BALLISTICS MISSILE DEFENSE AND THE MISSILE TECHNOLOGY CONTROL REGIME

Recommended Citation

Li Bin, "BALLISTICS MISSILE DEFENSE AND THE MISSILE TECHNOLOGY CONTROL REGIME", EASSNet, June 25, 2000, https://nautilus.org/eassnet/ballistics-missile-defense-and-the-missile-technology-control-regime/

"East Asian Regional Security Futures: Theater Missile Defense Implications"
The United Nations University, Tokyo, Japan, June 24-5, 2000

BALLISTICS MISSILE DEFENSE AND
THE MISSILE TECHNOLOGY CONTROL REGIME*by LI BinUS-JAPAN COOPERATION ON THEATER MISSILE DEFENSE

On August 16, United States and Japanese defense officials announced the signing of a memorandum of understanding (MOU) to conduct joint research on naval theater missile defense technology. The cooperation will reportedly focus on the US Navy Theater Wide (NTW) missile defense program.(1) According to the MOU, the two countries will develop four major components of the NTW guided missiles: the sensor, advanced kinetic warhead, second stage propulsion and lightweight nose cone. The research and design work will last at least three years. The US-Japan project of joint research on the Navy Theater Wide missiles poses a serious problem in the compliance of the Missile Technology Control Regime (MTCR). It also adds more to China's concerns over missile defense and military buildup in Japan.

China has objected to missile defense in Japan since the issue appeared because China believes that missile defense in Japan will disturb regional stability.(2) The Chinese also worry that Japan would develop its weapons of mass destruction and delivery systems. The accumulation of plutonium and the development of solid-fuel rockets have given Japan the potential to develop nuclear weapons and missiles with which to carry them.(3) Japan's refusal to apologize to its neighboring countries for its invasion during and before World War II has increased the threat perceptions in those countries. The development of anti-missile by Japan will:

1. politically encourage Japan to go further in the direction of a military buildup; 2. increase Japan's defensive forces while it holds a huge potential to develop offensive forces and; 3. provide Japan with an excuse and an opportunity it did not have before to exercise and improve its missile technology publicly.

The US-Japan joint NTW missile research will certainly be regarded by China as a serious challenge to China's national security. The issue is now coupled with the issue of MTCR compliance. If the US wants China to fully accept the MTCR - including its annexes as China's export control law - the US needs to convince China that the joint research is in compliance with the MTCR.

THE NTW CAPABILITIES AND THE MTCR LIMITATIONS

According to the US Ballistic Missile Defense Organization (BMDO),(4) the Navy Theater-Wide (NTW) ballistic missile defense program will provide an exo-atmospheric sea-based capability to counter medium to long range theater ballistic missile threats. An NTW interceptor will probably consist of an improved Standard Missile (the SM-3, or SM-2 Block-4), a modified MK-41 Vertical Launching System, and a LEAP (Lightweight Exo-Atmospheric Projectile) anti-missile. The NTW system includes NTW interceptors, a SPY-B radar, an AEGIS fleet with which to carry the interceptors and the radar, and some other Command, Control, Communication, and Intelligence (C3I) supporting the system.

An NTW interceptor is reportedly to have a speed of 4.5 kilometers per second at burnout. If it is launched by the way of surface-to-surface missiles, the NTW interceptor will have a range of about 2500 kilometers. The Standard Missiles are designed as dual-use missiles: surface-to-air or surface-to-surface.(5) So, an NTW interceptor that uses a Standard Missile as its major component should not be difficult to be launched as a surface-to-surface missile. The parameters of the Standard Missiles are given below:(6)

Type of Missiles: SM -1 MR; Range in meters: 4.41; Diameters (cm): 34.3; Launch Weight (Kg): 495
Type of Missiles: SM-2 MR; Range in meters: 4.41; Diameters (cm): 34.3; Launch Weight (Kg): 621
Type of Missiles: SM Extended; Range in meters: 7.9; Diameters (cm): 34.3; Launch Weight (Kg): 1341

The MTCR strongly forbids the transfer of technology of missiles that can fly over 300 kilometers/second with a 500 kilogram payload. To check the compliance of an NTW system transfer with the MTCR, we need to calculate the range of the NTW interceptor if it carries a 500-kilogram payload instead of a LEAP Kinetic Killing Vehicle (KKV). Since some parameters of the NTW interceptor are not yet publicly available, some educational guesses will therefore have to be made to describe the capabilities of the NTW interceptor. By using an NTW model provided by Dr. David Wright of the Union of Concerned Scientists,(7) the calculation gives the following result if the NTW interceptor carries a 500-kilograms payload instead of a LEAP KKV:

Burnout speed: 1.42 kilometers/seconds; Burnout altitude: 54 kilometers; And range: 261 kilometers. This calculation shows that the range of an NTW interceptor is close to 300 kilometers/second when it carries a 500-kilogram payload. If we consider the model uncertainties and some simple upgrade of the propulsion system, it is possible that the NTW interceptor and its subsystems should be identified as Category I items of the MTCR. Therefore, the transfer of the NTW interceptor or its technology raises a serious problem for compliance with the MTCR.

If a country wants to use the NTW interceptor to carry weapons of mass destruction weighing 500 kilograms, there are two factors that are unfavorable to this effort. The first is aerodynamic instability caused by the shift of weight center. It could cause aerodynamic instability if the light payload of LEAP KKV is replaced with a heavy payload of 500 kilograms. However, the factor of aerodynamic instability is not a crucial one and it cannot stop the effort of using the NTW interceptor as a surface-to-surface missile. Aerospace instability may reduce the accuracy of the missile or make the missile tumble after the boost phase of the flight. However, the warhead can continue flying and reach the designed range without serious problems. For example, the Iraqis changed the design of the Scud missile to an A-1 Hussein missile to extend its range and this caused aerodynamic instability. However, there was no evidence that shows the A-1 Hussein missiles to have had any difficulty in reaching their designed ranges due to aerodynamic instability.

The second unfavorable factor is size-mismatching. The NTW interceptor (or Standard Missile) has a relatively small diameter compared to most surface-to-surface missiles with a 300 kilometer range. For chemical and biological warheads, there are no size-mismatching problems because their shapes could be made to match thin missiles without big difficulty. A gun-type nuclear warhead, however, can have a size-mismatching problem. For example, the gun-type US W33 warhead has a diameter of 0.40 meter, comparable to that of the Standard Missile,(8) while an implosive nuclear warhead weighing 500 kilograms is estimated to have a diameter of 0.58-0.76 meters.(9) So, the NTW interceptor has a problem of size-mismatching if it carries implosive nuclear warhead weighing 500 kilograms. However, size-mismatching is not a deadly problem for the NTW interceptor carrying a big payload. The main consequence of size-mismatching is also aerodynamic instability. As discussed above, aerodynamic instability cannot stop the effort in delivering the big payload to the designed range.

LEGAL ASPECTS OF THE MTCR COMPLIANCE

The Missile Technology Control Regime is an export control document adopted by certain countries, including the United States and Japan as their domestic law. The purpose of the MTCR is to prevent the spread of missiles capable of carrying weapons of mass destruction within a certain range. Missiles that can deliver at least a 500 kilogram payload for at least 300 kilometers/second, along with their important subsystems and technology are identified as Category I items of the MTCR. Missiles that have ranges greater than 300 kilometers with any payload and some other less sensitive equipment and technologies are identified as Category II items of the MTCR. Category I items are strongly denied for export and category II items are examined case by case and denied export if their end-uses are not guaranteed. If the range of the NTW interceptor is about 300 kilometers or greater when it carries a 500-kilogram payload, it should be identified as a Category I item and the joint NTW research is, therefore, a violation of the MTCR. The calculation in the last section shows that the range is very close to 300 kilometers. If more information about the NTW interceptor is available, the conclusion will be more accurate. If the range of the NTW interceptor is much less than 300 kilometers when it carries a 500-kilogram payload, it can be identified as a Category II item because the NTW interceptor has a range of about 2500 kilograms when it brings a payload as heavy as the LEAP KKV. In this case, the joint NTW research should still be denied because the end-use of the NTW technology is difficult to verify.

There are some arguments that claim that the joint NTW research does not violate the MTCR. The first argument is that the MTCR allows its "members" to share missile technology with each other. However, this is a widely believed argument, but it is a misunderstanding of the MTCR. The fact is that the MTCR does not distinguish "members" and "non-members" at all in its content. If the MTCR allowed its "members" to share missile technology, any enlargement of the MTCR community would mean encouraging the proliferation of missile technology. The origin of this misunderstanding came from some US about the implementation the MTCR. These laws allow waving the sanctions of the transfer of missile technology if the recipients of the technology are also MTCR partner countries.(10) This is a reservation of the US to the MTCR that leaves a loophole to the implementation of the MTCR in the US and sets a bad norm for missile technology transfers among MTCR partner countries. The US-Japanese joint research on NTW may not violate the US law, but it probably violates the MTCR.

The second argument is that the end-use of the jointly developed NTW technology will be verified, so the transfer of these items is not a violation of the MTCR. However, the MTCR calls for strong presumption to deny the transfer of Category I items regardless of their purpose. If the NTW interceptor can deliver a 500-kilogram payload for approximately 300 kilograms/second or greater, it will be identified as a Category I item and the transfer of its technology will be regarded as an MTCR violation no matter what mission the NTW system is designed to have. If the range of the NTW interceptor is much less than 300 kilometers/second when it carries a 500-kilogram payload, the possibility of MTCR violation cannot be simply excluded by end-use assurances either. The reason is that the end-use of transferred technology can never be verified well. The verification of the end-use of some transferred hardware may be possible while the verification of the end-use of data or knowledge is very difficult. People may not even be able to receive any early warnings if either the US or Japan converts the knowledge learned from joint NTW research into designing surface-to-surface missiles. So, we cannot expect a reliable or effective end-use verification arrangement in the joint NTW research.

Obviously, the joint US-Japan NTW study has posed a big challenge to the compliance of the MTCR, even though US laws do not forbid the activity.

CONCLUSIONS AND DISCUSSIONS

Although the United States has its own reservation about the MTCR, it urgently pushes more countries - including China - to fully accept the MTCR as their export control law.(11) There is no doubt that China is watching the MTCR implementation process closely. So, it is a very bad time for the US to sign an MOU with Japan to jointly develop anti-missile technology that probably violates the MTCR. This is certainly a big concern for China. Before the signing of the MOU, a spokesman for the Chinese Foreign Ministry said China believed the MOU to be harmful to regional security.(12) If the US and Japan cannot convince China that the joint research complies with the MTCR, it will have a negative impact on China's attitude towards the MTCR. China will have to draw the conclusion from this event that the MTCR and its current implementation system will constrain China rather than protect China's security. If the MTCR cannot bring security benefits to China, it is unimaginable that China will be happy to adopt the entire MTCR as China's domestic law.

In this analysis, there are some uncertainties about the range of the NTW interceptor because there insufficient public information. A more accurate judgment about the MTCR compliance of the joint NTW research can be made if more information is provided. A US defense official said that ". . . these (NTW systems) are defensive systems and we are being very transparent with countries in the region about our work here."(13) To respond to China's concern over the US-Japanese joint NTW project, the US and Japan should provide the transparency of the project in East Asia as they had promised so that China can review the joint NTW project according to the MTCR criteria. If the final conclusion is that the project violates the MTCR, the US and Japan should consider terminating the project immediately if they want to sustain or enhance the MTCR.

---

(1) "US, Japan ink plan to cooperate on Navy TMD," Aerospace Daily, August 17, 1999. Vol. 191, No. 33; p. 251.
(2) see, for example, the Speech of PRC Delegation to the ASEAN Forum on TMD, March 5, 1999. Bangkok. http://www.fmprc.gov.cn/c/c/ccbe.htm
(3) see, for example, Liu Cheng'an, "The Enlargement of Japan's Potential Nuclear Capabilities and Its Impact on The Security in the Asian-Pacific Area", in the Collection of Arms Control Papers of PSNSS, 1996 Janurary.
(4) Ballistic Missile Defense Organization, "FY 1998 President's Budget Press Release" http://www.smdc.army.mil/presbudget.html
(5) "Navy Fact File: Standard Missile," http://www.chinfo.navy.mil/navpalib/factfile/missiles/wep-stnd.html
(6) see endnote 5
(7) David Wright, Private Communication.
(8) Cochran, Nuclear Weapons Databook, Vol. I, US Nuclear Forces and Capabilities, p. 47.
(9) Li Bin, "Nuclear Missile Delivery Capabilities in Emerging Nuclear States", Science & Global Security, 1997, Vol. 6, pp. 311-331.
(10) For example, The 1991 FY US National Defense Authorization Act (Public Law 101-510).
(11) Howard Diamond, "US Renews Effort to Bring China into Missile Control Regime", Arms Control Today, March 1998.
(12) Zhang Qiyue, Spokesman of the Chinese Foreign Ministry, Press Conference, June 29, 1999. http://www.fmprc.gov.cn/c/b/cb1999/cb199900629.htm
(13) "United States, Japan Finalize Deal On Navy Theater Wide Cooperation," Inside Missile Defense, August 25, 1999. Vol. 5, No. 17.

End notes:

* The work is supported by a fellowship granted by the Ploughshares Fund.

View this online at: https://nautilus.org/eassnet/ballistics-missile-defense-and-the-missile-technology-control-regime/

Nautilus Institute
608 San Miguel Ave., Berkeley, CA 94707-1535 | Phone: (510) 423-0372 | Email: nautilus@nautilus.org