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SYMPOSIUM ON NEW CHALLENGES IN WEAPONS INSPECTION

WHAT ARE YOU LOOKIN' AT? AERIAL AND SPACE OBSERVATION FOR ARMS CONTROL

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Effective arms control between rival states requires reconciling three autonomous elements simultaneously: a) politics—the substantive agreement about what military items and activities will be restricted or prohibited; b) technology—the means and methods to monitor compliance with those negotiated limitations; and c) law—the rights and obligations that enable effective international use of the designated verification capabilities. Each of these three variables changes over time; the history of arms control reveals the difficulty of keeping them in sync as international conditions evolve. Today, we are in a period of remarkably rapid revolution regarding all three factors—particularly evident in the air and space domains—which will generate exciting new opportunities and require negotiators to be extraordinarily deft and responsive. This essay reviews some illustrative prior state practice in arms control in harmonizing the three variables and speculates about future adaptations.

Background

Arms control is almost always difficult, slow, and controversial. That is because it is trying to do something that is both important and counter-intuitive in persuading mutually suspicious erstwhile-adversaries to symmetrically lower their respective guards. Accordingly, verification of compliance with the provisions of the relevant arms control treaty is usually an essential ingredient; it makes sense to focus attention on effective monitoring when so much is at stake. Even "confidence-building measures," which do not directly limit or reduce the armed forces or armaments of the participants but do attempt to assure nervous states that their neighbors (and potential opponents) are not preparing to mount an aggressive attack, can strain the participants' appetite for compromise.

With many arms control treaties, the substantive "ban" provisions at the heart of the instrument are surprisingly brief. Although of foremost importance in achieving the treaty's object and purpose, these key obligations can often be captured in only a few operative articles and a few pages of treaty text. In contrast, the provisions regarding verification of compliance often become voluminous, running to dozens or hundreds of pages, and the negotiators expend the lion's share of their time and energy explicating the fine points of the monitoring capabilities and the rights, functions, and equipment of on-site inspectors.

The 1993 Chemical Weapons Convention (CWC)[1] and the 1996 Comprehensive Test Ban Treaty (CTBT)[2] illustrate these odd proportions. The key undertakings of the CWC—the "Thou Shalt Not" commitments never to

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[1] Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction, Jan. 13, 1993, 1974 UNTS 45 (entered into force Apr. 29, 1997).

[2] Comprehensive Nuclear-Test-Ban Treaty, Sept. 24, 1996, 35 I.L.M. 1439 (not yet in force) [hereinafter CTBT].

develop, produce, acquire, transfer, use, etc. chemical weapons and to destroy all existing chemical weapon stockpiles and production facilities—are contained in a relatively brief Article I. Almost the entirety of the rest of the agreement—which comprises twenty-four articles and three annexes, spanning some two hundred pages—is devoted, in one way or another, to mechanisms for verifying compliance with those fundamental obligations. Likewise, the *raison d'etre* of the CTBT—the undertakings not to carry out nuclear explosions and not to encourage others to do so—is expressed concisely in just the two sentences of its Article I. Thereafter, the document elaborately specifies the structure and authority of its newly minted international implementing organization, the creation of a multi-component international monitoring system, the routines for initiating and conducting on-site inspections, the mechanisms for resolving disputes, and other subsidiary matters.

That empirical observation leads to a second overarching point, to be elaborated below: in many instances, the substantive content of an arms control treaty is driven as much by considerations about the available monitoring capability and legal authority as it is by strategic logic. The negotiators, always consumed by the art of the possible, devote their energies to crafting restrictions that can be adequately verified, rather than developing other possible formulations that might prove more militarily impactful but would escape extant observational capabilities and rights. In short, negotiators tend to operate on the view that if you cannot (yet) monitor things that are really important, then the things that you actually monitor become really important.

This linkage between what arms control would like to restrict, what verification capabilities exist, and what legal protections will empower effective monitoring is especially subject to change today. Unpredictable jolts of technology and upheavals in legal/political relationships will ensure that future negotiators face a very dynamic task, even beyond what their predecessors had encountered in prior iterations.

Historical Evolution

The 1972 SALT I agreements vividly display this three-way relationship. Regarding the first element—the substantive restrictions—the Anti-Ballistic Missile Treaty and especially the Interim Agreement on Strategic Offensive Arms concentrated their strictures principally on the *launchers* of weapons (rather than on the missiles or warheads—the components that actually inflict harm upon an enemy) because launchers were the largest, most visible, and most readily identified, counted, and tracked segments. This constrained focus was mandatory because of the second element: the reality that during the Cold War era, verification of compliance with the agreements would be accomplished only remotely, via "national technical means of verification" (NTM) (principally, photoreconnaissance satellites). The parties were not yet willing to countenance more proximate monitoring, such as via on-site inspections. Turning to the third element (law), the negotiators had to invent novel legal protections to ensure that the NTM could operate effectively and reliably to support the verification demands. The negotiators thus devised stipulations that each party "undertakes not to interfere with" the other side's NTM, and that each would refrain from the use of "deliberate concealment measures which impede verification" by NTM.[3]

Fifteen years later, each of the three elements had evolved dramatically, and the 1987 Treaty on Intermediate-range Nuclear Forces (INF Treaty) reflected quite a different palette of values.[4] This time the parties directly prohibited missiles capable of the relevant ranges. To monitor compliance with the ban on this smaller and more mobile hardware, the INF Treaty concocted an excruciatingly detailed system of notifications and exchanges of previously-sensitive weapons data, as well as a network of previously unthinkable on-site inspections at missile

[3] Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems art. XII, May 26, 1972, 1042 UNTS 424 (entered into force Oct. 3, 1972) [hereinafter ABM Treaty].

[4] Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles, Dec. 8, 1987, 1657 UNTS 2 (entered into force June 1, 1988).

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operating bases, support facilities, and elimination facilities. The inspection regime lasted thirteen years and provided up to twenty inspections per calendar year, plus a continuous presence of foreign monitors' boots on the ground outside the portals of facilities at which relevant missile stages were manufactured or assembled. Even the NTM monitoring scheme was strengthened: each party had the right, six times per year, to employ "cooperative measures," under which the other party was required to open the roofs of all fixed shelters for road-mobile missile launchers at a specified base, remove all missiles from those structures, and display them in the open for twelve hours to facilitate satellite inspection.[5]

In support of that verification rigor, the INF Treaty's elaborate Protocol on Inspections contains page after page of step-by-step specifications about the initiation and conduct of different categories of on-site monitoring, the diplomatic privileges and immunities of the inspectors, the equipment they can employ in order to fulfill their mandate, and related legal protections and rights.[6]

Subsequent multilateral agreements, such as the CWC, became even more ambitious in securing the abolition of immense stockpiles of tremendously lethal chemical agents and their precursors. That salutary substantive accomplishment imposed unprecedented demands upon the verification system, because the relevant chemicals are highly transformable, concealable, and transportable, and because many are capable of being used in multiple ways, some of which are foundational for the civilian economy and therefore exempt from the treaty's prohibitions. Accordingly, the treaty-authorized monitoring activities run well beyond reliance upon NTM to include both "routine" and "challenge" on-site inspections, with elaborate specification of the access rights of the inspectors (as well as the privacy rights of the targets).

Notably, few arms control treaties include provisions for aerial inspection—those types of territorial overflights are apparently deemed even more sensitive than other intrusions into the sphere of sovereignty. The standard arms control treaty authorization for the use of NTM specifies that those monitoring capabilities are available only when the system is operating "in a manner consistent with generally recognized principles of international law."[7] The law of space generally permits unrestricted satellite passage; the overflown state has no legal basis for objection to the activity. In contrast, the international law applicable to air is quite different: each state has sovereignty in its superjacent air, and no airplane (or drone or balloon) may enter without permission.

The CTBT provides a notable exception in permitting verification by aerial assets. That treaty would allow up to four members of a challenge inspection team to conduct an overflight of the inspection area, via "relatively slow fixed or rotary wing aircraft," for up to twelve hours, to obtain a "general orientation of the inspection area."[8] Again, the procedures, rights, and limits guaranteed for such an overflight are spelled out in detail in the treaty's protocol.

Aerial Monitoring and the Open Skies Treaty

Provisions for monitoring by aircraft have proven valuable in other arms control contexts, too. The 1992 Open Skies Treaty is a unique confidence-building measure joined by thirty-five states of Europe and North America and operating on the basis of rigid equality of reciprocal obligations.[9] This treaty does not institute any new restrictions on the parties' weapons holdings or activities, but it does expose them to fresh international transparency via

[5] *Id.* art. XII.3.

[6] *Id.* Protocol Regarding Inspections.

[7] ABM Treaty, *supra* note 3, art. XII.1.

[8] CTBT, *supra* note 2, Protocol, Part II, paras. 71–85.

[9] Treaty on Open Skies, Mar. 24, 1992, S. TREATY DOC. 102.37 (entered into force Jan. 1, 2002).

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systematic aerial monitoring. By venturing into such a sensitive operation—previously derided as negotiating for "legalized espionage"—the treaty incorporates minute legal detail regarding each state's assigned numerical quota of flights; the four kinds of sensors available for use; the types, length, and duration of lawful flight plans; the right of the overflown party to obtain duplicates of all acquired data; and much more.

Parties have conducted at least 1,500 overflights, generating mountains of data pursuant to the treaty. For the United States, which maintains unique satellite reconnaissance capabilities, much of the acquired Open Skies material was redundant. But even so, aerial overflight carries some special advantages—it operates much closer to the target, observing it from multiple angles and beneath the cloud layer, and permits much more rapid alterations in flight plans than a satellite could accomplish. For the other participating states, the Open Skies access and insight are truly unparalleled—even though the participants have relied extensively upon archaic wet film photography, lending an air of Rube Goldberg to the otherwise modern suite of synthetic aperture radars, infrared line scanning, and other equipment.

The United States' ill-advised 2020 withdrawal from the Open Skies Treaty has cast a dark shadow over the treaty's future. To date, the other parties have been sustaining the operation, but Russia (which has been the natural target of most other participants' data-acquisition) has recently expressed its intention to abandon the treaty, too. In withdrawing, the United States cited several longstanding, deliberate violations by Russia, such as improperly restricting overflights over Kaliningrad and along Russia's border with Georgia. These are, indeed, serious issues, but they are worthy of serious diplomacy, not a petulant departure from a treaty that has long provided otherwise-unobtainable opportunities for effective national security sleuthing.

Other types of aerial monitoring are noteworthy, too. For example, the United States maintains nuclear "sniffing" aircraft capable of detecting and accumulating radioactive particulate samples that would provide concrete evidence of a clandestine nuclear explosion. The CTBT's international monitoring system sustains a similar capability, but it is based on ground stations at fixed locations, lacking the flexibility to deploy to particular locations of sudden interest. (The U.S. aircraft can serve other public interest functions, too, such as exploring other unexplained spikes in hazardous radioactivity, as occurred in northern Europe in June 2020.[10])

In the future, long-lived drones or aerostats (free-flying or tethered lighter-than-air balloons) could enable persistent observation of sensitive sites. Beyond that, the emerging category of "pseudo-satellites"—embracing stratospheric buoyant craft, operating at altitudes higher than most other aircraft but lower than most satellites—may become a preferred station for diverse long-duration Earth observation missions as well as provide a node for communications.

Space Arms Control

The familiar triangular relationship between substantive political restraints, technological monitoring capabilities, and legal authorities plays out again in the emerging realm of outer space arms control. The world has grown ever more reliant upon satellites for support of the entire array of essential civilian and military functions, but there is now a widely-shared perception of sharply rising threats to the security and stability of the extraterrestrial regime. The long-lurking danger of anti-satellite (ASAT) weapons competition has expanded, and kinetic interceptors or directed energy ASAT systems (e.g., high-energy lasers) could pose a sudden, irresistible threat to the reliability of satellite services. Today's increasingly belligerent rhetoric underscores the danger of an arms race, and even armed conflict, in space.

[10] *See* Jari Tanner, *Radioactivity Hike Seen in Northern Europe: Source Unknown*, Associated Press (June 27, 2020).

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Regarding the first factor, the political accommodations necessary to fashion meaningful space arms control, multiple good ideas for new treaties have long been floated in the literature.[11] But none of those initiatives has yet gained much political traction, and one of the imperative missing ingredients focuses directly on the second element, the need for improved capability for verifying compliance with any new accord. Today's incomplete auditing capabilities have routinely resulted in unfortunate uncertainty about the orbital population—the precise nature of recent Russian and Chinese "rendezvous and proximity operations" in space, for example, that might be dress-rehearsals for a future attack.

Space has long been a favored venue for monitoring in support of arms control treaties and other purposes, but today's revolutionary technology and economics are rapidly restructuring the field. The "democratization of space"—featuring dramatically reduced launch costs and the proliferation of small, inexpensive "CubeSat" capabilities—is infusing private capital into a sector long dominated, and almost exclusively populated, by governments.[12] Already, aggressive private entrepreneurs have placed thousands of small spacecraft into near-Earth orbit, and many thousands more are poised to follow, offering services in Earth observation, communication, and more. These small satellites will not offer the exquisite capabilities of the large, expensive legacy national security behemoths, but the proliferating swarms will carry the prospect for cheap, ubiquitous, continuous coverage—a modern panopticon, available on the commercial market. Already, investigative journalists and non-governmental experts such as Jeffrey Lewis at the Middlebury Institute can exploit volumes of public-access data derived from space, and they can freely employ them to monitor and interpret hitherto clandestine activities—such as possible preparations for a North Korean missile launch, or U.S. and allied joint military exercises. Decentralized monitoring that generates crowdsourced data will soon flood the global market with competing, redundant monitoring.

Further elaboration of the third essential ingredient—legal protections for the verification apparatus to be constructed—would be vital for a future space arms control instrument. Adequate verification would probably require a judicious mixture of ground-based and space-based assets, and could be especially tricky to negotiate, since sometimes the same types of facilities (such as laser systems) that could monitor satellite activity could also be employed to interfere with the normal operations of those spacecraft. Enhanced legal authorization and safeguards for the necessary observational resources, and somehow differentiating those peaceful tools from weapons, would therefore become essential.

Another idea whose time may be coming is some version of an International Satellite Monitoring Agency. It would be a treaty-based institution, funded and empowered by the community of nations to develop, deploy, and operate space-based observation platforms in support of arms control treaty verification and other functions. As the costs of space launch and operations continue to fall, some of the impediments that have always short-circuited such an enterprise may now begin to fade. With that augmented global transparency would come a heightened public accountability, exploiting widely-accessible raw data from space.

Space is the one domain in which near-perfect real-time monitoring might be achievable. The transparency of the medium could enable persistent observers to discern the location and trajectory of everything of appreciable

[11] Regarding proposals for arms control in space, see, e.g., Daniel Porras, *Towards ASAT Test Guidelines* (UNIDIR Space Dossier, File 2, 2018); Brian G. Chow, *Stalkers in Space: Defeating the Threat*, STRATEGIC STUD. Q. 82 (Summer 2017); Patricia Lewis, *Create a Global Code of Conduct for Outer Space*, CHATHAM HOUSE (June 12, 2019); Theresa Hitchens & Joan Johnson-Freese, *Toward a New National Security Space Strategy: Time for a Strategic Rebalancing* (Atlantic Council Strategy Paper No. 5, 2016); Icho Kealotswe, *The Rule of Law in Outer Space: A Call for International Cooperation* (Mar. 2018); Alexey Arbatov, *Arms Control in Outer Space: The Russian Angle, and a Possible Way Forward*, BULL. ATOMIC SCIENTISTS 151–52 (June 28, 2019).

[12] *See* Dave Baiocchi & William Welser IV, *The Democratization of Space: New Actors Need New Rules*, FOREIGN AFF. (May/June 2015); John McKenna, *How New Technology Is Democratizing Access to Space*, SPECTRA (July 16, 2018).

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size, at least in low-Earth orbit. Even then, however, external examination cannot reveal the full capabilities of the spacecraft or the intentions of its user.

Conclusion

For some purposes, there is no substitute for on-site monitoring, in person or via cameras, seals, and other advanced technology—the gold standard is referred to as "ground truth" for a reason. But for other functions, and for dealing with inaccessible sites, monitoring from air or space platforms offers important advantages, complementing or even exceeding the information that is derived by other methods.

The phenomenon of "societal verification" would enable more states and other participants to collect, disseminate, and analyze treaty-relevant information and make it harder for rogue states to conceal their treaty violations and other bad acts. After all, in many situations, it is not sufficient for the U.S. government to know a fact—it must be able to prove that fact to a skeptical world population, using unclassified sources and methods. Further proliferation of effective aerial and space monitoring capabilities can assist in that effort.

In sum, for effective arms control, a delicate relationship must be sustained in the triangle created by the substantive limitations written into an arms control treaty, the technical mechanisms to verify compliance with those terms, and the legal protections afforded to enable the monitors to do their jobs.

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