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Modernizing the Missile Technology Control Regime

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Arms control arrangements—both bilateral and multilateral—have been a central element of modern US diplomacy since the Hague Convention on the conduct of war was negotiated in 1899. This series of multilateral arms control agreements was based on President Abraham Lincoln's General Order 100, also called the Lieber Code, which was promulgated during the US Civil War in 1863.[1] Moreover, the enduring aspirations of arms control have not changed since the earliest recorded efforts at arms control and disarmament in China in 546 BC: to reduce the risk of war, and if war should occur, to diminish or mitigate its consequences.[2]

Since World War II, arms control has been predominantly focused on managing the impact of nuclear weapons on international affairs. Arms control agreements have taken several forms. Some are treaties, such as the prevailing New Strategic Arms Reduction Treaty (New START, 2009), or the recently dissolved Intermediate Range Nuclear Forces Treaty (INF, 1987–2019), or the dissolved Treaty on the Limitation of Anti-Ballistic Missile Systems (1972–2002).

Other arrangements are in the form of executive agreements that do not require Senate advice and consent, such as the US-Russia Plutonium Management and Disposition Agreement (PMDA). However, most executive agreements require appropriated funds for their implementation, implying de facto congressional consent.

Other forms of agreement are more ephemeral. An example is the nuclear testing moratoria interpreted in accordance with the US "zero-yield" standard, despite its rejection by the signatories in the final provisions of the Comprehensive Nuclear Test Ban Treaty (CTBT) in 1996. In 1999, the US Senate rejected ratification of the CTBT, as it found the compliance-verification provisions inadequate. Although the United States is not a party to the treaty, Washington has incorporated the US view of "zero yield" in its compliance commentary, and the State Department's annual arms control compliance reporting includes commentary on the issue.[3]

However, neither China nor Russia has chosen to comply with the US zero yield standard that both previously rejected. Their nuclear weapons modernization programs appear to have necessitated hydrodynamic nuclear testing, which does not comply with the yield standard in its compliance

reporting.[4] This agreement did not in any case require Senate advice and consent.

Yet an additional form of arms control and disarmament arrangements involves "understandings" between signatories, which frequently are multilateral affairs that reflect a shared interest in an outcome defined in the agreement. Signatories have no explicit compliance or monitoring and verification obligation.

Perhaps the most visible of these Cold War agreements is the Missile Technology Control Regime (MTCR), for which negotiations began in 1983 and were completed in 1987. The MTCR has a dimension of personal interest, as the author was involved in US government interagency effort to negotiate the agreement during his service in the Department of State.

At the time, the MTCR built upon the foundation of a collaborative relationship between US allies and non-allied international partners to interdict the flow of advanced technology to the Warsaw Pact states and China through the Coordinating Committee on Export Controls (COCOM, 1950–94).[5] This model of collaboration was tried, tested, and found effective in a multinational political-military setting. Its practices were well-aligned with the emerging need to address the problem of the sale of delivery systems—cruise and ballistic missiles—that could deliver weapons of mass destruction, particularly nuclear weapons.

The MTCR's purposes were attuned to the complementary Nuclear Non-Proliferation Treaty (NPT) of 1968 in that the MTCR was aimed at denying nuclear-capable delivery systems—cruise and ballistic—to states acquiring nuclear weapons that were illegitimate under the NPT. The International Code of Conduct Against Ballistic Missile Proliferation (2002), with 140 member states, is often paired with the MTCR, linking national commitments to WMD non-proliferation regimes and their associated delivery systems. However, the Code of Conduct has lost some of its utility as the MTCR's focus has shifted from missiles to aircraft.[6]

Following the 1973 Yom Kippur conflict, the Soviet Union began to proliferate its R-11 and later R-17 SCUD-series liquid-fueled ballistic missiles to its client states in the Middle East and East Asia. The SCUD is NATO's codename for the Soviet Union's copy of the hypergolic propellant-based Wasserfall, a variant of the V-2 ballistic missile. The Wasserfall, designed in Germany in 1943, underpins the worldwide proliferation of liquid-fuel ballistic missiles for the short-, medium-, and intermediate-range delivery of nuclear weapons. These missiles include North Korea's No Dong and Taepodong, Iran's Shahab, and Pakistan's Ghauri and Shaheen series medium- and intermediate-range ballistic missiles. Indeed, all the subsequent SCUD variants retain the same 35-inch (0.88 m) diameter of the original 1943 Wasserfall design.[7]

Soviet cruise missile development followed a similar trajectory. In October 1944, the UK provided the Soviet Union with a captured V-1 cruise missile recovered from the bombardment of London, which had begun in June of that year. By the end of 1944, design engineer Vladimir Chelemoi had reverse engineered the engine and airframe—an initiative that led to the USSR's adaptation of the MiG-15 as a cruise missile. Subsequently, cruise missiles became a major element of Russia's conventional and nuclear land-, air-, and sea-based strike capability, and Moscow now employs them on about 600 different platforms. They are also a significant component of its arms export portfolio.[8]

The proliferation of ballistic and cruise missiles in the international arms export market in the 1970s opened an attractive opportunity for nations with clandestine nuclear weapons programs. Since World War II, about twenty-four nations had initiated such programs. Bilateral diplomatic advocacy, especially by the US, helped persuade potential nuclear proliferators that the US policy of "extended deterrence" was sufficient. This advocacy strengthened the

appeal of the NPT after it entered into force in 1970. The number of signatories grew from 43 in 1970 to 190 today. In 1995, the treaty was extended indefinitely.

In the 1980s, understanding of nuclear weapons technology improved, as knowledge of nuclear weapon design and the ability to produce special nuclear material became more widely accessible. The improved access induced several countries to pour substantial resources into developing and acquiring nuclear weapons.[9]

Concerns that countries such as India, Iraq, Iran, North Korea, and Pakistan were developing nuclear weapons were not unwarranted. In the 1970s and '80s, there was interest in supporting clandestine nuclear weapons programs in countries with local or regional rivalries that were generally outside the domain of the US-Soviet nuclear competition. These states sought to acquire both nuclear weapons and their means of delivery. This included countries such as Argentina, Brazil, and Egypt—though there was no evidence that they had a significant security need for such capabilities or a regional rivalry that would justify the cost of such an effort.[10]

The interest was coupled with efforts to acquire delivery systems whose existence was abetted by the extensive use of cruise and ballistic missiles in the first Iran-Iraq war (1980–88). North Korea received missiles directly from the Soviets and from client states such as Libya and Iran, and its development of an extended-range variant of its SCUD missile was financed by Iran.[11] The industrial base created in North Korea enabled it to develop its own long-range versions of the SCUD (Nodong and Taepodong) and export variants for Iran, Pakistan, and other users.

Hence, as evidence emerged that nations with clandestine nuclear weapons programs might seek long-range cruise and ballistic missile-delivery systems for use in "civil" aviation and space programs, the US was impelled to act. In 1983, Washington initiated negotiations with like-minded nations to limit commerce in cruise and ballistic missiles. This resulted in 1987 in the MTCR, whose purpose it was to link to the NPT to prevent the dispersion of nuclear weapons and related technology with their primary means of delivery—cruise and ballistic missiles.[12]

Why have so many Cold War–era arms control agreements failed?

Arms control agreements became the primary platform for bilateral Soviet-American diplomacy starting in the early 1960s. Twin shocks produced a powerful impetus for arms control: the Soviet breach of the atmospheric nuclear moratorium (1958–61) and the Cuban missile crisis (1962).[13] The US, UK, and USSR negotiated the low-hanging fruit of limiting the environments in which nuclear tests could be undertaken (atmospheric, outer space, and undersea testing in 1963), and limiting nuclear yields on underground nuclear tests (in 1974). The P5, the permanent members of the UN Security Council, which had developed and fielded nuclear weapons prior to 1964, did not require nuclear testing in the atmosphere, outer space, or undersea, nor did they require underground testing with yields higher than 150 kt for weapon development. Hence, there was little opposition to the treaties.[14]

The most successful—and important—of the Cold War arms control agreements is the NPT. The risk of nuclear proliferation posed a profound threat to global stability, and the prospect that the underlying technology would eventually leak created a shared interest in mitigating the risk. China has done so by providing Pakistan with nuclear weapon design information and special nuclear material based on China's missile-delivered warhead design, which it tested in the atmosphere in 1966.[15] Beijing sought membership in the MTCR in 2004, but its application was denied because compliance was unlikely. China continues to supply ballistic and cruise missiles to certain countries, which is inconsistent with its proclaimed

adherence to the MTCR. In 2013, for example, Beijing provided Saudi Arabia with its nuclear-capable DF-21 medium-range ballistic missile.[16]

Most of the major arms control agreements made in the latter part of the Cold War and the early post–Cold War period have failed. These are:

1. The (bilateral) Interim Agreement on the Limitation of Strategic Offensive Arms (1972), part of SALT I. Soviet non-compliance made it impossible to ratify the successor agreement, SALT II, under President Jimmy Carter in 1980.[17]
2. The Treaty on the Limitation of Anti-Ballistic Missile Systems (1972), from which the US withdrew in 2002. The Clinton administration sought to negotiate an adaptation to permit the US to field defenses against "rogue" states, including North Korea and Iran, which were developing long-range missiles targeting the US and its allies. Russia, however, rejected the demise of the treaty because it was unprepared to adapt it to the reality of post–Cold War nuclear proliferation.
3. The Intermediate Range Nuclear Forces Treaty (1987), on which agreement was reached in an environment where the Group of Soviet Forces in Germany deployed short-range ballistic missiles in East Germany (and other forces in what is now the Czech Republic) that put NATO forces at risk and hence sustained deterrence. At the end of the Cold War, Russia was forced to bring the GSFG home, as the only way it could maintain a nuclear threat to NATO was by clandestinely fielding intermediate-range missiles in Russia, primarily in the Kaliningrad region. The Obama administration in 2014 and the Trump administration in 2018 identified Russian non-compliance, and the US withdrew from the treaty in 2020.
4. The Open Skies Treaty (1995), an early post–Cold War confidence-building measure. Russia's need to conceal its military activities and deployments in the Kaliningrad and Caucasus regions caused it to block OST flights, though the US did not block them. Russian non-compliance ensured the treaty's failure as a confidence-building measure and caused the US to withdraw in 2020.
5. The Conventional Forces in Europe Treaty (1990), which was signed by twenty-two nations and designed to maintain the balance of forces in Europe from the Atlantic Ocean to the Ural Mountains. The treaty was initially successful; however, Russia's need to expand its military operations in the Caucasus region during its invasion of Georgia (2007) and the Ukraine's Crimea region (2014), along with its nuclear and conventional force deployments in the Kaliningrad region, significantly diminished the treaty's regional security value, though it remains in force.
6. New START (2009), which had a promising beginning. The US had initiated its "reset" of bilateral relations, and the "Spirit of Prague" suggested a shared US and Russian aspiration to reduce or eliminate nuclear weapons. This effort was aimed at replacing the unsuccessful strategic arms control agreements enacted in the last two decades of the Cold War. Unfortunately, the Russian State Armament Plan, announced the same month that the US Senate ratified New START, was an ominous portent. Russia engaged in a vast decade-long effort to circumvent the treaty by developing six new nuclear delivery systems that were not covered by the treaty, while recapitalizing thousands of sub-strategic systems not covered by New START.[18] In parallel, China accelerated its nuclear modernization program, and there is a possibility that it will add 1,000 MIRV warheads to its land-based mobile DF-41 ICBMs.[19] The US government has indicated that it will not commit to renewing New START unless Russian circumvention and Chinese nuclear modernization are addressed. Bilateral negotiations with Russia are underway.
7. The Missile Technology Control Regime (1987), which is neither a treaty nor an executive agreement, but a

commitment by member states to refrain from exporting controlled systems. The high level of agreement among member states on the need to limit the sale of cruise and ballistic missiles, especially to nations believed to have clandestine nuclear weapons or other WMD programs, upon which the MTCR was founded, is fundamental to the effort. However, a decision taken only three years after the MTCR was negotiated undermined the core agreement, which is about preventing the sale or transfer of delivery systems that could deliver nuclear weapons or other WMD technologies.

The MTCR plenary meeting in Oslo in mid-1992, chaired by Norwegian diplomat Sten Lubo, expanded the MTCR's scope to include non-proliferation of unmanned aerial vehicles (UAVs) in addition to cruise and ballistic missiles. The diplomatic history of the plenary meeting remains classified, so the sponsorship and argumentation used to advance the proposal is not publicly known.

The decision departed from the underlying aim of the MTCR—to control commerce in missiles, not aircraft. Missiles—cruise or ballistic—are not designed to be reused, nor can they be. They are guided or flown on a ballistic trajectory to their target, and the missile payload delivers the desired kinetic or non-kinetic effects. UAS are simply remotely piloted aircraft and are designed for reuse. For purposes of export control regulation, there is no public policy basis for treating UAVs/UAS differently from manned aircraft. Aircraft, manned or unmanned, can delivery nuclear or other WMD payloads to targets and return to base. Indeed, most US tactical and strategic aircraft now in advanced development are designed to be "optionally manned" as the enabling technologies for remotely controlled and autonomous operation for this application mature.[20]

As the author's accumulated experience in arms control has affirmed, bureaucratic or policy overreach stimulates or incentivizes behavior that undermines the core purposes of the agreement. UAS are ubiquitous. Today, ninety-five countries maintain military UAS programs, and 170 different types of UAS are deployed on 230 bases. Nineteen countries have exported drones that are in active military services, and seventy-nine countries operate at least one UAS from the US, China, or Israel.[21] Thirty-two countries operate at least one drone made in China, while thirty-nine countries operate one from Israel. Neither China nor Israel is a member of the MTCR; both claim, with heavy caveats, "compliance" with the spirit of the regime (though their export behavior is infrequently aligned with this "compliance").

It is likely that many operators of fourth-generation aircraft like the F-16 and F-18 will eventually convert these platforms to optionally manned configurations to extend their operational life and facilitate their integration with optionally manned fifth- and sixth-generation aircraft. Both the F-16 and F-18 have been tested in remotely piloted variants. Similar circumstances are likely to arise among US allies in Europe and Asia as the world's air forces adapt to the impact of information technology, remote sensing, autonomous technologies, and modern command-control, communications, and intelligence. The limitations on the US capacity to facilitate allied nations' access to modern UAS platforms have disrupted coalition operations. This is because they fail to permit US and allied forces to effectively interoperate, while China is proliferating advanced UAS strike capabilities throughout the world.[22]

A minor incremental change in the US conventional arms transfer policy as it pertains to UAS export policy was announced in July 2020.[23] This change, which moved UAS with an airspeed of less than 800 km/hr from a Category I system ("strong presumption of denial") to Category II (which are widely proliferated) will facilitate the export of medium-altitude armed and unarmed UAS via direct commercial sale (subject to State Department approval) and the Foreign Military Sales system. The regulations continue to treat UAS as "missiles" when they are in every respect "aircraft" that are designed to perform a

military mission and return to base. This regulatory flaw will limit intra-alliance defense-industrial collaboration, even among the Five Eyes states, our closest allies, where existing treaties are intended to promote such collaboration.[24]

Compliance by the major military UAS exporters who are not MTCR member states, China and Israel, remains unlikely, despite their pledge to impose similar constraints on their own exports. Non-MTCR members have become major suppliers to US allies and friendly states that are unable to acquire interoperable UAS from the United States.

Conclusion

The MTCR and the NPT are the diplomatic foundation agreements for constraining proliferation and delivery of the most destructive technologies invented by man. However, the incorporation of unmanned aerial systems has proven to be counterproductive to the MTCR's core purpose: preventing the proliferation of cruise and ballistic missile systems for the delivery of WMD. According to a report prepared for the Chairman of the Joint Chiefs of Staff in response to Section 1276 of the FY 2017 National Defense Authorization Act, the MTCR has not achieved its core purpose. The report concluded that the MTCR's impact and effectiveness in controlling Category I systems (complete cruise and ballistic missile systems) "had eroded," and the security of US and allied forces had been "negatively affected while the threat to U.S. and allied troops from foreign-made UAVs, mostly from China, has increased."[25] MTCR in its current form is fatally flawed. No tweaking of the provisions relating to UAS, such as velocity, range, or system payload weight, will mitigate the destructive impact of incorporating UAS into the MTCR.

The United States and the international community are losing focus on the main event—the proliferation of cruise missiles. Both China and Russia are building—and exporting—nuclear-capable cruise missiles designed for clandestine deployment and launch from commercial shipping containers.[26] Moreover, technologies readily available on the international market can be used to significantly improve short-range cruise missiles—their delivery accuracy, range, payload, and reduction in the radar cross section—and this has been well known for a quarter century.[27]

Iran is now providing ballistic missiles it received with help from North Korea and China—flight tested in defiance of UN Security Council Resolution 2231—to its Houthi Shia terrorist allies operating in Yemen. Syria is using Russian/Soviet-era SCUD short-range ballistic missiles adapted for chemical weapons payloads. Furthermore, it stepped up its use of helicopter and tactical aircraft to deliver barrel bomb chlorine and sarin chemical weapon payloads after the US failed to act on its 2012 declaration that this would be a redline that could trigger US intervention.[28]

The United States should apply the same rigor to the State Department's case-by-case munitions licensing system for the export of UAS that is currently applied to manned systems, but should otherwise make no distinction between manned and unmanned systems.

Endnotes

1 Francis Lieber, General Order No. 100, Adjutant General's Office, *Instructions for the Government of Armies of the United States in the Field*, 1863, https://archive.org/details/governarmies00unitrich.

2 See US Department of State, "Lessons from Disarmament History for the CEND Initiative," April 30, 2019, https://www.state.gov/lessons-from-disarmament-history-for-the-cend-initiative/.

3 Bureau of Arms Control, Verification, and Compliance, US Department of State, *Fact Sheet: Scope of the Comprehensive Test Ban Treaty (2013)*, https://2009-2017.state.gov/t/avc/rls/212166.htm#:~:text=U.S.%20Department%20of%20State&text=Key%20Point%3A%20The%20CTBT%20is,for%20weapons%20or%20peaceful%20purposes.

4 These bilateral agreements have no compliance or enforcement process. Non-compliance remains a broader concern with treaties as well. Russia's circumvention of New START through development, testing, and fielding of new nuclear delivery systems not covered by the treaty has placed extension of the agreement at risk. US Department of State, *Executive Summary of Findings on Adherence to and Compliance with Arms Control, Nonproliferation and Disarmament Agreements and Commitments*, https://www.state.gov/2020-adherence-to-and-compliance-with-arms-control-nonproliferation-and-disarmament-agreements-and-commitments-compliance-repor/. R. N. Thorn and D. R. Westervelt, *Hydrodynamic Experiments*, Report LA-10902-MS, Los Alamos National Laboratory, February 1987. A statement by the Defense Intelligence Agency in response to remarks by agency director Lt. General Robert P. Ashley Jr. at Hudson Institute noted that the intelligence community "has assessed that Russia has conducted nuclear weapons tests that have created nuclear yield. Regarding China, the information raised at the Hudson Institute, coupled with China's lack of transparency on their nuclear testing activities, naturally raise questions about those activities in relation to the 'zero yield' nuclear weapons testing moratorium adhered to by the United States, the United Kingdom, and France. These are actions that the U.S. government characterizes as inconsistent with the commitments undertaken by the United States, the United Kingdom, and France." Defense Intelligence Agency "DIA Statement on Lt. Gen. Ashley's Remarks at Hudson Institute," June 13, 2019, https://www.dia.mil/News/Speeches-and-Testimonies/Article-View/Article/1875351/dia-statement-on-lt-gen-ashleys-remarks-at-hudson-institute/.

5 The COCOM was established in 1950 on the basis of US-UK-French agreement on the need to impose export controls on products and technologies that would facilitate the development, fielding, and support of military equipment by the Warsaw Pact Organization (WPO) and China. US Department of State, *Foreign Relations of the United States: National Security Affairs, Foreign Economic Policy, 1951,* vol. 1, p. 1012, https://history.state.gov/historicaldocuments/frus1951v01/pg_1012. In 1981 Col. Vladimir Petrov of the KGB, a French intelligence asset, galvanized the organization by providing detailed information about Soviet technology collection requirements. This led to intense intelligence community involvement in support of COCOM and stepped-up interdiction of the flow of advanced technology to the WPO. A new, diminished, export control regime was needed to reflect the optimism that prevailed at the end of the Cold War in 1992. In November 1993, the COCOM's seventeen core members agreed to disband the organization in March 1994 and replace it with the Wassenaar Arrangement. The first meeting of the Wassenaar Arrangement was held in Vienna in December 1996 with a founding membership of thirty-three states (now forty-two). Wassenaar Arrangement Secretariat, *Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies Founding Documents*, vol. 1, December 2019, https://www.wassenaar.org/app/uploads/2019/12/WA-DOC-19-Public-Docs-Vol-I-Founding-Documents.pdf.

6 *Hague Code of Conduct*, https://armscontrolcenter.org/the-hague-code-of-conduct-hcoc/#:~:text=The%20International%20Code%20of%20Conduct,chemical%20or%20biological%20weapons%2C%20as.

7 Bruce Berkowitz, "What's a SCUD?," *Air and Space Magazine*, May 2003, https://www.airspacemag.com/history-of-flight/whats-a-scud-4510864/; Norbert Brügge, "The History of Post-War Rockets Based on German World War II 'Wasserfall' Missile Production," http://www.b14643.de/Spacerockets/Specials/Wasserfall_postwar_rockets/index.htm.

8 Carlo Kopp, *Soviet/Russian Cruise Missiles,* Technical Report APA-TR-2009-0805, Air Power Australia, updated January 27, 2014, https://www.ausairpower.net/APA-Rus-Cruise-Missiles.html; Anatoly Zak, "Russian Cruise Missiles," Russian Space Web, September 2019, http://www.russianspaceweb.com/rockets_cruise.html; and D. M. Gormley et al., "A Potent Vector: Assessing Chinese Cruise Missile Developments," *Joint Forces Quarterly*, September 30, 2014, https://ndupress.ndu.edu/Publications/Article/577568/a-potent-vector-assessing-chinese-cruise-missile-developments/. China is also seeking to buy the Ukrainian aircraft engine firm *Motor Sich*. The US is seeking to block this effort, which is intended to obtain the company's cruise missile propulsion technology, particularly its MS400 system for cruise missiles, and to facilitate advanced military UAS export market development. Douglas Barrie, "Aeroengine Concerns Thrust Ukraine into Broader US-China Struggle," IISS Blog, June 26, 2020; https://www.iiss.org/blogs/military-balance/2020/06/aeroengine-concerns-ukraine-us-china and Kenneth P. Werrell, *The Evolution of the Cruise Missile*, Air University, Maxwell Air Force Base, September, 1985, https://www.airuniversity.af.edu/Portals/10/AUPress/Books/B_0006_WERRELL_EVOLUTION_CRUISE_MISSILE.pdf.

9 Philipp C. Bleeck, *When Countries Did (and Did Not) Proliferate: Chronicling the Spread of Nuclear Weapons*, Belfer Center, Harvard University and the Middlebury Institute of International Studies at Monterey, 2017, https://www.belfercenter.org/sites/default/files/files/publication/When%20Did%20%28and%20Didn%27t%29%20States%20Proliferate%3F_1.pdf; National

Academy of Sciences, *Monitoring Nuclear Weapons and Nuclear Explosive Materials: An Assessment of Methods and Capabilities* (National Academies Press, 2005), https://www.nap.edu/download/11265.

10 Woodrow Wilson Center Digital Archive, *Brazilian Nuclear History, 1947—1989*, https://digitalarchive.wilsoncenter.org/collection/167/brazilian-nuclear-history. Woodrow Wilson Center Digital Archive, *Special National Intelligence Estimate, SNIE 91-2-82, Argentina's Nuclear Policies in Light of the Falklands Defeat*, September 8, 1982 (redacted and declassified November 2005), https://digitalarchive.wilsoncenter.org/document/123331. Norbert Brügge, "Missile Development Program in Egypt, 1958–1967—Based on German World War II Technology," February 8, 2019, http://www.b14643.de/Spacerockets/Specials/Al-Kaher/index.htm.

11 CIA, Near East-South Asia Division, *Iran-Iraq: Ballistic Missile Warfare and Its Regional Implications*, March 1986 (Sanitized and approved for public release, February 7, 2012), https://www.cia.gov/library/readingroom/docs/CIA-RDP88T00096R000100120003-6.pdf.

12 Congressional Research Service, *Missile Technology Control Regime (MTCR) and International Code of Conduct Against Ballistic Missile Proliferation (ICOC): Background and Issues for Congress*, April 8, 2003, https://www.everycrsreport.com/files/20030408_RL31848_d939615abb94a06026b1fa5d3b98594de27e3adc.pdf.

13 The Cuban missile crisis occurred after the Soviets surreptitiously deployed in Cuba six sites of transportable medium-range megaton-class ballistic missiles (NATO designation SS-4 Sandal, Soviet designation 8K63/R-12) and three sites of intermediate-range ballistic missiles (NATO designation SS-5 Skean, Soviet designation 8K65/R-12).

14 Lisa M. Schenck and Robert A. Youmans, *From Start to Finish: A Historical Review of Nuclear Arms Control Treaties and Starting Over with the New START*, George Washington University Law School, 2012, https://scholarship.law.gwu.edu/cgi/viewcontent.cgi?article=1104&context=faculty_publications.

15 CIA, *Special National Intelligence Estimate: China's Policy and Practices Regarding Sensitive Nuclear Transfers*, 1983 (redacted and approved for release May 30, 2012); Thomas Reed and Danny B. Stillman, *The Nuclear Express: A Political History of the Bomb and Its Proliferation* (Voyageur Press, 2010); and Jeffrey T. Richelson, *Spying on the Bomb: American Nuclear Intelligence from Nazi Germany to Iran and North Korea* (Norton, 2007).

16 Ethan Meick, *China's Reported Ballistic Missile Sale to Saudi Arabia: Background and Potential Implications*, US-China Economic and Security Review Commission Staff Report, June 16, 2014, https://www.uscc.gov/sites/default/files/Research/Staff%20Report_China%27s%20Reported%20Ballistic%20Missile%20Sale%20to%20Saudi%20Arabia_0.pdf.

17 US General Advisory Committee on Arms Control and Disarmament, *A Quarter Century of Soviet Compliance Practices Under Arms Control Commitments: 1958–1983* (unclassified summary), 1984, http://insidethecoldwar.org/sites/default/files/documents/GAC%20Report_1.pdf.

18 Jill Hruby, *Russia's New Nuclear Weapon Delivery Systems: An Open Source Technical Review*, Nuclear Threat Initiative, November 2019, https://media.nti.org/pdfs/NTI-Hruby_FINAL.PDF.

19 Liu Xuanzun, "China Urged to Expand Nuclear Arsenal to Deter US Warmongers," *Global Times*, May 8, 2020, https://www.globaltimes.cn/content/1187775.shtml.

20 "The primary difference between a UAV and a cruise missile or other similar vehicle is one of re-use. UAVs are, by definition, unmanned aircraft capable of re-use. The cruise missile (and other such vehicles) are considered expendable and hence are missiles and not 'aircraft' or 'aerial vehicles.'" *Physics 911*, http://physics911.net/drones-uavs-and-cruise-missiles/#:~:text=The%20primary%20difference%20between%20a%20UAV%20and%20a,missile%20%28and%20other%20such%20vehicles%29%20are%20considrered%20expendable. "The Case for Optionally Manned Aircraft," *Armed Forces Journal*, September 1, 2012, http://armedforcesjournal.com/the-case-for-optionally-manned-aircraft/.

21 Dan Gettinger, *The Drone Data Book*, Center for the Study of the Drone at Bard College, 2019, https://dronecenter.bard.edu/projects/drone-proliferation/databook/.

22 H. R. Penny, *Modernizing Unmanned Aerial Vehicle Export Policy for Effective Coalition Forces,* Mitchell Institute Policy Paper, June 2020, https://a2dd917a-65ab-41f1-ab11-5f1897e16299.usrfiles.com/ugd/a2dd91_cf3af457648a49dc889de89fd6d6dcd0.pdf.

23 Bureau of Political-Military Affairs, US Department of State, "US Policy on the Export of Unmanned Aerial Systems: Fact Sheet," July 24, 2020, https://www.state.gov/u-s-policy-on-the-export-of-unmanned-aerial-systems-2/.

24 US Department of State, "Fact Sheet: US Defense Trade Cooperation Treaties with the United Kingdom and Australia," September 30, 2010, https://2009-2017.state.gov/r/pa/prs/ps/2010/09/148478.htm.

25 George Nacouzi et al., *Assessment of the Proliferation of Certain Remotely Piloted Aircraft Systems: Response to Section 1276 of the National Defense Authorization Act for Fiscal Year 2017*, RAND Corporation, 2018, https://www.rand.org/pubs/research_reports/RR2369.html.

26 "China Is Building Long-Range Cruise Missiles Launched from Ship Containers," Navy Recognition, April 8, 2019, https://www.navyrecognition.com/index.php/news/defence-news/2019/april/6971-china-is-building-long-range-cruise-missiles-launched-from-ship-containers.html; Russia's SS-N-30 Kalibr in a four-missiles per twelve-meter commercial shipping container is a mature system. "Kalibr Missile System. Kalibr Cruise Missile. Combat Missile System," FB.ru, https://fb.ru/article/184556/raketnyiy-kompleks-kalibr-kryilataya-raketa-kalibr-boevoy-raketnyiy-kompleks.

27 The now-ancient Chinese Silkworm short-range cruise missile could be upgraded to a 2,000-km range system. Dennis Gormley,

Transfer Pathways for Cruise Missiles, Appendix III in the *Report of the Commission to Assess the Ballistic Missile Threat to the United* States (1997), https://www.globalsecurity.org/wmd/library/report/1998/rumsfeld/pt2_gormley.htm.

28 Eliot Higgins, *A Brief Open Source History of the Syrian Barrel Bomb,* Bellingcat*,* July 8, 2015, https://www.bellingcat.com/news/mena/2015/07/08/a-brief-open-source-history-of-the-syrian-barrel-bomb/. Syria acceded in 2013 to the Chemical Weapons Convention, which bans the use of chemical weapons. Nevertheless, it continued its use of both sarin and chlorine with lethal effect, killing 1,500 civilians. James Taranto, "Obama's Red-Line Debacle from the Inside," *Wall Street Journal*, June 8, 2018, https://www.wsj.com/articles/obamas-red-line-debacle-from-the-inside-1528497718, and Kareem Shaheen, "Almost 1500 Killed in Chemical Weapons Attacks in Syria," *Guardian*, March 14, 2016, https://www.theguardian.com/world/2016/mar/14/syria-chemical-weapons-attacks-almost-1500-killed-report-united-nation.

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William Schneider, Jr. is a Washington-based economist and defense analyst. He is a senior fellow at Hudson Institute, and president of International Planning Services, Inc. He served as under secretary of state for security assistance, science, and technology under President Reagan, and as chairman of the President's General Advisory Committee on Arms Control and Disarmament from 1987 to 1993. He has served on several presidential commissions and government advisory bodies in the fields of counterterrorism, intelligence, foreign affairs, defense, and economic policy. He formerly served as chairman of the Defense Science Board in the Department of Defense and the Department of State's Defense Trade Advisory Group. Dr. Schneider has also published numerous articles and monographs on defense and foreign policy, US strategic forces, theater nuclear forces, and unconventional warfare.

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