning time is only possible in theory, and can hardly make much difference in reality; identifying real warheads is extremely challenging, and the THAAD radar does not add much to the US anti-missile capability against China[8].

This understanding is supported by some Chinese experts, who point out that according to available technical documents from the US military, it would be very difficult to use sensors such as the THAAD radar to distinguish real warheads from decoys[9]. The design of ICBM post boost vehicles (PBV) varies from country to country and special devices can be added to mask the deployment movements. During the release of warheads and decoys, a PBV also uses thrusters to conduct maneuvers and readjust flight conditions. This means it is very difficult to tell the difference between real and fake warheads simply by observing the kinetic energy changes of the PBV during the release process. One possible solution, as suggested in one of the US Army Science Board (ASB) reports, is to look into differences of more subtle motion changes between warheads and decoys. For example, a decoy may show a different micro motion change from a real warhead when it is impinged by the PBV's thruster plume, and such motion--if discriminable--may help the identification of a real warhead. However, this requires much greater sensitivity and resolution of the remote sensor (radar),

and is susceptible to countermeasures such as by deploying small attitude rate reducers[10]. Thus, it would be ill-conceived—and potentially misleading—to suggest that the THAAD radar is able to discriminate Chinese missile warheads from decoys and therefore poses a serious threat to China's strategic nuclear deterrence simply because such missiles may be within the radar's detection range when they release their warheads and decoys. [11]

There is no simple conclusion as to whether THAAD radar has the warhead discrimination capability. It depends on numerous technical factors beyond the radar itself, and there are always countermeasures China can take. The technological competition between target discrimination and counter-discrimination capabilities is usually endless, especially between such major military powers as China and the US. As is pointed out by Dean Wilkening, an American missile defense expert and researcher at Lawrence Livermore National Laboratory, a wide array of discrimination techniques and countermeasures have been developed. However, "[t]here is no countermeasure against which an effective defense cannot be designed, and [t]here is no defense against which an effective countermeasure cannot be designed." [12] The view is also shared by ASB in its above mentioned report: "It must be recognized that discrimination [of real and fake warheads] is not a problem that can be 'solved'. Rather it will be a continuing race between the offense and defense to institute, respectively, more effective pen-aids [penetration aids] and more capable means to counter those pen-aids to a degree that is adequate to maintain the defense's desired level of effectiveness…its effectiveness will probably always be a matter of judgment rather than a demonstrable fact." [13]

Dean Wilkening, whose technical know-how has influenced the US missile defense policy[14], made clear at a domestic seminar in the United States that if the US chooses the right technologies, it may have a chance "for staying ahead of the discrimination problem against states like the DPRK and Iran". [15] In other words, when faced with more powerful countries like Russia or China, it would be difficult for the US to gain the upper hand even with its best technologies. His statements seem to indicate that America

is not necessarily seeking warhead discrimination capabilities against China and Russia. Admittedly, even if this is the US policy for now, the policy may change later; it does not mean that the US will never try to develop such capabilities in the future. However, from the technical perspective, no single technology can secure perpetual advantages once and for all in this on-going race between the offense and defense. Technical breakthroughs and new military deployments can only bring about relative and temporary advantages, not absolute and permanent ones. To obsess oneself with the controversial debate over THAAD radar's target discrimination capability and dramatize its influence tends to lose the longer-term picture. This would do no good to ensure rational distribution of China's resources for achieving advantages in the long-term competition.

Another threat theory claims that the deployment of THAAD radar in South Korea allows earlier detection of China's ICBMs or submarine-launched ballistic missiles (SLBMs), giving the US missile defense systems an earlier warning and longer preparation time. However, this argument also seems oversimplified. The THAAD radar in South Korea affects the Chinese SLBM fired from the Bohai Bay most, but it would still need at least 50 seconds to detect the launch of an SLBM[16], and would take longer to detect an ICBM fired from China's hinterland. By comparison, the US Space-Based Infrared System (SBIRS) satellites can provide an earlier warning with their see-to-ground (STG) infrared sensors.[17] According to Chinese technical experts, these sensors are capable of conducting cloud-penetrating and high-frequency scanning and therefore can detect missiles immediately after launch. The warning can be communicated to the control center within 10-20 seconds after the launch. [18] Due to the existence of other sensors that can provide earlier warnings against a Chinese missile launch, it seems ill-founded to suggest that THAAD radar can significantly increase early warning time for the U.S. missile defense systems against Chinese strategic missiles.

Apart from the SBIRS, the Space Tracking and Surveillance System (STSS) satellites constellation is also considered to have significant early warning capabilities against missiles. In his

statement to Congress in 2011, Patrick J. O'Reilly, then director of the US Missile Defense Agency, pointed out that in two recent flight tests by that time, STSS satellites demonstrated the ability to provide tracking data more accurately and timely than the Aegis or THAAD radars.[19] In addition to early warning satellites, America also has a strong sea-based sensor network. It consists of the Sea-based X-band Radar (SBX) and a number of missile range instrumentation ships of various sorts. The Howard O. Lorenzen, for example, is a tracking ship that carries the powerful Cobra King radar system comprising of X-band and S-band phased radars. These sea-based sensors are mobile and can be deployed in waters near China when needed and can provide effective early warning detection of missile launches.

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As a result, it is questionable how much the THAAD radar can meaningfully add to America's existing early warning and tracking capabilities against China's strategic missiles.[20] The THAAD radar's threat to China should be assessed by taking into consideration America's overall early-warning capabilities. Looking at the issue in isolation from the broader context can lead to misunderstandings about America's strategic intentions.

IV. Causes of perception difference

Strategic distrust

Profound and long-term distrust has long shadowed China-US strategic security relations, particularly over nuclear issues. The lack of internal consensus and the existence of future uncertainties over key US nuclear policy issues contribute to China's long-term suspicion about American strategic intentions. Sometimes the American nuclear policies vis-à-vis China were clearer than other times. The Obama administration, in particular, clearly stated its

willingness to maintain strategic stability with China, indicating that the US would not seek to undermine China's strategic nuclear deterrence. However, there are also always hardline voices from some American experts who feel uneasy about the mutual assured destruction relationship with China. Some American experts even suggest that with the constant advancement of military technologies, it is technically possible for the US to acquire preemptive strike capability against China's nuclear weapons.[21] Although these voices by no means represent the US mainstream thinking or official policy, they inevitably ring alarm bells for the Chinese strategic community. Given the importance of such issues, it is only natural that China has taken it seriously and prepared for the worst.

There are also ambiguities over US missile defense policies which may have important implications for other countries' nuclear policies. The US National Missile Defense Act of 1999 defined the scope of US missile defense as "limited." This principle has guided the missile defense policies during the Bush and Obama administrations, as they sought primarily to protect the US homeland against limited ballistic missile threats from states such as the DPRK and Iran, not major nuclear powers like Russia and China.[22] This policy has been constantly challenged by suggestions on developing strategic missile defense capabilities against countries with very advanced nuclear capabilities.[23] This is extremely difficult to achieve from both financial and technical perspectives. Nevertheless, such voices have raised serious concerns over future US policies and strategic intentions in China and Russia. In response to the rapid development of DPRK's missile capabilities, the US has stepped up its efforts for building a multi-layered missile defense system; the National Defense Authorization Act for Fiscal Year 2017 removed the word "limited" from its guidance on missile defense development; and the Trump administration seems very committed to enhancing homeland missile defense and how its new Ballistic Missile Defense Review Report may change the relatively moderate missile defense policy of the Obama administrations continues to unease Chinese experts.

Against the background of strategic distrust, China suspects any US moves to deploy better missile defense capabilities in the Asia-Pacific region would be part of a long-term grand strategy to establish a comprehensive missile defense network to ultimately neutralize China's nuclear deterrence. Just as many American analysts tend to interpret the Chinese efforts to enhance defense postures as aiming at challenging the existing US dominance, China could not help but assume the worst in US strategic intentions when it comes to future US missile defense policy. The Chinese perception over the THAAD deployment is inevitably influenced by this general dynamic.

However, exaggeration of missile defense threat is against China's own security interests. Admittedly, from the technical perspective, the possibility cannot be absolutely ruled out that the THAAD radar in South Korea does serve other purposes such as monitoring China's missile launches and collecting intelligence. Nonetheless, it is worth noting that most evidence suggests the system is primarily aimed at countering DPRK's missile threat and is not to undermine China's nuclear deterrent. This view is shared by some Chinese technical experts, who point out that: the primary target of the X-band radar is the DPRK[24]; and South Korea chooses to deploy the THAAD system "out of concern of DPRK's ballistic missile attacks." [25] Such issues are essential, as they determine how China understands the nature of the matter and responds to it. Some Chinese commentators have categorically asserted without the backing of any specific technical analysis that the primary—and even the "only"—target of THAAD is China. If this ill-founded view becomes dominant in China, the risk is that the Chinese government would develop serious misunderstandings about the strategic intention of the US (and South Korea). The consequences of China's misinterpreting the THAAD deployment as part of a long-term US strategy to neutralize China's strategic nuclear deterrence may include problematic Chinese countermeasures such as making too much investment in building up its nuclear

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forces rather than investing in other more pressing and important areas, which can undermine China's long-term development and strategic interests. It may also trigger an unnecessary nuclear-arms race, making the Sino-American Thucydides trap a self-fulfilling prophecy.

Confusion about the type of the threat

It should be noted that while it is not the US official policy to seek strategic missile defense capabilities against China or Russia, the US is clearly interested in developing defense systems against the perceived threat from theater missiles of China and Russia, to protect US allies.[26] The theater missiles mainly refer to China's short- and medium-range missiles that can directly threaten key regional targets of the US and its East Asian allies. In this regard, the THAAD inceptors and the radar deployed in South Korea may indeed be helpful for defending South Korea-based US and allied forces from China's theater missiles. More broadly speaking, most of the US missile defense systems deployed in East Asia can be useful for protecting the interests of US' allies (especially Japan) against threats not only from DPRK's missiles, but also from China's theater missiles. This objective is clearly stated in US official documents and acknowledged by officials of the Ministry of Defense the US and some US experts.[27] Some Chinese experts have also expressed concerns over such US intentions.[28]

However, the distinction between the US regional missile defense (for protecting regional assets from short-range and medium-range missiles) and US strategic missile defense (for protecting US homeland from ICBMs and SLBMs) should not be overlooked. The latter may be seen as a strategic threat to China's strategic security interests, while the former is a threat at the tactical level. In the case of THAAD, if China believes the system poses threat to China's theater missiles, there are a number of tactical countermeasures that China can employ to effectively address the threat.[29] However, whether such tactical-level military competition should be elevated as a "strategic" or "political" priority deserves careful consideration.

What is needed in the THAAD discussions in China is in-

depth studies and sound assessment of the nature and level of the threats that THAAD poses to China. Opinions diversify as to what specific threats the system presents, ranging from undermining China's strategic nuclear deterrence, to undermining China's theater missiles, and to collecting intelligence of aircraft activities in China's airspace; some acknowledge that THAAD itself does not pose any serious military threat but still conclude that the system would bring about "profound" and "significant" impact on the "strategic balance and geopolitics of East Asia". The lack of consensus on the specific threat that THAAD poses makes it impossible for policymakers to accurately understand the nature of the threat and to properly develop diplomatic, military, and economic responses. Unfortunately, such discussions have not been thoroughly conducted within the expert community.

Summary and Looking Ahead

The US, South Korea, and China have major differences in their perceptions of the THAAD issue. So far, these countries focus too much on the strategic and political aspects of the issue to realize that the dispute to a large extent is a result of their divergent understandings of key technical issues, such as to what extent the THAAD system is aimed at countering DPRK's or Chinese missiles, and its real capability to undermine China's strategic nuclear deterrent. If these countries do not acknowledge and seriously address their genuine divisions on these key technical issues, the complete resolution of the THAAD dispute seems unlikely.

As discussed above, the complexity and nuances of many key technical issues regarding THAAD are not yet fully appreciated; some existing mainstream judgments of key technical issues are debatable and controversial. Inadequate understandings about technical issues can mislead policy makers and exacerbate the dispute.

The dispute continues even after China and South Korea agreed to temporarily set aside their differences. On the one hand, as the US and South Korea are committed to deploying more advanced missile defense systems on the Korean Peninsula,

the possibility exists that upgraded and more capable THAAD systems may be deployed in South Korea in larger numbers in the future; and on the other hand, the mainstream Chinese view about the threat of THAAD has not changed even after the recent détente. This means in the foreseeable future, the THAAD issue will continue to plague China-US and China-South Korea relations and to hinder productive cooperation to check DPRK's nuclear ambitions. Even worse, misunderstandings of China's thinking have led to a popular view in the US that China has been deliberately exaggerating the THAAD threat to achieve its own geopolitical goals—such as to weaken the US-South Korea alliance. This fuels the strategic mutual suspicion and a vicious circle of negative interactions among these regional powers. For China, there is also the danger of overreaction. The country is faced with a growing domestic clamor for nuclear force expansion, which is partially driven by the popular perception that the THAAD system would severely undermine China's existing nuclear deterrence capability. The result is an increasing risk of an unnecessary nuclear arms race, which is far from good news to China's long-term interests.

Looking ahead, it is imperative that all sides recognize and work to manage the perception gap. Specifically, based on open source information, technical experts from all sides can jointly conduct and publish research on some of the key technical issues regarding THAAD. In the near future, complete removal of the current THAAD system seems impossible; as a result, options of interim agreements to address the key concerns and to manage the fallout for their strategic relations should be explored. One historical precedent we can learn from is a 2007 proposal from the Bush administration to address a similar US-Russian dispute. In order to ease Russia's concerns over the US plan to deploy missile defense radar in the Czech Republic, then US Defense Secretary Robert Gates suggested that Russia station its inspectors at the radar base to prevent it from being operated in ways that might jeopardize Russia's security interests. In the case of THAAD, China, the US, and South Korea can explore similar confidence-building mechanisms that would allow China to exercise a

reasonable level of supervision and verification to ensure that the THAAD radar would only operate in a manner that does not threaten China's strategic interests. Chinese experts have also proposed to replace the THAAD radar with some other radar that is less threatening to China. It would require joint research by technical experts from these countries to evaluate the technical feasibility of such a plan, as well as the logistical and economic price for doing so. The bottom line is that priority should be given to avoiding useless political finger-pointing and to conducting fact-based in-depth dialogues on underlying technical disagreements. So long as all sides recognize the existence of genuine technical disagreements and take a pragmatic approach to address them, it may still be possible to find effective solutions that take care of the primary concerns of all parties. This may be the only hope for settling the THAAD dispute without undermining their strategic relations.

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[1] According to the Chinese definition, short-range ballistic missiles have strike ranges shorter than 1,000 km.

[2] George Lewis, "THAAD Flight Tests since 2005," https://mostlymissiledefense.com/2014/01/27/thaad-fl ight-testssince-2005-january-27-2014/, accessed on May 20, 2017.

[3] Wang Shitao and Xing Xiaoli. (2016). "The Effects of THAAD Deployment on the Ballistic Missiles Deployed along the Coastal Areas of China", *Aerodynamic Missile Journal*, Issue 9, pp. 43.

[4] Hu Baojie, Xu Zhongfu, Fan Jiangtao, and Feng Tao. (2015). "The Present and Future of US High Altitude Area Defense Systems", *Modern Defense Technology*, Issue 2, p. 7.

[5] Yue Songtang and Xue Jie. (2008). "Blurring Boundaries: The US THAAD System", *Modern Weaponry*, Issue 4, p. 44.

[6] Shi Rong. (2006). "The US High Altitude Area Defense System", *Aerospace China*, Issue 12, pp. 43-44. Li Ping, "Weaving A Layered Missile Interception Network: The US High Altitude Area Defense System", *China Space News*, Issue 3, August 21, 2008. Qi Haotian. (2016). "The Deployment of THAAD System in South Korea and Tactical and Strategic considerations behind US Missile Defense in the Asia-Pacific Region", *Contemporary International Relation*, Issue 7, pp. 13-21.

[7] Department of Defense, "Report to Congress on Theater Missile Defense Architecture Options in the Asia - Pacific Region," Department of Defense, April 14, 1999.

[8] "Missile Defense Expert Ted Postol on THAAD," The Peace Report, https://www.youtube.com/watch?v=PRAd5zWdIjE. Accessed on May 19, 2017.

[9] According to the author's private conversations with Chinese experts.

[10] "Midcourse Discrimination for the Phase One Strategic Defense System: A Report of the

BMD Panel of the Army Science Board," https://fas.org/spp/military/asbmidcourse.pdf. Accessed on May 19, 2017.

[11] Wang Shitao and Xing Xiaoli. (2016). "The Effects of THAAD Deployment on the Ballistic Missiles Deployed along the Coastal Areas of China", *Aerodynamic Missile Journal*, Issue 9, pp. 44-45.

[12] Wilkening, Dean, "Making Sense of Ballistic Missile Defense: An Assessment of Concepts and Systems for U.S. Boost-Phase Missile Defense in Comparison to Other Alternatives," in *American Physical Society "Nuclear Workshop"*, George Washington University, November 1-2, 2013.

[13] "Midcourse Discrimination for the Phase One Strategic Defense System: A Report of the BMD Panel of the Army Science Board".

[14] Katie Paul, "Meet Dean Wilkening, the Man Behind the Missile-Shield Decision," Newsweek, http://www.newsweek.com/meet-dean-wilkening-man-behind-missile-shield-decision-215886, accessed on May 19, 2017.

[15] Dean Wilkening, "Making Sense of Ballistic Missile Defense: An Assessment of Concepts and Systems for U.S. Boost-Phase Missile Defense in Comparison to Other Alternatives," in *American Physical Society Nuclear Workshop",* George Washington University, November 1-2, 2013.

[16] Liu Chong. (2015). "An Analysis of America's Plan to Deploy THAAD System in South Korea", *Contemporary International Relation*, Issue 5, p. 17. Wang Shitao and Xing Xiaoli. (2016). "The Effects of THAAD Deployment on the Ballistic Missiles Deployed along the Coastal Areas of China", *Aerodynamic Missile Journal*, Issue 9, p. 44. Wu Riqiang. "The Impact of the US Antimissile System in Asia - Pacific region on China's Security and China's Countermeasures", *2014 China International Strategy Review*, p. 339.

[17] "SBIRS HEO: Space Based Infrared System - Providing Global, Persistent IR Surveillance and Security," SBIRS Program, Lockheed Martin Space Systems Company, 2015.

[18] Zhang Baoqing. (2016). "SBIRS: The Eye of the US Ballistic Missile Defense", Beijing Institute of Space Science and Technology Information. Cui Maodong. (2005). "A Probabilistic Analysis of SBIRS Detection and Visualization of Anti-Nuclear Model", China Academy of Engineering Physics, MD, p. 8.

[19] Patrick J. O'Reilly, "Statement of Lieutenant General Patrick J. O'reilly, Director, Missile Defense Agency, before the Senate Appropriations Committee Defense Subcommittee, Regarding the Fiscal Year 2012 Budget Request Ballistic Missile Defense Programs," Washington DC, May 25, 2011.

[20] Qi Haotian. (2016). "The Deployment of THAAD System in South Korea and Tactical and Strategic considerations behind US Missile Defense in the Asia - Pacific Region", *Contemporary International Relation*, Issue 7, p. 19.

[21] Keir A Lieber and Daryl G Press, "The New Era of Counterforce: Technological Change and the Future of Nuclear Deterrence," *International Security* (2017).

[22] Brad Roberts, "Anticipating the 2017 Review of U.S. Missile Defense Policy and Posture," in *Missile Defense and Defeat: Considerations for the New Policy Review* ed. Thomas Karako, Washington DC: Center for Strategic and International Studies, March 2017.

[23] David Trachtenberg, "Time to Reassess U.S. Missile Defense Policy," in *Information Series Issue No.409* Fairfax, VA: National Institute for Public Policy, 2016.

[24] Wu Riqiang, "The Impact of the US Antimissile System in Asia-Pacific Region on China's Security and China's Countermeasures", p. 336

[25] Chen Shitao, Yang Jianjun, and Ma Li. (2011). "The Terminal High Altitude Area Defense System and Its Deployment", *Aerodynamic Missile Journal*, Issue 5, p. 65.

[26] Department of Defense, "Ballistic Missile Defense Review Report," Washington DC: Depart-

ment of Defense, 2010.

[27] Roberts; Tom Z. Collina, "U.S. Pushes Missile Defense Globally" *Arms Control Today* November, 2012.

[28] Bin Li, "China and the New U.S. Missile Defense in East Asia," Carnegie Endowment for International Peace, http://carnegieendowment.org/2012/09/06/china-and-new-u.s.-missile-defense-in-east-asia-pub-49297. Accessed on May 19, 2017.

[29] Zhang Qiang. "Can THAAD Stop Ultra-High-Speed Missiles?", *Science and Technology Daily*, May 24, 2016, p. 3.