Chemical and Nuclear Weapons Law: A Comparative Study

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A. Introduction

One of the ways we as humans attempt to control our world is via rules. This can especially apply to one of the key human arenas of warfare and how to properly make war. While "gentlemen's agreements" regarding rules of conduct and chivalry have been around since the dawn of organized violence, the current age equips us with byproducts of scientific thought, which, when applied, can kill or maim millions of people. Thus we create rules to curtail or prevent the damage that wars fought with these new weapons can cause. This paper will analyze how the legal strictures regarding chemical and nuclear weapons differ. The reason why we make such an attempt is to obtain a greater understanding of how armaments policy is formed in two very different fields involving weapons of mass destruction (WMD). The idea behind this work is to understand if advances in one field can be applied to the other; e.g., if chemical arms control can teach us about what nuclear arms control can do better and vice-versa. Legal work often goes hand-in-hand with both political as well as practical objectives – and something as crucial and highly-charged as national defense is no exception. By exploring the legal terms surrounding such deadly weaponry, scholars can understand what motivates states to both build and restrain use of weapons of mass destruction.

Chemical and nuclear weapons will be the topics of this comparative analysis – together these form are two-thirds of the WMD triad. Biological weaponry will not be included in this analysis because biological weapons are, even more so than nuclear weaponry, largely confined to the realm of theory. They generally are only deployed in two

World Health Organization Labs (in Atlanta and Moscow respectively) and are largely for research purposes as opposed to weaponized stockpiles. They are often relegated to the very least of WMD concerns, and the amount of regulation on them is sparse – often biological weapons are lumped in with chemical weaponry when it comes to controlling this type of weapon legally. It should be said that the main objective of all arms control is synonymous with the main objective of all military policy. All policy environments serve one main objective, to deter attack, though they achieve that objective very different ways. Military policy generally uses aggression or deterrence via force of arms to ensure that other nation states respect its sovereignty and enforce its interests. Arms control, on the other hand, attempts to use legalistic means to deter attack and create an environment where aggression is either unlikely, impossible, or faced with a very high opportunity cost.

This following report begins with an overview of each weapon system (chemical, then nuclear) in question, in terms of how it used, the most prevalent and recognizable types of agent that is delivered, and delivery methods. Then we will detail the effects of use and possible long-term consequences of chemical or nuclear bombardment over an area or population. This will include both macro- and micro- assessments, which are defined here as the effect of weapons on individual health of those affected – as well as some comments on long term effects regarding the environment and general population. We will then analyze the various treaties since the dawn of the 20th century (the century that these weapons first came to use) that control the weapons system in question, with particular eye to the following questions: What military and political conditions were prevalent that made this treaty a concern of people at the time? What exactly makes up these treaties, and what do they focus on restricting? Finally, after both chemical and nuclear weapons have been

explored, we will proceed to the comparative analysis, which will primarily compare how these types of treaties are similar, as well as an exposition on the nature of why arms control is attempted for these types of weapons.

B.) Literature Review

Multiple sources have been indispensable for the research presented here, and I will detail a few of the most useful. Valerie Adam's *Chemical Warfare, Chemical Disarmament* is the gold standard for research regarding chemical weaponry. It is one of the few books that provides a concise overview of the entire breadth of existing chemical weaponry. It was primarily a source for the actual chemicals used in warfare, as well as being a helpful dictionary when it came to understanding chemical terms. A large amount of obscure data about what chemical weapons actually were, in a physical sense, builds upon Mrs. Adams' research. Historical data on how chemical weapons were used comes mainly from *Chemical Weapons and Warfare* via KR Padmanbhan. Several pages of the OPCW's webpage also go into extensive detail regarding the actual physical details of chemical weapons and how they react on the body.

Kosta Tpsis' *Arsenal, Understanding War in the Nuclear Age* was my primary source for understanding the physical characteristics of nuclear weaponry, including how it worked, what it did, and what it was meant to be used against (target-wise). The book also detailed the physics of how the weapon detonated, and what that implied for cities. The journal *Arms Control Today* also goes into detail about how nuclear weapons have generally operated mechanically, as well as detailing how the countermeasures for such weapons work and are deployed.

The *Evolution of Nuclear Strategy* via Lawrence Freedman was primarily used to understand the global strategy when it came to nuclear weaponry – as the book was written primarily as a history of how nuclear policy evolved over time. It's framing of nuclear arms control as primarily a bilateral United States-Soviet Union affair has been adapted to the methods of this paper. The *United States' Strategic Bombing Survey* also informed the answer to why nuclear weapons target what they target. The *Survey's* work categorizing targets and why they were bombed primarily informs why nuclear weapons are used primarily against cities as opposed to manufacturing areas or food production.

When it comes to law and analysis of the law regarding chemical weaponry, credit largely goes to the extensive website of the Organization for Prevention of Chemical Weapons, which details the actual text of the Chemical Weapons Convention as well as work explaining what the law actually means. The Red Cross also maintains the minutes for their yearly symposiums on prevention of chemical weapons use, which goes into great detail about the law and recent breaches of it regarding chemical weaponry. The Hague and Geneva Conventions against Chemical weapons are also used and cited.

When it comes to the law and analysis of such regarding nuclear weapons, credit largely goes to Mason Willrich and Bhupendra Jasani's work in articles covered in *Space Weapons and International Security* for the text and basic explanation of what the law involves. More in depth analysis on what the law implies can be attributed to *Law of War and Dubious Weapons* and *Nuclear Weapons and Law*, both of which detail what use and storage of nuclear weapons is permitted, as well as verification procedures and potential problems arising from stockpiles.

One of the core problems with nuclear disarmament is that there is no generic process available that fully encompasses all steps of the nuclear disarmament process. Norwegian Minister of Foreign Affairs Jonas Gahr Store outlined in his statement to the 2008 conference on disarmament in Geneva that four separate things need to emerge from the political process in order for nuclear disarmament to fully work. The first is generating a basic model of the entire disarmament process. This model need to include relevant verification objectives and technologies and identify suitable verification procedures for each step of the disarmament process. The second is developing a standard in which states can declare nuclear weapons – including sites, documentation, and personnel, and a framework for declaring objects ineligible inspection and details regarding the reason for this denial. The third is standardizing the inspection technology and relevant measures that are included in creating an inspection regime. The fourth involves developing a standard procedure for resolving compliance concerns involving sensitive materials and information – (e.g., a nation doesn't want to give up a certain piece of information on national security grounds, what does the inspectorate do/how does it respond?) Finally, reconciliation must be made in the costs of building new dismantlement facilities that are built for the purpose of disarmament and comparison with the current dismantlement facilities, which were reconfigured, not purpose built for destroying nuclear material.

Problems of Verification

Chemical verification is somewhat different in form if not in structure. While laws banning chemical warfare are nothing new, the recent drive to verify and control weapons on an international scale started primarily with nuclear weapons, and that experience has informed the recent verification regime of the Chemical Weapons Convention, albeit

addressing some national security concerns by substituting an NGO as the verification body as opposed to an intergovernmental or governmental body. The way of going about verification is similar to how the Nuclear Non-Proliferation Treaty goes about disarmament – create a structure for the reporting of nuclear test, assembly, and manufacturing sites, and provide a framework for verification by members of foreign national inspection bodies. The main difference is the OPCW's personal overseeing of inspectors to assert trust and remove allegations of spying. The other discrepancy is more engineering or environmentally based than based in the idea of policy; that chemical and nuclear weaponry need separate technologies to decommission, and while chemical agents can be neutralized with relatively little lethal byproduct, nuclear waste rarely, if ever, becomes safe to handle – becoming a storage concern.

The main concern facing the differences of nuclear and chemical weapons is primarily a political one. Scott Garthner of Penn State's school of International Affairs comments that "Compared to nukes, chemical weapons have less ego attached to them; countries can give them up without a loss of face or dramatic concerns about their security." The unfortunate reality is that the opposite is also true – nuclear weapons are seen as not only a source of national prestige and a sign of strength, but also a core component in nuclear-armed countries' national security strategies. The 80% of worldwide chemical weapons that have been eliminated by OPCW's efforts with the CWC may signal a more efficient system, but it is far more likely it merely signals that national military bodies (even ones at war, such as India's military vis-à-vis the Pakistan conflict, which has recently eliminated all chemical stockpiles) are dismissive of the utility of chemical weapons but deadly serious about nuclear weaponry's role in warfare today.

Thus, it is primarily a perceptive issue that causes nuclear weaponry to be such an issue when it comes to disarmament. The first prong of this perception is lack of use – nuclear weapons have only been used in anger twice by the United States. It is difficult to fathom the sheer human cost of use of such weapons when any use of them has been relegated so far into the past. Chemical weaponry, by comparison, has been used in virtually every armed conflict since the beginning of the 20th century, with incidents as recent as the Syrian civil war of 2014. There are more than enough examples of gore and suffering to convince citizens and policymakers that something must be done.

The second prong of the nuclear issue is the relatively low costs of breaking non-proliferation agreements vs. the high payoff of managing to obtain nuclear weaponry. Nuclear treaties that are multilateral in scope are largely toothless, as most of the nuclear weapons buildup since the bomb's inception has been limited to United States and Soviet Union. Thus, while the US and Russia have an effective multilateral framework that they hold each other accountable to, newer members to the nuclear club have few real disincentives disarm. Even when it comes to states that desire to enter the nuclear club, the Nuclear Non-Proliferation Treaty is a voluntary agreement and primarily defers to the UN Security Council when it comes to enforcement – which generally results in sanctions. While economic sanctions can be troublesome, often the nondemocratic regimes that pursue nuclear weapons are bothered little by the public opinion decline brought about by embargo. On the other hand, actually obtaining nuclear weapons grants near immunity from invasion – as the ability to set off another major World War is too high for even superpowers to risk. This is a highly attractive option for governments wary of the United States and nearby rivals. It also is useful as a saber to rattle when attention is desired via the international

community – nations with nuclear weapons have a certain prestige, which if brought only of fear, does keep eyes on a government's proclamations.

1.) Why Arms control?

Arms control itself far predates chemical and nuclear weaponry, and the conception of justice in war and controlling war for humanitarian reasons has been around since the turn of the first millennium. St. Augustine began with the conception that there was such a thing as "just war", or war that could be waged for reasons necessary to human justice. He outlined "just war" as a result of having four tenets of just legal process in international relations, which are:

Just Authority	Is the decision to fight based on legal and fair processes of government?
Just Cause/Just Means	Is war an appropriate remedy to the wrong? Are we responding with an appropriately or using disproportionate force?
Right Intention	Is the response proportional to the wrong?
Last Resort	Have all other means of diplomacy been exhausted?

St Augustine also wrote on the conception of warfare as a directed entity, in other words, that a distinction should be made from combatants and noncombatants and special privileges afforded to the latter. Hugo Grotius refined this view in the seventeenth century by adding the concept that a military action that does not further the conduct of a war directly should not be permitted. Of course, there is much argument over what is militarily necessary and what is not. The Hague Conventions of 1907 were some of the first attempts to codify that statement into law – prohibiting the killing of surrendered enemy forces or declaring a "no quarter given" rule. Another added regulation was the prohibition on

weapons that inflicted unnecessary suffering, that is, that weapons should be calibrated so they inflict only the needed damage to take a solider out of combat(SIPRI, 9)

Proportionality was another concept written about by both Augustine and Grotius, as their idea of justice in war coincided with the idea that means of combat that caused disproportionate suffering to noncombatants ought to be prohibited. However, while the Hague Conventions of 1907 did give officers a legal responsibility to avoid shelling targets without giving adequate warning to civilian authorities, there were no written rules governing what was "proportional" and "non-proportional" in warfare. The Stockholm International Peace Research Institute writes in its report "The Law of War", "The principle of proportionality follows logically from the principles that civilians as such may not be the target of attack and that they must be spared as much as possible. Its significance today, as a consequence of the emergence of weapons of mass destruction, makes it advisable to give more weight to this concept, and to emphasize its importance by an express formulation in the laws of war. (SPIRI, 10) A further concern is that chemical and nuclear weapons are considered "blind" or "dumb" weapons, as they have no way of identifying friend from foe, or civilian from military target.

These ideals extend from the "demands of humanity" – in other words, the concept that the good of the human race as a whole is generally considered a greater good than the demands of military action on behalf of one country. There is also a level of repugnance to the use of the two weapons systems discussed in this paper, as both nuclear and chemical weapons offer something that humanitarian considerations label as inhumane. For nuclear weapons, we have the consideration that these weapons are so enormously destructive and non-discriminating in the destruction of their target, that it is impossible to truly separate

military from civilian damage, as the affected area is simply too large in total. Chemical weapons are legislated against due to the repugnance of their use – they work more like terrible diseases than traditional "honorable" weapons and often cause disgusting medical trauma in the way they do their work.

International law treats nuclear and chemical weapons identically with regard to civilian targeting and indiscriminate attacks. The Hague Conventions prohibit most means of attacking noncombatants and prescribe a law of proportionality of force. As the Red Cross itself states, "The principle of distinction between civilians and combatants was first set forth in the St. Petersburg Declaration, which states that "the only legitimate object which States should endeavor to accomplish during war is to weaken the military forces of the enemy" (Red Cross, 3) Combantants, while being consensual participants in a conflict, are not protected from all harm or even death. However, they are protected from "unnecessary pain" by the Hague and Geneva Conventions, which sought to criminalize "barbarous forms of warfare" that caused undue pain and suffering. Furthermore, under the statues of the International Criminal Court, deliberately targeting civilians (whether individual civilians or a population as a whole) constitutes a war crime regardless of the weapon type used. Civilians or "noncombatants" as the Red Cross terminology states, are any and all persons that do not have a direct part in hostilities – and the main concern with chemical and nuclear weapons in this light is that they are "broad brush" – they cannot be targeted like bullets and missiles can. (Red Cross, 7). Even acts of terror designed to intimidate civilian populations are prohibited in Rule (2). Even further, Rule (7) states that; "The parties to the conflict must at all times distinguish between civilian objects and military objectives. Attacks may only be directed against military objectives. Attacks must not be directed against civilian

objects." (Red Cross, 25) So targeting cities with nuclear or even chemical weapons constitutes a war crime under International Criminal Court law – as targeting a city would constitute a non-military objective with a civilian population. The argument, however, goes that cities have a military component to them, and thus are fair game for nuclear bombardment. Yet even this would fall under ICC rules (11) and (12), which prohibit "indiscriminate attacks without effort to distinguish noncombatants". Indiscriminate attacks are attacks of a nature to strike military objectives and civilian objects without distinction. This can include nonspecific military objectives or a method of combat where the destruction cannot be limited to military objectives. This ties in with Rule (14) of the law of proportionality, which states that counterattacks on opposing forces must be proportional to the need to defend national security. More succinctly, "Launching an attack which may be expected to cause incidental loss of civilian life, injury to civilians, damage to civilian objects, or a combination thereof, which would be excessive in relation to the concrete and direct military advantage anticipated, is prohibited." (Red Cross, 46) For example, it is illegal under international law to counter a rocket attack on a military installation with a nuclear detonation over the opponent's capital city. The damage caused by the enemy's attack on your forces is disproportionate to the damage your forces deal by enabling said nuclear explosion. Even the environment's health, under the Hague Conventions, must be accounted for before a military body can legally discharge certain weaponry. Military operations must "employed with due regard to the protection and preservation of the natural environment" and take precautions for the preservation of such, per Rule (44). (Red Cross, 147). WMD are classified as weapons that have a proportionally high yield (in terms of kills) compared with conventional guns and explosives, which are covered themselves by

"small arms" weapons control treaties. In order of importance (generally determined by the weapon's destructive potential) the commonly described WMD are as follows: Nuclear, Radiological, Chemical, and Biological. Nuclear weapons uses nuclear fission reactions to generate a massive explosion, Radiological weapons use nuclear by-products and radiation to kill, chemical weapons use chemicals that use the chemical's effect on the human body to kill, and biological weapons use germ agents to infect and kill human beings.

B. Chemical Weapons

1. Four generations

To begin the analysis of weapons capabilities, we will start with chemical weapons, the less deadly of the WMD. Valerie Adams, in her book *Chemical Warfare, Chemical Disarmament,* succinctly puts the rationale behind chemical weapons as follows, "while the rationale for possession of nuclear weapons is largely straightforward, the issues raised by chemical warfare are more complex, often contradictory." The primary use of "chemical weapons" is to cause casualties via a toxic byproduct of chemical substances. Generally, the use of smoke and incendiaries, riot control to control domestic populations, or herbicide use is not considered chemical warfare. The reason for this is that chemical weapons are explicitly defined by governing bodies (e.g., the Organization for Prevention of Chemical Weapons – OPCW) as "any toxic chemical or its precursor that can cause death, injury, temporary incapacitation or sensory irritation through its chemical action." This means that the chemical in question must be engineered in the sense that through its chemical reactivity, it causes death or illness. It does not apply to chemicals which control plant growth (herbicides) or chemical which kill by some result or byproduct of their chemical reactivity (e.g. incendiaries, which kill by causing a fire).

The three major categories of chemical weapons are as follows: irritants, incapacitants, and lethal agents. Irritants make it impossible to fight without taking protective measures of some kind – either by inducing mucous membranes to overproduce (lachrimators) or to force the enemy to continuously sneeze (sternutators). Incapacitants are designed not to kill, but rather to make it so an enemy soldier simply cannot fight. It may kill a few of the more unlucky cases, but largely incapacitates rather than kills. Killing agents, or lethal agents, are the chemicals that, as Adams puts it, "can be expected to cause death, though there are varying degrees of potency." The degree that the chemicals persist in the atmosphere once the weapon is discharged is also a factor. Nonpersistent chemicals do not remain present in the air for more than a few seconds, and thus are often eschewed in favor of semi-persistent and persistent chemical weapons. While there is no "fine line" that describes the difference between semi-persistent and persistent – chemicals in these categories can remain effective from anywhere to a few days to a few weeks. The final factor that is used to classify chemical weapons is the way they achieve their effect. The few that are under the "lethal category" are: Choking agents, which achieve their affect by damaging the respiratory system, blood agents, which inhibit the body's ability to transport oxygen, vesicants, which cause blisters which can damage the respiratory system, nerve agents, which paralyze the muscles and thus render the victim unable to breathe, and psychochemicals, which disable the victim's ability to coherently think and function.

For purposes of simplicity, I have categorized chemical weaponry into 4 distinct categories that follow the trend of advancement through the twentieth century. The chart below serves as a quick synopsis.

Generation 1 – Unitary Chemicals – Simple	Byproducts of industry that were pressed into service due to their inhibiting affects on respiratory function.	Examples: Phosgene, Chlorine
Generation 2 – Unitary Chemicals – Nerve	Pesticides that found a use in inhibiting muscle function in humans when inhaled.	Examples: Sarin, Tabun, Ricin
Generation 3 – Unitary Chemicals – VX Series	Same effects above, but on skin contact rather than inhalation.	VX- Series
Generation 4 – Binary Chemical Weapons	Separates lethal agents into nonlethal precursor chemicals which can be stored safely.	Various – type of storage and delivery rather than chemical agent itself

Generation 1 chemicals were largely the result of using products from the industrialized countries' chemical industries, products that were known to cause harm to human health, but originally were never "processed" or produced primarily with weaponization in mind, rather, they were seen as a by-product of making useful materials for industry. The first use of a large scale chemical attack was near Ypres in Belgium, where the German military released 150 tons of chlorine gas on the Allies via canisters. (Padmanhaban, 25)

Development of chemical weaponry began in earnest when Dr. Gerhard Shrader, a German industrial/agricultural chemist, synthesized tabun and sarin gases in a search for more efficient insecticides. This leads to Generation 2 of the chemical agent process – nerve agent. These chemicals blocked neurotransmitters that allowed muscles to stop contracting – inhalation of nerve agents would result in a paralysis that would render the victim unable to breathe. While never used via the Allies or Axis in the principal battles of World War II, these chemicals were nonetheless produced by both sides as a deterrent, with the German's far more developed chemical warfare program being undiscovered until the conclusion of the war.

The 3rd generation of chemical weaponry largely concerns "supertoxic" chemicals, or chemicals that are lethal even with minimal exposure to human anatomy (around 36 mg per inhalation for humans). The discovery of these weapons is related to the discovery of 2nd generation chemical warfare agents – VX was originally a British attempt to create better insecticides – it was actually brought to market for that purpose until it was found that the compound was lethal to humans as well as insects. It was then shared with the United States military, who capitalized on the lethal capacity of the chemical to develop VX. While largely a stockpiled chemical deterrent vs the massive Soviet chemical warfare program, it had nonetheless been synthesized by the Japanese Aum Shinrikyo cult and Iraqi weapons scientists for use against their own respective members. (Miller, 6-8)

The final generation of chemical weaponry concerns not toxicity, but rather storage. Chemical weapons are extremely risky to store in enclosed spaces – as a potential leak of the compound could result in the death of all personnel in the facility. This can be catastrophic when considering independent enclosed spaces like ships and aircraft carriers. The solution was to create "binary" chemicals – or chemicals that were the result of two precursor chemicals being mixed. The chemical precursors were themselves harmless – a leak would not create a massive catastrophe. But when the precursors were combined, the mixture would result in a lethal chemical agent like VX. This made the storage and disposal of chemical agents much easier to deal with, as potential leaks were no longer the chemical disasters they formerly were. (Via OPCW, Citation #)

C. Nuclear Weapons

1.) Technology

While all nuclear bombs are incredibly powerful weapons, the way the weapons are configured generally pertains to what the weapon is meant to target. Among these mechanics, most useful is involves an understanding of the basics of rocketry – that ballistic missiles consist "basically of two parts, a booster rocket of one or more parts, and a structure on top of the rocket that contains the payload." (Tsipis, 102) Early nuclear missiles only had one "re-entry vehicle" a cone shaped object that is designed to re-enter the atmosphere without damaging the weapon inside. Today, many missiles consist of Multiple Independent Re-Entry Vehicles (MIRV), which allow a single rocket to deliver multiple payloads to separate targets. Perhaps more pertinent to the discussion of disarmament regimes is the conception of counterforce – or how nuclear weapons are deployed in regards to a counterattack. Alarmingly, cities, which are the "worst target" that nuclear weapons can be used against, are also the most susceptible, being easily damaged by relatively low overpressures and thermal radiation. Thusly, guidance systems need be minimal when it comes to targeting cities – as even a far off the mark impact can be sufficient in rendering the city uninhabitable. The reason for such advances in guidance systems, in fact, is to target military targets, especially silos. As the first nuclear missiles were deployed aboveground, liquid fueled, and required lengthy preparation before launch, "surprise attack" was originally not possible. It is only with the advent of the hardened silo that contained a nuclear missile that made the targeting capabilities of contemporary nuclear weapons so necessary. According to Tsipis, "Protected in a modern silo, a strategic ballistic missile has a high probability of surviving a nuclear attack." (p.132) Silos today are equipped with large overhead blast doors and suspension systems designed to alleviate the shock that is created by a nearby nuclear explosion. Interestingly enough, silos rarely have personnel to fire them

onsite – rather, they are dispersed and centrally controlled by a "nerve center" of round the clock Air Force officers. Perhaps the most worrying concept in regards to vulnerability is the cables that connect this nerve center to the silo itself, which could potentially disable a "fire" command.

While the above paragraph largely describes nuclear missile use and deployment now, the atomic bomb has a long and varied history that is deeply tied with the history of the United States Air Force and the prevailing attitudes regarding bombing after World War II when the bomb was developed. Originally the basic idea behind atomic bombardment was conceived as a concept called "strategic bombardment" which was itself a direct result of the conception of air power on modern warfare. As Stanley Baldwin puts it, "Any town within reach of an aerodrome can be bombed within the first five minutes of a war from the air, to an extent inconceivable in the last war, and the question will be whose morale will be shattered quickest by the preliminary bombing? I think it is well for the man in the street to realize that there is no power on Earth that can prevent him from being bombed." (Freedman, 4-5) Aerial bombers offered the unique capability to bypass armies and defenses on the way toward their target, and novels such as H.G. Wells *War in the Air* hypothesized that armies would become obsolete insofar as they could not defend against bombers who could simply fly over them. War would become a question of which nation's population could withstand the most bombing before demanding that their respective government surrenders. To further support his, Lawrence Freedman writes in *The Evolution of Nuclear Strategy*, "At the time when the early theories of strategic bombardment were being formulated, morale was a central concept in military though. [the French Army] saw war as a clash of opposing wills, with defeat the punishment of the force whose will broke first."

(Freedman, 7) How the civilian population factors in to this is that they are the ones providing the materials and logistics for men on the front. Should they riot or strike, as populations in Russia and Germany did during World War I, defeat becomes inevitable as armies slowly run out of supplies to fight with. However, actual military experience with bombers during WWII as emphasized by the US Strategic Bombing Survey (p. 16), which noted that German civilians would not simply "give up" due to bombing runs being conducted on their citizens. The authoritarian role of the Nazi regime was credited with some of the German resolve to continue fighting despite bombing on the home front, and the power of propaganda and government terror is a potential new source of research when it comes to understanding why people don't give up under bombing.

Whatever the reason, bombing was not the key to actually defeating a state, but rather, as Freedman puts it, "another instrument of attrition, and another method for industrial societies to beat each other down." (Freedman, pg. 21) The development of the V-1 and V-2 rockets by Germany was an extension of strategic bombing, but this time involving rocketry to deliver explosives instead of airplanes. It was used as a terror weapon to allow Germany to counter-attack Allied targets in retaliation of the strategic bombing of German cities. However, it was of limited use until WWII ended, when the sudden introduction of the atomic weapon made a pilotless, difficult-to-intercept delivery device extremely useful versus slower, easier-to-catch heavy bombers. The main problem with using V-2 technology to transport atom bombs right off the bat was that rocketry technology after WWII was, by our standards, extremely inaccurate. With a "4 mile spread over a 200 mile range; not as effective from a cost or performance as an airplane with a crew aboard." (Freedman, 24). The fact that the devastation caused by a nuclear bomb was so widespread

helped alleviate the problem of low accuracy, but during the bomb's inception airplanes were much more accurate and cost effective as delivery mechanisms. Now that the civilian population cannot hide (to say nothing of members of the government), states now have an interest in destroying these weapons, deterring their use, or banning them – as this new technology has created a world where no one is truly safe from bombing, be it civilian or soldier on the front.

Missiles came into primacy due to the gradual evolution in man's understanding of the bomb as a weapon. The key concept behind nuclear warfare is the idea of a "first strike", or that the nuclear bomb that strikes first can do incredible damage in a surprise attack with little the defense can do to mitigate the damage. This is compounded by the idea of a "decapitation attack" where government and military headquarters are eliminated first to throw the enemy into disarray. Mounting nuclear bombs on a rocket afforded nuclear weapons a "flexibility and surprise previously known only to mobile instruments" (Freedman, 24) due to the speed which missiles traveled and the idea that missiles could be easily hidden and launched. Submarines became a new interest for the Navy as the idea proliferated that submarines could be equipped to serve as mobile platforms for nuclear missiles. (Freedman, 25)

B.) Law

1.) Chemical Law

Attempts to make chemical weaponry illegal or less-than-acceptable predate the modern adoption of chemical warfare. The International Peace Conference in the Hague in 1899 primary treaty was to prohibit the use of weapons which used "diffusion of asphyxiating or deleterious gases." (Adams, 167) This was repeated at the second Hague convention in

1907. However, the use of chemical weaponry to break the deadlock in World War I quickly rendered these earlier conventions moot. Another attempt was made in Geneva in 1925, as the "Geneva Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous, or other Gases and of Bacteriological Methods of Warfare." According to the treaty itself; signatories "agree to extend this prohibition to the use of bacteriological methods of warfare and agree to be bound as between themselves according to the terms of this declaration." The problem is that this convention merely prohibits using such weapons, not developing or storing them. This issue was later rectified in the Chemical Weapons Convention, which came much later due to U.S.- Soviet arguments over what could be classified as a chemical weapon and bacteriological weapon. 1997 was the year that the CWC was finally decided on and ratified, and prohibits "To develop, produce, otherwise acquire, stockpile or retain chemical weapons, or transfer, directly or indirectly, chemical weapons to anyone;" or to use chemical weapons in general. This was an incredible leap from the original, near toothless prohibition against using chemical weapons, but there are certain caveats under the law that states are allowed to deploy chemical weapons. A further problem that goes back to 1968 when the committee thinking up the CWC was formed involved the issues of verification and how to prevent countries from cheating – as the ability to deploy chemical weapons on a disarmed world was a factor tempting nations to cheat. i.e. monitoring and enforcement.

The Chemical Weapons Convention, signed in 1993 and moving into force in 1997, is the pre-eminent method that international law controls chemical weaponry. It breaks down chemical weaponry into categories or "schedules".

Schedule 1	Chemicals that have few, if any, non-military uses. Under the CWC, states are only allowed to keep small amounts of these chemicals for research and medical use.
Schedule 2	Chemicals that are precursors to making Schedule 1 or 2 chemicals, and have few if any civilian uses.
Schedule 3	Chemicals that could potentially be used for chemical weaponry, but are produced in large quantities for non-military purposes.

States under the CWC must declare all stockpiles of chemicals that fall under schedules 1, 2, or 3. All production, storage, and research facilities related to chemical weapons must also be disclosed, within 30 days of the CWC's entry into law for the member state. States must also submit plans for destruction of existing chemical weapons stockpiles, and detail all transfers of any scheduled chemical to another state or party. Finally, all riot control agents (which are NOT prohibited by the CWC) are to be declared.

The CWC also requires member states to destroy all chemical weapons under the state's control. The way the CWC prevents a security dilemma in this instance is by instituting chemical weapons destruction by percentage of total stockpile rather than by amount (e.g.; in tons). The idea behind this is to ensure that all states are disarming themselves at roughly the same rate. States with large chemical stockpiles will destroy their weapons faster than states with small chemical stockpiles, ensuring that states do not "drag their feet" in order to still have weapons parity with their neighbors.

The CWC finally creates an international institution that provides for inspection and arms control verification and preparedness needs. The Organization for the Prohibition of Chemical Weapons (OPCW) trains inspectors and curates the verification regime set out in

the OPCW. Inspectors are afforded the same rights as diplomats, and are granted multiple powers under Part II of the Verification Annex of the CWC, including;

- Interviewing personnel at the site
- Inspect documents and records
- Take photographs
- Collect chemical samples

Inspections themselves are carried out to resolve disputes between member states, with inspections occurring 12 hours after notification of the state party. States themselves have rights to challenge inspections and bring them before the OPCW's ruling body, the Executive Council, which is elected via representatives from member states. However, should the OPCW find that a state is cheating or otherwise circumventing the CWC, the OPCW reserves the right to recommend punitive measures to other state parties, making compliance a collective issue. Potential punishments could involve presentation of the offending party to the UN Security council for potential military, trade, and commerce sanctions, as well as suspension of voting rights when it comes to CWC governance.

As of today, the OPCW has been in force for member countries for 17 years, and still is destroying chemical stockpiles. The original agreement called for a worldwide destruction of chemical weaponry within 10 years, but problems with implementation of the convention has stymied this ultimate goal. As noted in the SIPRI's report on the CWC's Third Conference, "the CWC paid little attention to the operational difficulties a state might encounter, since this was largely considered an internal matter for the state." For instance, Malyasia and India are still having difficulties establishing the legal base for implementing the CWC in its entirety - factions within the government occasionally refuse to ratify select

portions of the treaty while still being part of it. “99 percent of parties have established a state authority for implementing the CWC, 47 percent have legislation [allowing implementation of the CWC] into all key areas.” (SIPRI, 13) Colin S. Gray spoke about this issue in his book *House of Cards*, which argued that arms control was ineffective because arms control measures break down when war threatens – which defeats the purpose of arms control as war is when weapons are most likely to be used. Gray noted that arms control regimes are primarily considered in light of a certain political agenda. Strategic realities are rarely considered and overall help misshape the overall military posture due to militaries adapting to attempt to get “around” treaty constraints – in other words, focusing on weapon systems that are less regulated as opposed to ones that are covered by treaty. Furthermore, authoritarian countries tend to cheat, while democratic regimes are unable to design and implement a timely compliance policy. A better way would be to create a system of governance of the CWC that more reliably can assure compliance – posting a deposit which is withheld upon noncompliance, or making membership in trade and economic organizations contingent on good standing with the CWC. Yet talk is now focused on the transitory period after chemical weaponry is totally abolished in member states. While some member states refuse to discuss this eventuality until all stockpiles are destroyed, still, three quarters of declared chemical weapons agents, and half of declared chemical munitions have been destroyed.

2.) Nuclear Law

Most nuclear today’s arms control were developed during the Cold War era and were intended to limit the amount of competition that was to be reached by the two superpowers at the time – the United States and the Soviet Union. At a glance, there are

four major “treaties” that dictate how the United States and Russian Federation deploy their strategic nuclear forces: ABM, SALT, START, and SORT.

ABM Treaty (Anti-Ballistic Missile) 1972	Sought to limit the amount of anti-ballistic missile technology used by both superpowers. Limited both parties to 100 missile interceptors each, and two ABM warning complexes – one for the national capitol and the other to defend the strategic rockets used to launch missiles.
SALT I and II (Strategic Arms Limitation) 1979	Capped the number of missile silos and the amount of launch tubes usable on nuclear-capable submarines. SALT I did not address strategic bomber planes or number of warheads per missile, so SALT II was written to cap the amount of warheads per missile and limit bombers to about 2,000 delivery vehicles per side. Was scrapped after President Reagan refused to abide by treaty terms – stating that Soviet military presence would decide amount of American armament buildup.
START I and II (Strategic Arms Reduction) 1991 - 1993	Limited both sides to 1,600 delivery vehicles with no more than 6,000 warheads. Involved extensive inspections and dual-party sharing of information to ensure compliance. START II added on to this by lowering the cap to 3,000 and outlawing multiple warhead weapons. START II, however, was never ratified by the United States.
SORT and New Start (Strategic	Reduced strategic arsenals to around 1700 – 2200 warheads per side. SORT did not count “mothballed” or non-operationally ready

Offensive Reduction) 2002-2011	warheads toward this total. Was replaced by New START in 2011, which reduced warheads to 1550 and delivery systems (subs, planes, etc) to 800. Includes multiple verification provisions much like START I.

The basic policy assumption underlying arms control were established by written by a C.W. Sherman – a chief scientist for the Air Force who published a number of works on nuclear strategy. He compared arms control to "two tribes, both armed with a variety of poison darts which were fatal, but worked slowly, [thus] engaging the capacity for retaliation." (Freedman, 192) The only rational way to deal with the situation was that neither side should engage the other – as any attack would certainly be met with a fatal counterattack. Freedman extrapolates from this that the idea behind the huge arsenals and fleets of bombers that were nuclear capable was not to *win,* but rather demonstrate to an attacker that any attack was going to result in unbearable losses. Deterrence, therefore, was to work through the destruction of social and economic structures, rather than through "the prospect of victory in combat" (Freedman, 193) Thomas Schelling elaborated further in that the "true power to threaten was held in weapons that are designed to destroy military targets – as these weapons can exploit the advantage of striking first and provide the temptation to do so." (Freedman, 195) In other words, weapons that are designed to target cities of civilian populations are largely useless in terms of military strategy; as they don't actually eliminate the enemy's capacity to hurt you in retaliation. Chemical weapons, to an extent, can be said to have the same "don't shoot me and I won't shoot you" theory, but due to the lack of

globe-spanning delivery mechanisms for chemical weapons, distance becomes a factor, so countries can control, to an extent, how vulnerable they are to chemical weapons by controlling territory in and around their jurisdiction. Nuclear weapons are global due to the advent of intercontinental ballistic missiles (ICBMs) that can strike, literally, anywhere on the planet.

Policy analysts during this era also proposed a "military theory" to arms control – that it made sense for military elites to desire strictures that limit the amount or type of weaponry they were allowed to possess under the law. The first concept was that the more weapons one had; the more difficult it was to wipe them all out in a surprise attack. Thus, a high ceiling on armaments would be the most likely to be acceptable to both sides. The second is that an agreed upon verification regime for nuclear weaponry, even while the opposing signatories had them pointed at each other, had the value in "avoiding the kinds of crises in which withdrawal is intolerable for both sides, in avoiding false alarms and mistaken intentions, and in providing reassurance that restraint on the part of our enemies will be matched with restraint of our own." (Freedman, 196-7) A final factor was that limiting arms control to explicit agreements bound arms control to "the process of international negotiation". "Negotiations take time, had distorting effects on nations' sense of interests and priorities, introduced special demands so as to make agreement binding and verifiable and so on – [and thus] were difficult to arrange." (Freedman, 197)

It is dangerous to rely entirely on regulations- rather Schelling proposed that "self-control" was key in averting nuclear war. Self-control could be manifest in informal understanding or reciprocated restraints. Freedman goes on to describe the policy hurdles that faced the arms control regime – as US military authorities, understandably, were loathe

to accept a status quo that involved anything other than the US in a position of overwhelming strength. The key in disarmament ideals taking effect was the lobby of what Freedman calls nuclear pacifists, who are not necessary pacifists in the traditional sense, but rather opposed to any use of nuclear weaponry whatsoever. Their heritage developed from the tradition of "civilizing" or "just" war that developed in the Western world – starting with Saint Augustine and culminating in the United Nations. In this comes that concept of proportionality, that nuclear bombs are only permissible when a proportional threat is laid against them – in other words, they could only be used when a nation was faced with a "direct and potentially mortal threat to itself". (Freedman, 201) Further, nuclear pacifists raised the argument that nuclear weapons used offensively were criminal in that it endangered the whole of humanity. "To plan to use such weapons was not only evil, but irrational, as no gain could result." (Freedman, 202) The only real problem with the nuclear pacifist movement is that it effectively wished the status quo of mutual deterrence to continue indefinitely. This is because nuclear pacifists had no issue with the conception of mutually assured destruction, as long as nuclear weapons were never actually used. Yet this is inherently an unsafe policy – as the world continually must teeter on assumption that nation-states would never use nuclear weapons due to the costs involved. Another pressing difference was that policymakers disagreed whether an underlying political antagonism between the Soviet Union (whether it was a "special case" in the way of enemies or not).Eventually the nuclear pacifism movement petered out due to the concession by prominent policymakers that "nuclear deterrence was the best of the practical options available to us." (Freedman via Phillip Green, 206) In other words, if there was no escape from the balance of terror, then said balance had to be accepted.

However, now the Soviet Union has fallen prey to its own economic inefficiencies, and a new problem has arisen from the ashes to present a problem to arms control policymakers – nuclear proliferation. As Heather Wilson writes "for a long time, the nuclear club was one of the world's most exclusive – even before proliferation became a significant concern in the late 1980s, there were only a few states that qualified for membership in this exclusive group (pg. 447) Yet as the Soviet Union fell and nuclear scientists and weapons experts faced unemployment or worse, the idea of proliferation suddenly came into vogue. This can change the enforcement game as nuclear scientists "migrate" for work – often to the highest bidder. Sadly, as nation-states tend to have the deepest pockets, they also offer tempting paychecks – potentially in return for said nuclear scientist building them a nuclear weapon. This would cause not only a failure in controlling the spread of nuclear weaponry, but also would be a disaster should the state paying to develop weapons be aggressive in aim. Convincing scientists to sell nuclear material is also a threat, as it is not difficult - "It takes only 15 kilograms of highly enriched uranium or 6 kilograms of plutonium to make a nuclear weapon" (Wilson, 447) and is relatively easy compared with the highly technical task of refining the necessary elements to build the weapon. The Nunn-Lugar Act of 1991 was a major unilateral stride in the prevention of proliferation and indeed, a step into new territory for arms control. The Nunn-Lugar Act provided 400 million in funding to policies designed to secure Soviet nuclear material. By 2012, the Act managed to secure hundreds of kilograms of nuclear-usable material at a secured test site in Kazakhstan (Semipalatinsk Test Site, to be specific). Furthermore, it provided funds to various nuclear decommissioning projects, such as dismantlement of 92 train loads of operational nuclear warheads controlled by the Russian Ministry of Defense. It also funds a nuclear "best practices" exchange at

'nuclear security centers' with the US Department of Energy, so nation-states can exchange information as to how to properly store and decommission nuclear weaponry.

However, arms control at the nuclear level is not only associated or concerned with materiel, per se. The people who actually assemble and formulate the technology used in nuclear weaponry are also a concern for proliferation. In instances like the collapse of the Soviet Union, the idea that multiple members of this exclusive group could end up unemployed in a country that was desperate for cash was understandably a cause for alarm. The CIA estimated that in early 1992, one million people were employed in the Soviet nuclear arms production industry, with about one or two thousand of that million capable of having the access, experience, and know-how to produce a basic nuclear device. (Wilson, 449) The Bush Administration's response to this was the proposed establishment of a 25 million dollar science center that would accept grant applications from ex-weapons scientists. The Soviet Scientist Immigration Act was also passed, headed by a Senator Hank Brown (R-CO) that opened a further 750 immigration slots to ex-Soviet weapons scientists should they choose to immigrate to the US. The idea that private sector laboratories could have precedence in hiring these unemployed scientists was also toyed with, but never implemented. The idea behind all these controls was to ensure a lack of desperation on the part of Soviet nuclear scientists who had, with the collapse of the Soviet Union, newfound freedom to emigrate from cities they were previously forbidden to leave. It was feared that the collapsing Soviet economy would make these scientists desperate for work and money, which they could easily find by seeking employment in one of many "rogue states" that sought access to nuclear weapons technology, and was thus willing to hire Soviet nuclear scientists wherever they could find them. The infusion of money to keep them working, as

well as opening an option to have them move to the United States if desired, was primarily intended to lure them away from working on a rogue nuclear weapons program.

A unique animal is the Treaty on Nonproliferation of Nuclear Weapons (NPT), which is a more recent treaty administered by both the UN and International Atomic Energy Agency (IAEA). Its primary goal is to ensure that nuclear weapons are not proliferated to any non-nuclear countries as opposed to controlling their production, so it is not truly an "arms control" treaty. Still, it bears mention in this paper since the agency regulates the technology that can potentially be used to create a nuclear bomb. The key difference between it and the bilateral American/Russian nuclear arms control treaties is that the NPT is concerned with parts that could potentially be used to manufacture a nuclear bomb, as opposed to an amount of weapons that needs to be capped or destroyed. In this vein the IAEA provides an impartial agency that inspects signatories nuclear programs to ensure that the nuclear plant in question is primarily for producing energy as opposed to nuclear material. The IAEA's stewardship provides model that the Chemical Weapons Convention was built on, yet the IAEA is beholden to the UN, as opposed to an NGO that administers the treaty. The UN is subject to political pressures from a variety of sources, and as such, is often used as another arena for nation-states to aggrieve each other. This was especially apparent in the Cold War where the UN was more a sparring ground for the US and USSR than a real international government, but it is true today as well – as Russia and China's reluctance to enforce NPT guidelines regarding North Korea illustrate. All nation-states fear allowing other countries get too involved in what they regard as their "national interests" or geopolitical "backyard", thus there is an incentive to stymie any international legal initiative, no matter how benign. The shortcomings of the CWC are also present in the NPT

in a more magnified form – as the OPCW that administers the treaty can punish member states by excluding them from voting. The IAEA must appeal to the UN for any enforcement regime to be implemented, which makes it somewhat weaker in comparison with the OPCW. The main difference here is organizational – the OPCW handles its own enforcement activity by using membership and lack thereof as an incentive to comply with treaty regulations. The IAEA, being a UN agency, is hamstrung in much the same way the UN is – it cannot "force" anyone with force of law the way a nation state can force an organization to comply with restrictions. Inspections are voluntary, and enforcement actions are sole property of the UN Security Council, which is often at odds with itself, due to a single veto nixing any legislation on the table, and the fact that it is populated with multiple great powers that are often at odds with one another.

3.) Enforcement and Verification Regimes

The theory behind verification regimes are generally the same at their core. This is because both nuclear and chemical weapons agreements are outlined in independently ratified international treaties, which form the basic document for what is expected and what is enforced. Amy Woolf provides an overview of what 'treaty language' generally consists of:

- Restrictions – Or bans on a material or certain type of activity
- Obligations – What contracted parties are compelled to do by the agreement
- Cooperative measures – What both parties do to promote the efficacy of the treaty (such as provide information to other parties, etc.)

The key difference between chemical and nuclear verification is the type of monitoring system that is used. A monitoring system is the methodology contracted countries use to collect data on the status of treaty compliance per other signatories. The following two sections will detail what kind of monitoring systems are proscribed by both nuclear treaties and chemical treaties.

Nuclear

The monitoring system for nuclear treaties is largely a hodgepodge of both nonconsensual reconnaissance and consensual inspections. Nonconsensual reconnaissance is primarily characterized by photography or detection by satellite, radar, and electronic warfare facilities via signatories, which can submit their findings to independent agencies. Such reconnaissance technology is largely uncontrollable by other countries without committing an act of war, as the equipment conducting such scans is either inside of the verifying country or in international space. While new technologies such as drones and unmanned detection is possible, the building of underground and "hidden" nuclear test facilities can make tracking these weapons a guessing game at best. This espionage like behavior also is at odds with the legalistic nature of treaties – the idea is that a treaty is a contract nations sign, not something that authorizes what is effectively violation of sovereign territory (spying). The other main verification method is a system of inspections, which are used both in "international" nonproliferation treaties and bilateral agreements

between the United States and Russia. The main difference is who actually performs the inspection. For Russian/American bilateral agreements, both respective parties employ nuclear scientists who are permitted into the opposing country in order to inspect agreed-upon facilities under the terms of the treaty. For the Nuclear Non-proliferation Treaty (NPT), International Atomic Energy Agency inspectors affiliated primarily with the NGO perform inspections. From there they take samples, interview staff, and observe production for signs that nuclear material is being diverted for military use. The key problem with this regime is that while agreed-upon inspections are much more diplomatic when it comes to working with other countries, legal rules are rigid in a fluid world. Often countries will make efforts to hide or obscure data that is evidence of a nuclear weapon, or steadfastly fail to comply with inspectors. This, in turn, leads to another problem – there is no real consequence other than bad press and a decreased international standing. The NPT declares in cases of noncompliance, "the Board shall be able to call upon the State to take the required action without delay." (Art. XII C) The issue with this is that there is no real "teeth" to the agreement – enforcement is entirely subject to other signatories' willingness to involve themselves in the issue. For example, when North Korea contravened international law and built a nuclear weapon, the international community could tout the NPT as a reason why the act of building a bomb was wrong, but only could appeal to the UN for punitive measures. The IAEA can recommend the offending nation to the UN, which can in turn, issue economic sanctions, but the IAEA itself, which is the party charged with ensuring noncompliance, has no way of compelling the state to be bound by the agreement. The bilateral Russian/American treaties are much the same, the treaties (such as SALT, START, etc.) being guidelines for behavior as opposed to laws that dictate

punishment of breach. It is up to both individual countries to determine what can be done in the event of noncompliance with treaties. A question that can be asked, then, is "Why have a treaty at all if no enforcement can actually be done?" The first reason is that both the IAEA and American/Russian nuclear security experts stand to gain much more information about nuclear programs through cooperation than through subterfuge. Clandestine surveillance is very limited in scope and dangerously provocative, while treaty inspections allow physical entry into armaments installations for on-site inspections under a legal pretense. The second is that, especially in the case of the NPT, agreements provide a framework for dialogue between states regarding nuclear weaponry, which serves to ease tensions and build trust amongst the international community. While it is true that tensions do rise when violations or cheating is suspected, this is one of the many cases where bad rules are better than no rules. A legal framework gives nations a mutually agreed upon procedure that can be turned to, as opposed to resorting to ad-hoc solutions that can break down. While no method of conflict resolution is airtight, a legal framework ensures that the response to what is ostensibly a military matter does not remain squarely up to the interpretations of the national military establishments. Graham Allison in his work on the Cuban Missile Crisis notes that when there is no alternative method, nations turn to military means (blockades, invasions) to alleviate security concerns – which can escalate to a nuclear response. Further, national governments exist in a state of imperfect information: predictions based on "enemy morale or when 'the tide will turn'" regarding nuclear saber-rattling are often distorted. Nuclear treaties regarding weapons give nations an alternative to using military force to solve nuclear security issues – it also creates an environment where other nations can learn and debate regarding nuclear arsenals – thus lessening suspicion. Finally, it provides a well-

defined procedure to make overtures to opposing sides regarding nuclear weapons – as opposed to the, as Allison puts it, "bungling" that occurs when nations themselves are forced to define what is and isn't a threat with no external validation.

Chemical

One of the key shortcomings of the both the Hague and Geneva conventions is that they provided no way for signatories to know whether or not the strictures agreed to were actually being followed in other countries. It is this failure that provided for the stockpile of nerve weapons prior to World War II – as while no country wished to use chemical weapons after the experience of World War I, at the same time chemical weapons were a key deterrent against other chemical arsenals. The Chemical Weapons Convention sought to remedy that through the institution of a verification regime that provided member countries with a way of reliably knowing who was actually complying with the treaty provisions, as well as providing an impetus to actually comply. States upon signing the CWC are required to publicly state all chemical storage, production, and destruction facilities, both past and present, and both facilities controlled by the government as well as facilities controlled by private industry. Declared sites (as nondeclaration would be in breach of the treaty) are subject to inspection by the employees of the Organization for Prevention of Chemical Weapons (OPCW). States are allowed to verify the identity of inspectors, establishing trust in inspectors who are unbiased and impartial in inspection. Like nuclear agreements, OPCW inspectors are permitted to take samples, explore facilities, and interview personnel. The OPCW has an independent laboratory in Rijswijk, the Netherlands, which handles sample analysis and controls general verification procedure, as well as training all new inspectors.

While the OPCW's approach has some excellent improvements on chemical weapons verification, there are still two core problems. The first is that due to chemical and radiological detection being fundamentally different, chemical sensors or satellite analysis is impossible due to the nature of chemical detection. While nuclear material gives off electromagnetic radiation that can be detected from space, chemicals do not, and thus the OPCW is more reliant on on-site inspections, which can be denied (although to do so is in breach of the treaty). The second is that the OPCW has little to no recourse other than to appeal to other countries and the UN when it comes to noncompliance of the treaty. The OPCW does have an additional stick available in being able to suspend membership from the CWC and thus from voting on OPCW initiatives, but governments bent on using chemical weapons may not see this as a sufficient deterrent. When it comes to actual force and action to remedy chemical weapons use and noncompliance, it is largely up to individual states and the UN Security Council. The Security Council generally takes the lead when it comes to peacekeeping – as in the case of Syria's use of chemical weapons. Resolution 2118 provides insight on how it aims to remedy Syria's use of chemical weapons, calling on UN members to, "engage as appropriate, and apply joint and sustained pressure on, the parties in the Syrian Arab Republic to take the steps and measures outlined in paragraph 5 above. (which deals with the cessation of violence)." What pressure this involves exactly, the does not say – though an "international assistance presence under UN mandate" is mentioned. A Joint Special Envoy is also appointed in the resolution to lead the diplomatic talks with the Syrian government – but his duties are extremely broad and limited to negotiation only. The President of the United States' promise for "a targeted strike can make Assad, or any other dictator, think twice before using chemical weapons." is

more substantial, but the commitment not to put "boots on the ground" in Syria is a clear cutoff of that international commitment.

In other words, while chemical and nuclear agreements generally lack teeth when it comes to actually enforcing their agreements. However, it should be noted that these agreements provide a jumping-off point for what is, and what is not, legal – and how to go about following the laws and being transparent with armaments for mutual security. These agreements being broken also provides an impetus for the UN and related powers to cite specific illegal actions, and thus garner support for international punitive effort.

Conclusion

One of the key concepts we see in how arms control is formulated is how outside political events and rivalries shape the policy process. Nuclear weapons arms control was largely a bi-lateral agreement between the United States and Soviet Union that occasionally included other nuclear powers. Chemical weapons, on the other hand, were developed and came into vogue during a time where the world geopolitical landscape was largely a multi-polar environment. Many "great powers" of the time such as Germany, France, and the United Kingdom signed on to multilateral agreements that generally involved a "host nation" or non-government organization to steward compliance to treaties.

The nature of how these agreements were structured reflects largely on the political environment. Nuclear treaties generally involved an "equal partners in disarmament" view when it came to the two nuclear superpowers. SALT trusted the superpowers' naturally adversarial relationship to ensure compliance, as each party would demand a high level of verification and transparency to ensure the other side was not readying a first strike.

START, on the other hand, was more motivated by a mutual desire for disarmament based on the thawing tensions that came out of the end of the Cold War, and START I largely was stymied due to tensions during Reagan's military buildup. START II, however, was George H. W. Bush's desire to reach out to the Soviet side by promising to destroy a certain amount of weapons stockpiles should the Soviets agree to match the amount. Mikhail Gorbachev, faced with internal pressures at home, happily agreed to this. The reasons for doing so is twofold – During the early part of the 1990s the concept of the Cold War world was rapidly degenerating as the Soviet bloc began to increasingly demand accountability on the part of its rulers. Part of this accountability, of course, involved accountability for the military policy Soviet elites were touting – many citizens on both sides of the Iron Curtain were upset that elites, who would have access to nuclear shelters, were targeting cities where undefended citizens made their home as a method of deterrence. The idea that the world should be held under a concept of "mutually assured destruction" to ensure peace was becoming less acceptable as more Cold War mores gave way. Gorbachev and Bush's move toward voluntary disarmament was a reflection of the idea that the constant threat of nuclear war was no longer acceptable as a path to peace. The second reason is that it relieved pressure on the Soviet Union, where the economy was collapsing and less could be spent on the procurement and upkeep of new armaments. Dismantling arms was not only a good move from a public relations standpoint; it was a necessary move to help keep the Soviet government fiscally solvent.

Chemical weapons are more of a multilateral agreement between powers that are more or less on equal military footing with each other. Part of the reason for this is historical, as mentioned the earliest chemical weapons agreements were concluded shortly

after World War I. The military parties that were privy to both the Hague Conventions and the first World War itself were used to "great powers" system of international multipolar rivalry, as opposed to the nuclear "dual-superpower" model. Thus, the agreements that revolve around chemical weapons tend to be largely a group effort and comprehensive as opposed to stopgap – nuclear agreements tended to be more specific due to the difficulty of both superpowers to agree on even small details of arms control. The multipolar nature of chemical agreements, as well as the more developed NGOs that control the chemical arbitration and enforcement, make it easier for trust to be kept amongst signatories, due to more expansive enforcement and verification procedures, as well an "everyone's doing it" mentality when it comes to disarmament.

Overall, chemical weapons and law are generally more legally comprehensive and democratically accountable than nuclear agreements based on the more prevalent nature of chemical weaponry, and thus, chemical control regimes. The CWC and OPCW are essentially the arbiters of all current chemical weapons law, as opposed to the multiple bilateral and international treaties that govern nuclear weaponry – which rarely have an NGO governing their verification or enforcement. Chemical weapons are also seen as a non-critical military need in relation to nuclear weaponry – indeed, chemical weapons are seen as an escalation method in military strategy that doesn't involve pushing the nuclear button. Nuclear weaponry is seen more as a military "need" by the few states that have them due to the incredible deterrent capability that they offer, and thus states that possess nuclear weaponry are much more resistant to regulation and control.

The core shortcoming when it comes to chemical and nuclear weaponry and its role in law is the lack of enforcement. The volunteerism model that has been adopted for the

control and verification of weapons is insufficient when it comes to preventing abuse of nuclear and chemical weapons by determined regimes. Yet all arms control agreements covered in this paper, even the ones that are governed by an international non-govermment agency, are powerless to enforce their own law. The punishment for noncompliance on the part of chemical and nuclear weapons law is largely an appeal, by a state or NGO to other nations or the United Nations for sanctions, military intervention, or diplomatic talks. This is not sufficient when it comes to rogue states or actors unwilling to comply with treaty demands, even if they agreed to them previously. The anarchic nature of the world system largely stymies the ability of treaties to be enforced by anything other than a coalition of interested countries – and that volunteer model fails when countries are unwilling or unable to intervene, no matter how pressing the threat.

Bibliography

Adams, Valerie. *Chemical Warfare, Chemical Disarmament*. Bloomington: Indiana UP, 1990. Print.

The Chemical Weapons Convention. London: Foreign & Commonwealth Office, 1993. Print.

Collina, Tom Z. "CWC at a Glance." *The Chemical Weapons Convention*. Arms Control Association. Web.

Final Reports of the United States Strategic Bombing Survey, 1945-1947. Washington: National Archives and Records Service, 1975. Print.

Freedman, Lawrence. *The Evolution of Nuclear Strategy*. New York: St. Martin's, 1981. Print.

Gray, Colin S. *House of Cards: Why Arms Control Must Fail*. Ithaca: Cornell UP, 1992. Print.

"Great Philosophers: Augustine on War." *Great Philosophers: Augustine on War*. Oregon State University, 2002. Web. 10 Aug. 2014.

Hague Conventions of 1907 and 1925. 18 Oct. 1907. Treaties. France, Paris.

Hays, Peter L., Brenda J. Vallance, and Van Tassel Alan R. *American Defense Policy*. Baltimore: John's Hopkins UP, 1997. Print.

The Law of War and Dubious Weapons. Stockholm: Almqvist & Wiksell International, 1976. Print.

Meyrowitz, Henri. "The Principle of Superfluous Injury or Unnecessary Suffering." *International Committee of the Red Cross* (1994). *Www.loc.gov*. Red Cross. Web.

Miller, Arthur Selwyn, and Martin Feinrider. *Nuclear Weapons and Law*. Westport, CT: Greenwood, 1984. Print.

Miller, Victor. "Health Effects of Project SHAD - VX Nerve Agent." *National Academies* (2004). *IOM.edu*. IOM.edu. Web.

"Nerve Agents: Introduction, Physical and Chemical Properties, Binary Technology, Mechanism of Action, Symptoms, Antidotes and Methods of Treatment." *Nerve*

Agents: Introduction, Physical and Chemical Properties, Binary Technology, Mechanism of Action, Symptoms, Antidotes and Methods of Treatment. OPCW. Web. 10 Aug. 2014.

Padmanabhan, KR. *Chemical Weapons and Warfare*. New Dehli: Surendra Publications, 2010. Print.

Paris Convention for the Protection of Industrial Property of March 20, 1883, as Revised at Brussels on December 14, 1900, at Washington on June 2, 1911, at The Hague on November 6, 1925, at London on June 2, 1934, at Lisbon on October 31, 1958, and at Stockholm on July 14, 1967. Geneva: World Intellectual Property Organization, 1978. Print.

Price, Richard. "A Genealogy of the Chemical Weapons Taboo." *International Organization* 49.1 (1995): 73-103. *JSTOR*. Web. 10 Aug. 2014. <http://www.jstor.org/stable/10.2307/2706867?ref=no-x-route:f8d3ed589e3dad95f82398c5b27cbbeb>.

"SIPRI's Report on the CWC's Third Conference." *Www.sipri.org*. SIPRI. Web. 10 Aug. 2014.

Tsipis, Kosta. *Arsenal, Understanding Weapons in the Nuclear Age*. New York: Simon and Schuster, 1983. Print.

"U.S.-Soviet/Russian Nuclear Arms Control." *Arms Control Today* 32.5 (2002): 12-13. *JSTOR*. Web. 10 Aug. 2014. <http://www.jstor.org/stable/10.2307/23626714?ref=no-x-route:3befa0f4eba2055e2eec1c3ceeff9598>.

Wells, H. G., and Patrick Parrinder. *The War in the Air*. London: Penguin, 2005. Print.

Willrich, Mason. "An Overview of SALT I." *The American Journal of International Law* 67.5 (1973): 28-35. *JSTOR*. Web. 10 Aug. 2014. <http://www.jstor.org/stable/10.2307/25660473?ref=no-x-route:612bcdd42b21837a32dd43f925d8881a>.

"Brief Description of Chemical Weapons, Chemical Weapon as Defined by the CWC, CW Agent Group, Persistency Rate of Action." *Brief Description of Chemical Weapons, Chemical Weapon as Defined by the CWC, CW Agent Group, Persistency Rate of Action*. Organization for Prohibition of Chemical Weapons. Web. 13 Aug. 2014.

Acton, James M. "Deterring Safeguards Violation." *Deterring Safeguards Violations*. Carnegie Foundation. Web.

Carlson, John. "Defining Noncompliance." *Arms Control.org*. Arms Control Association, May 2009. Web.

"International Atomic Energy Agency (IAEA)IAEA Home." *Factsheets: IAEA Safeguards Overview*. International Atomic Energy Agency. Web. 21 Aug. 2014.

Woolf, Amy. "Verification and Arms Control." *Science* 235.4787 (1987): 406-14. *Congressional Research Service FAS.org*. FAS, 23 Dec. 2011.

"Espionage Information." *International Atomic Energy Agency (IAEA)*. FAQ.org, Web. 08 Oct. 2014.