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Výzvy v multipolárním jaderném světě

Challenges of a Multi-Polar Nuclear World

Yehoshua Socol, Moshe Yanovskiy, Michael Bronshtein

Abstrakt

Ačkoli je jaderná válka katastrofou, není zdaleka apokalyptická, jak je obecně vnímána. V tomto článku zvažujeme možné scénáře jaderné války v multipolárním jaderném světě a předkládáme argument, že demokratická společnost má dobré šance na vítězství proti totalitním státům vlastnícím jaderné zbraně. Poté se zaměřujeme na dvě odborné otázky prvořadého významu – doktrínu zacílení a civilní obranu. Došli jsme k závěru, že vytrvalý a odhodlaný postoj spolu s vhodně koncipovanou a dobře plánovanou politikou přístupu k agresi je cena, kterou musí být demokratické společnosti ochotny zaplatit, chtějí-li účinně bojovat s agresi na všech úrovních.

Abstract

Nuclear warfare, being calamitous, is nevertheless, unlike popular perception, far from being apocalyptic. In the article, we consider possible scenarios of nuclear war in a multi-polar nuclear world, arguing that a democratic society has good chances of victory against a totalitarian nuclear-possessing state. Afterwards, we focus on two technical issues of primary importance – targeting doctrine and civil defense. We conclude that a steadfast and determined stance together with properly conceived and well planned policies for dealing with aggression is the price democratic societies must be willing to pay in order to effectively battle aggression at all levels.

Klíčová slova

Jaderná válka; doktrína; zacílení; civilní obrana.

Keywords

Atomic warfare; doctrine; targeting; civil defense.

INTRODUCTION

The future world is going to be a world with many nuclear-possessing actors, whether we wish or (probably) not. Anti-proliferation efforts have yielded up to now very limited results,¹ and it is widely believed that any state which is determined to acquire nuclear weapons – will “build, buy, borrow or burgle” it.²

Assuming that rogue states will acquire nuclear weapons, we have actually two alternatives:

- to surrender;
- to think.

This article suggests the second alternative. The nuclear warfare, being calamitous, is nevertheless, unlike popular perception, far from being apocalyptic. A steadfast and determined stance – including the willingness and ability to suffer heavy losses, in both human and economic terms – is the price democratic societies must be willing to pay in order to effectively battle aggression at all levels. “*He who wants peace now will not receive peace ever.*”³

In the article we deal with a scenario of nuclear exchange between a democratic country on the one side and a totalitarian regime on the other (with some attention to possible involvement of non-state actors). Indo-Pakistan conflict can be to a large extent characterized as such, though there are certain problems with the Indian politico-juridical system and certain democratic institutes in Pakistan. There are surely other possibilities that are beyond the scope of this article. We do not consider nuclear conflict between two democratic states since it is extremely improbable (though the examples of the American Civil War and the First World War do not permit to totally exclude such scenario in the future). Conflict including non-democratic superpowers is more probable, but is not specific to future multi-polar nuclear world, and was extensively studied for decades. Finally, nuclear conflict between totalitarian regimes seems rather possible, but is far less important for NATO and other democratic countries.

The article is organized as following. First, we make a short overview of the nuclear warfare. Then, we consider possible scenarios of nuclear warfare in a multi-polar nuclear world, arguing that a democratic society has better chances of victory against a totalitarian nuclear-possessing state. Afterwards, we focus on two technical issues of a principal importance – targeting doctrine and civil defense. Regarding targeting, we claim that a democratic state should target first of all the infrastructure and objects of symbolic value for a totalitarian adversary, rather than its military targets or indiscriminate population centers. Regarding civil defense – we support the claim that it is indispensable rather than only feasible and efficient. None of these ideas is completely novel, but all need an elaboration in a common framework.

TO BE OR NOT TO BE? DEALING WITH NUCLEAR AGGRESSION

Weapons are seldom used without purpose, without the hope of achieving one’s aims and defeating one’s enemy. A democratic society must do everything possible to deprive terrorists and rogue states from harboring such hopes. Concessions and gestures of a good will on the part of a democratic society

¹ HARNEY, Robert C., Inaccurate Prediction of Nuclear Weapons Effects and Possible Adverse Influences on Nuclear Terrorism Preparedness [online], *Homeland Security Affairs* 2009 vol. 5, no. 3, Article 3, p.1, [cit. 2012-04-15]. Available from: <http://www.hsaj.org/?article=5.3.3>.

² NUDELMAN, Raphael, Interview with Martin van Creveld (in Russian). *Nota Bene*, 2005 vol. 7, [cit. 2012-04-15]. Available from: <http://gazeta.rjews.net/nudel.shtml>

³ AUMANN, Israel (Robert), 2006 Herzliya Conference Opening Ceremony [online]. *Herzliya Conference*, 2006 [cit. 2012-04-15]. Available from: <http://www.herzliyaconference.org/eng/?ArticleID=1394&CategoryID=215>

are seen as signs of weakness by totalitarian societies and lead only to an escalation of terror, as has been demonstrated by many authors.⁴ Israel Aumann notes:

*“...in such a situation concessions achieve the exact opposite of what they were meant to achieve when both sides are interested in peace. They encourage the aggressive side to demand and receive more and more and base the perception that the rope can be stretched further and further. Eventually the rope tears and there is a war in conditions far worse than what would previously have transpired, before the concessions.”*⁵

Or as Winston Churchill put it: those who are given the choice of war or dishonor, and choose dishonor, will have both war and dishonor.

The death toll, anticipated (as estimated below) in a full-scale nuclear conflict with a rogue state, is comparable with the US or UK human losses during the Second World War. It is anticipated to be considerably lower than the death toll of the American Civil War, not to speak about the million-scale British, French or Italian losses in the First World War. Therefore there is a little doubt that a nation determined to survive and with a strong sense of its own destiny would not succumb to such losses. A steadfast and determined stance – including the willingness and ability to suffer heavy losses, in both human and economic terms – is the price democratic societies must be willing to pay in order to effectively battle aggression at all levels.

Continuing reductions of nuclear arsenals, especially on the side of the USA, France and Britain, have a great impact on future capabilities in this regard, as does a potential withdrawal of remaining tactical nuclear weapons from NATO Western European countries. Meanwhile, the Russian doctrine, e.g., allows first use of nuclear weapons,⁶ while other states stress the use of nuclear weapons only in retaliation. Consideration of these aspects lies beyond the scope of the present article. We should only mention the necessity of keeping arsenals and – not less important – elaborating doctrines that pose a credible threat to any potential aggressor. In this context it is instructive to remember the words of Father John A. Siemes, a pastor and Hiroshima survivor:

*“We have discussed among ourselves the ethics of the use of the bomb. Some ... were against its use on a civil population. Others were of the view that in total war, as carried on in Japan, there was no difference between civilians and soldiers, and that the bomb itself was an effective force tending to end the bloodshed, warning Japan to surrender and thus to avoid total destruction. It seems logical to me that he who supports total war in principle cannot complain of war against civilians.”*⁷

Unfortunately, when a motivated aggressor wages war aiming at total domination, the only alternative to the total war is capitulation. Capitulation to an aggressor, however, is hardly a viable option. Besides the principal considerations, capitulation usually leads to ultimately higher level of losses and suffering, than fighting for freedom. The Jewish Holocaust is only the extreme case of a long chain of historical examples, illustrating that, as Goethe said: *“He only earns his Freedom and Existence, // Who’s forced to win them freshly every day.”*⁸

⁴ SHARON, Moshe, To Clean Out the Stables and Prepare for War, *Nativ* [online], 2006 vol. 9 [cit. 2012-04-15]. Available from: <http://www.acpr.org.il/ENGLISH-NATIV/09-issue/sharon-9.htm>

SAUTTER, John A., Variance, Violence, and Democracy: A Basic Microeconomic Model of Terrorism, *Journal of Strategic Security* [online], vol. 3 no. 1, 2010-03-01 [cit. 2012-04-15]. Available from: <http://www.henley-putnam.edu/652-267.htm#toc>

⁵ AUMANN, Israel (Robert), ref. 3.

⁶ *Military Doctrine of the Russian Federation* (in Russian) [online], 2010-02-05, sec. 22 [cit. 2012-04-15]. Available from: http://news.kremlin.ru/ref_notes/461

⁷ *The Atomic Bombings of Hiroshima and Nagasaki*, Manhattan Engineer District, 1946, p. 54.

Pennsylvania State University 2000 [cit. 2012-04-15]. Available from: www2.hn.psu.edu/faculty/jmanis/poldocs/a-ww2.pdf

⁸ GOETHE, Johann W. von, *Faust* [online] Translated by A. S. Kline, 2003, line 11575 [cit. 2012-04-15]. Available from: <http://www.poetryintranslation.com/PITBR/German/FaustIIActV.htm>

NUCLEAR TERROR: NON-STATE ACTORS

Can non-state actors gain access to nuclear weapons? In principle, yes, particularly if we speak of a time frame measured in decades and take into account future proliferation. Having said that, the complexity and high unit price of nuclear devices reduce this likelihood to sporadic and accidental access. State-sponsored nuclear terror seems to be a more probable option. However, this case should not be considered as dominated by non-state actors.

Dealing with nuclear terror by non-state actors, democratic society should probably adhere to two leading principles:⁹

Making the sponsoring state to bear full responsibility for the nuclear attack, with all the clear consequences. Being official, announced and credible, such position is capable of deterring most of otherwise-probable attacks.

Targeting objects of symbolic value to the terrorist group. As Martin van Creveld wrote,¹⁰ *“the sanctity of churches and other religious shrines is easily observed when the prevailing secular system of belief indicates that they are of no political significance... Such, however, may not be the view of future generations.”*

As happened in the wake of 9/11, a single nuclear attack – and very possibly even the fear of one – may well significantly impact the lifestyle of modern societies world-wide. Such change would not be due to direct damage to life and property but due to extensive (and arguably justified) counter-measures that societies may adopt. In view of the facts described below in the section on nuclear radiation, it seems likely that at least the current overestimation of radiation hazards (“radiophobia”) will dissipate in the wake of the first “live” nuclear attack. This in turn will mean that indirect economic damage – currently estimated as astronomical – will actually be far less than feared.

In light of the above, one should clearly distinguish between nuclear and radiological weapons – the so called “dirty bombs”. While radiological terror is rather simple and probable, its direct physical effects are far less than feared. As Vayl Oxford, director of the US Domestic Nuclear Detection Office, put it,¹¹ *“... in many cases this is more of a panic weapon than anything else”*. We tend to say, that large-scale radiological terror attack can be performed only once: the second attack will not already be large-scale due to the loss of its main factor – panic. Probably, that is the reason no serious radiological terror attack has been yet performed.

NUCLEAR CONFLICT

Casualties – reasonable worst-case

At the outset, a clarification is called for. There is no doubt that nuclear terror or nuclear warfare, even of a limited scale, will be calamitous. Strategically speaking, however, the direct consequences of the limited use of nuclear weapons, especially low-yield devices most likely in the hands of non-state actors or irresponsible governments, would probably not be great enough to bring about significant geo-political upheavals. Casualties from a single 20-KT nuclear device were estimated by the UK Home Office at about 25,000 fatalities, assuming rather unfortunate scenario (the center of a large British city, with minimal warning).¹² In most European and American cities (with New York being

⁹ FREILICH, Chuck, *The Armageddon Scenario: Israel and the Threat of Nuclear Terrorism*, Ramat Gan: The Begin-Sadat Center for Strategic Studies, 2010, p. 25. (Mideast Security and Policy Studies No. 84) Available from: <http://www.biu.ac.il/Besa/MSPS84.pdf>

¹⁰ CREVELD, Martin van, *The Transformation of War*, NY: The Free Press, 1991, p. 203. ISBN-10: 0029331552.

¹¹ MAGNUSON, Stew, Public Still in the Dark When it Comes to Dirty Bomb Threat, *National Defense* [online], June 2008 [cit. 2012-04-15]. Available from: <http://www.nationaldefensemagazine.org/archive/2008/June/Pages/Public2241.aspx>

¹² *The Number of Atomic Bombs Equivalent to the Last War Air Attacks on Great Britain and Germany*. Office of the Chief Scientific Adviser, UK Home Office CD/SA.16 1950, p. 4.

a notable exception) the population density is lower than the reference value of 11,000 people per square km,¹³ and the death toll is anticipated to be considerably smaller, probably by a factor of about two. Therefore scaling the above toll to larger devices or to a larger number of devices is less than linear. For example, the same UK study estimated that it would take as many as 80 devices of 20-KT yield each to cause 300,000 civilian fatalities in German cities – a result actually achieved by Allied area attacks, or carpet bombings, during the Second World War.¹⁴

This can be used as a reasonable worst-case scenario. Let us discuss now in some detail the applicability of the above estimation: 80×20KT devices leading to 300,000 deaths. We discuss separately the type (yield) of the devices, the available quantity and the accuracy of delivery.

While much more powerful thermo-nuclear devices ('hydrogen bomb') exist, they need complicated technology to considerably exceed the 20-KT yield. In order to assess the complexity level, one should remember that in the USA it took 9 years (1945-1954) to move from nuclear (atomic) to deployable thermo-nuclear weapon. In the USSR, which is a more relevant case (since, unlike American, there was full-gas effort), it took 4 years (1949-1953) to develop a 400-MT weapon (of the so called *Sloika* design); and 2 more years (till 1955) to develop a scalable thermo-nuclear weapon. Saying that, in the Soviet case the time to develop the thermo-nuclear technology was roughly equivalent to the time it took to develop the nuclear (1945-1949). We may expect that also in the future development, the time to jump from the nuclear to the thermo-nuclear technology will be comparable to the time needed to develop the nuclear weapons. The latter was measured in decades for India and Pakistan, not to speak about Iran and others.

Speaking about the number of devices available in a future conflict, one should remember that today – above decade after the official beginning of nuclear weapons deployment – both India and Pakistan have probably 50-60 devices.¹⁵ So the number of 80, used above, should be considered as fair estimation, if not an overestimation.

Finally, the accuracy of delivery was assumed to be as that of the WWII in the UK report. The latter can be derived from the numbers reported by the US Strategic Bombing Survey: about 20% of the bombs aimed at precision targets fell within 300 m from respective targets.¹⁶ Let us compare this accuracy with modern data, usually described by the CEP parameter. The CEP distance is defined so that 50% of bombs/missiles fall within CEP from target points. The WWII CEP can be therefore estimated as 500 m.¹⁷ While at present the technology to achieve higher accuracy with ballistic missiles surely exists (e.g. for Trident II SLBM – CEP is below 90 m), it is neither cheap nor simple. To illustrate this statement we can mention a series of failures with the Russian *Bulava* SLBM, as well as with the Iranian ballistic missiles' program; and also the fact that Russia is reported to possess only 24 launchers of high-precision SS-26 Stone (Iskander).¹⁸ Therefore amassing of high-precision ballistic missiles by a rogue state does not seem probable. Dealing with ballistic missiles, CEP of 1 meter per

¹³ Reference population density is taken as 1 person per 1000 square feet – see sec. 12.09 of GLASSTONE, Samuel and DOLAN, Philip J., *The Effects of Nuclear Weapons*, Washington DC : United States Dept. of Defense, 1977. 653 p.

¹⁴ *The Number of Atomic Bombs Equivalent to the Last War Air Attacks on Great Britain and Germany*, ref. 12, p. 1.

¹⁵ *World Armaments, Disarmament and International Security: SIPRI Yearbook 2007*, Oxford Univ. Press, 2007, p. 514-551. ISBN 978-0-19-969552-2.

¹⁶ *United States Strategic Bombing Survey Summary Report (European War)* [online] Washington D.C., 15 Sep 1945, p. 5 [cit. 2012-04-15]. Available from: <http://www.anesi.com/ussbs02.htm>

¹⁷ Assuming Gaussian distribution of the bombs' dispersion, we get for these WWII data CEP=530 m. Assuming another extreme of the uniform distribution yields CEP=475 m. The difference is not too big, and we took a round number in the middle.

¹⁸ SS-26 Stone / Iskander [online] 2012 [cit. 2012-04-15]. Available from: <http://warfare.ru/?lang=&linkid=1769&catid=363>

kilometer of distance is often assumed (see, e.g., the report of Toukan and Cordesman).¹⁹ With a distance to target of 500 km or above, the estimated CEP is above the WWII value.

Due to the reasons described above, the number of 300,000 deaths in a democratic country should be considered as a reasonable worst case outcome of a large-scale nuclear conflict with a rogue state. It is anticipated that well-prepared civil defense measures based on rather simple presently known techniques, would considerably decrease these numbers, as will be discussed later.

An additional consideration should be mentioned. In a conventional war, most casualties are military. In a nuclear war, most casualties are expected to be civilian (the same is usually correct for terrorist activity). The structure of the military and the civilian casualties is very different. While military casualties naturally target young and most active men (and partially women), civilian casualties are more or less equally distributed within the entire population, being more pronounced with the elderly or disabled. Young and active people are more prone to evacuate, perform civil defense actions and just survive in case of injury. Though certain parties will declare this consideration to be cynical, it should not be discarded as pointless.

Nuclear radiation hazard: facts against myths

The albeit technical but extremely relevant question of the consequences of nuclear radiation must be addressed in this context. It is often argued that the fallout effects of even the limited use of nuclear weapons would be world-wide and would last for generations. This is an exaggeration. The certain deterministic consequences of exposure to high doses of nuclear radiation – radiation injuries – are very real and well-established, but limited to a relatively small area (at most several tens of square kms for a 20-KT weapon). Estimations show that the casualties' toll from the fallout is within the anyhow large uncertainty of the overall toll. The extent of highly dreaded cancers and mutations (“stochastic” effects) as a result of exposure to low doses of radiation is debatable. Present predictions are usually based on the so-called linear no-threshold (LNT) model. While many people still believe in LNT, the fact remains that this model is not backed by solid science or by expert consensus.²⁰ Both the US Health Physics Society and the American Nuclear Society claim that LNT cannot be used for quantitatively estimating damage from radiation below some reasonable threshold.²¹ The following facts speak for themselves.

- In Japan, less than 1,000 excess cancer cases (i.e. above the natural occurrence) were recorded in over 100,000 survivors over the past 60 years²² – compared with about 110,000 immediate fatalities in the two atomic bombings. No clinical or even sub-clinical effects were discovered in the survivors' offspring.²³
- In the Chernobyl-affected area, only 15 cancer deaths (while LNT predicted above 4,000) may be directly attributed to fallout radiation. No radiation-related increase in congenital formations was recorded.²⁴

¹⁹ TOUKAN, Abdullah and Anthony CORDESMAN, Iran, Israel and the Effects of a Nuclear Conflict in the Middle East [online]. *Center for Strategic and International Studies*, 2009, p.18 [cit. 2012-04-15]. Available from: <http://csis.org/publication/iran-israel-and-effects-nuclear-conflict-middle-east>

²⁰ *The Effects of Nuclear War*, Office of Technology Assessment, Congress of the United States 1979. London: Croom Helm, 1980, p. 111.

²¹ Radiation Risk at Perspective. Position statement PS010-1 [online], *Health Physics Society*, 2004, [cit. 2012-04-15]. Available from: http://hps.org/documents/risk_ps010-1.pdf

Health Effects of Low-Level Radiation – Position statement 41 [online], *American Nuclear Society* 2001, [cit. 2012-04-15]. Available from: <http://www.ans.org/pi/ps/docs/ps41.pdf>

²² *A Brief Description of the Radiation Effects Research Foundation*, Hiroshima : Letterpress Co., Ltd., 2008, p. 14, 17. Available from: <http://www.nerf.jp/shared/briefdescript/briefdescript.pdf>

²³ *Ibid.*, p. 30.

²⁴ *Chernobyl's Legacy: Health, Environmental and Socio-Economic Impacts and Recommendations to the Governments of Belarus, the Russian Federation and Ukraine*. Vienna : International Atomic Energy Agency, 2006, p. 16, 20. Available from: <http://www.iaea.org/Publications/Booklets/Chernobyl/chernobyl.pdf>

- As for 2006, no conclusion could be drawn concerning the presence or absence of a radiation-related excess of cancer – particularly leukemia – among Chernobyl accident recovery workers, who received rather high well-documented radiation doses.²⁵
- In most of the nuclear industry worker studies, rates for all causes and all cancer mortality among the workers were substantially lower than in the reference populations.²⁶

The last little-spoken fact and many other studies comprise emerging (though not yet conclusive) scientific evidence, suggesting that low doses of nuclear radiation are beneficial to human health (“radiation hormesis”).²⁷ Just as ultraviolet radiation (also a form of ionizing radiation) is clearly beneficial in low doses (sun tanning) while high doses are certainly harmful (sunburns and skin cancer). Therefore, as already mentioned above, it seems logical that the current overestimation of radiation hazards – “radiophobia” – will dissipate in the wake of the first large-scale radiological or nuclear attack.

Nuclear conflict – scenarios

The amassing of a significant above-threshold nuclear arsenal by an irresponsible government seems improbable. The more likely scenario is that it would either use its nuclear capability at the first opportunity, or become responsible or at least rational. The question of rationality is not necessarily connected to the question of democracy, as attested to by the world’s experience with the USSR over a period of 40 years.

The term “rationality” used here in the meaning, that “*a person’s behavior is rational if it is in his best interests, given his information.*”²⁸ I.e. rationality assumes the decision makers’ ability to maximize their utility.²⁹ It means that decision maker is a subject able to compare various “baskets” filled with “sets of goods” under a set of externally-imposed budget constraints – including the constraint on scarce and high value informational resources. The “set of goods” can include prestige, power, self-appraisal, desire for distinction, etc., besides easy measurable goods that “money could buy”. The approach to rationality in political sciences is more or less compatible with that in economics, though different terminology is sometimes used (like “realist behavior”, “trait of domination” – see Thayer).³⁰ A common error is to treat rational behavior of adversaries in their best interests as irrational – if *their* interests contradict *our* values. E.g., the horrific Khmer Rouge genocide in Cambodia was the result of a rational well-thought policy. In the case of USSR during the Cold War, the credible threat of assured destruction can be interpreted as a budget constraint preventing Soviet leaders’ attempts to dominate the World.

We do not imply that a rational government would never initiate nuclear aggression. We claim, rather, that such a decision would be based on careful and rational, though probably erroneous, judgments. E.g., it was reasonably argued that Japan would probably never have attacked Pearl Harbor

²⁵ *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII – Phase 2*. Washington DC : The National Academies Press, 2006, p. 204. ISBN 0-309-09156-X. Available from: http://www.nap.edu/catalog.php?record_id=11340

²⁶ *Ibid.*, p. 194.

²⁷ CUTTLER, Jerry M. and Myron POLLYCOVE, Nuclear Energy and Health: and the Benefits of Low-Dose Radiation Hormesis, *Dose-Response* [online], 2009, vol. 7 no. 1 pp. 52-89. ISSN: 1559-3258 [cit. 2012-04-15]. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2664640/pdf/drp-07-052.pdf>

²⁸ AUMANN, Israel (Robert), Nobel Prize Lecture 2005 [online]. *The Nobel Prize*, 2005 [cit. 2012-04-15]. Available from: http://www.nobelprize.org/nobel_prizes/economics/laureates/2005/aumann-lecture.html

²⁹ BECKER, Gary S., *The Economic Approach to Human Behavior*, Chicago: University of Chicago Press, 1978, p. 145. ISBN-10: 0226041123.

³⁰ THAYER, Bradley A., *Bringing in Darwin: Evolutionary Theory, Realism, and International Politics*, *International Security*, 2000, vol. 25, no. 2, pp. 124-151.

had they not incorrectly assessed the determination of the United States to wage war until victory when attacked.³¹

For some leaders, the scenario of escalation of a conflict to the employment of nuclear weapons at some later stage cannot be totally excluded and dismissed as totally unlikely – especially in the case that an actor begins losing a conventional war and is ready to escalate because the perspectives of regime or his own survival are dim. However, the probability of such escalation seems to us low. If particular rogue state sees nuclear weapons as viable means to win the war, it should probably use them from the very beginning to take the advantage of a sudden strike. If it does not, the use of nuclear weapons is an act of despair in view of the imminent defeat. In such circumstances, the entire command hierarchy responsible for the use of nuclear weapons should realize that they personally have no chances of survival – be it devastating retaliatory strike or post-war trial like in Nuremberg. And each level of the command hierarchy is capable to block the actual use of nuclear weapons. In this context it is not accidental that Hitler did not order to use chemical weapons already realizing that he had nothing to lose: most probably this order would not have been carried.

Nuclear conflict – outcome

Let us now consider a state-scale nuclear warfare. According to the popular perception, there would be no winners in such a conflict, as implied by the term “Mutual Assured Destruction” (MAD). It is believed that the MAD concept was central to the nuclear standing of the two super-powers during the Cold War, however this is not exact. While the US scientists and intelligence believed in MAD, the USSR certainly considered the possibility of victory in a full-scale nuclear war and acted accordingly.³² We shall not discuss the question (fortunately a historical one) of MAD between super-powers – though Herman Kahn reasonably claimed that even in the case of all-out nuclear interchange of 5,000 MT from each side, “*life would go on*” and it would be possible to rebuild the destroyed cities in about 10 years.³³ With reference to a possible regional nuclear conflict between a rogue state and a democratic one, the no-winner scenario is probably false. An analysis by Anthony Cordesman et al. regarding a possible Israel-Iran nuclear conflict estimated that while Israel might survive an Iranian nuclear blow, Iran would certainly not survive as an organized society.³⁴ Even though the projected casualties cited in that study seem to us overstated, especially as regards Israel, the conclusion rings true. The same may be probably implied regarding possible Indo-Pakistan nuclear conflict: while India would survive the Pakistan's nuclear blow, Pakistan – facing serious problems even without nuclear conflict – would certainly not survive as an organized society. The fact that India would probably suffer much higher absolute losses should not alter this assumption, taking into account the country's huge potential in manpower.

Also in general, citizens of democratic societies believe in their values and trust their government, and are thus more likely to be motivated and determined to fight.³⁵ There is, however, an additional aspect specific to nuclear warfare which favors democracy. In a nuclear conflict, due to the extremely high intensity of fighting and extensive damage to infrastructure, the central government can be expected to lose its ability to govern and maintain direct control already during the early stages of the conflict. This was *not* the case during WWII until the very end. This in turn means that people's ability

³¹ *United States Strategic Bombing Survey Summary Report (Pacific War)*, Washington D.C., 1 July 1946, p. 32. Available from: <http://www.anesi.com/ussbs01.htm>

³² PIPES, Richard, *Vixi: Memoirs of a Non-Belonger*, Yale University Press, New Haven and London, 2003, p. 132-144.

³³ KAHN, Herman, *On Thermonuclear War*, Princeton : Princeton University Press 1960.

KAHN, Herman, *The Nature and Feasibility of War and Deterrence*, Santa Monica CA : RAND Corporation Paper P-1888-RC, 1960. Available from: <http://www.rand.org/pubs/papers/P1888.html>.

³⁴ CORDESMAN, Anthony, Iran, Israel, and Nuclear War [online], *Center for Strategic and International Studies*, 2007, p. 31 [cit. 2012-04-15]. Available from: http://csis.org/files/media/csis/pubs/071119_iran.is&nuclearwar.pdf

³⁵ SOCOL, Yehoshua and Moshe YANOVSKIY, Nuclear Proliferation and Democracy, *American Thinker* [online], 2011-01-02 [cit. 2012-04-15]. Available from: http://www.americanthinker.com/2011/01/nuclear_proliferation_and_demo.html

to make decisions and act independently, their devotion to their mission in the absence of direct commands and the fear of immediate punishment, is of a primary importance.

Due to the extreme high-intensity (“above-conventional”) of nuclear conflict, it is nearly certain that such a war, no matter what will be its outcome, would not last for years as we have become accustomed to in some current low-intensity conflicts. Rather we should anticipate a new geo-political reality: the emergence of clear winners and losers within several days or at most weeks after the initial outbreak of hostilities. This latter reality will most probably contain fewer nuclear-possessing states than the former.

A country emerging victorious from a nuclear warfare, even having suffered extremely high losses, is anticipated to not only gain territory, but also to attain extremely high international standing and credibility, which would then translate into massive international investment. As a consequence, extensive destruction and economic damage may be repaired rather quickly, as was the case, ironically, in post-war Germany and Japan.

ASPECTS OF NUCLEAR WARFARE

Targeting Doctrine

The targeting doctrine of a democratic state involved in a nuclear warfare requires careful consideration. There can be little doubt that terrorists or rogue states will target population centers, correctly assessing that human life is the highest value in a democratic society, and that by destroying lives they will inflict the greatest damage. The correct response is not necessarily symmetric. As the aim is to inflict the greatest damage to the aggressor, in order to achieve this we must play our game, not theirs. A tyranny is relatively insensible to the loss of human life, unless the affected population constitutes its power base. On the other hand, dictator's paramount concern is his continued ability to prosecute his act of aggression. This last argument is extremely important for choosing target areas: while the areas of dictator's support should be targeted, the opposition areas should be spared as much as possible. In this context, targeting objects of symbolic value to the aggressor, as described above in the section on nuclear terror, should be also seriously considered. Destruction of such objects will signal to people of the rogue state and its allies, that the aggressor is not as strong as it claims.

Speaking about defeating aggressor with serious industrial infrastructure, it is extremely instructive to consider the Allied experience in World War II:

“The importance of careful selection of targets for air attack is emphasized by the German experience. The Germans were far more concerned over attacks on one or more of their basic industries and services – their oil, chemical, or steel industries or their power or transportation networks – than they were over attacks on their armament industry or the city areas. The most serious attacks were those which destroyed the industry or service which most indispensably served other industries. The Germans found it clearly more important to devise measures for the protection of basic industries and services than for the protection of factories turning out finished products.”³⁶

The question of targeting is surely connected with the question of available means and capabilities, and also current nuclear strategies and postures of nuclear weapon states. These are closely interrelated. The detailed consideration of this question is beyond the scope of this paper, but one statement can be made. No matter what means are available, basic infrastructures, big enough and positioned at well-known places, are always much more vulnerable than military objects and population (which can be evacuated or sheltered). Therefore the list of high-priority targets of more than half a century ago – oil, power stations, transportation etc. – needs to be carefully studied by relevant agencies. Direct attack against nuclear facilities – almost certainly heavily protected and widely distributed – may well be ill advised.

³⁶ *United States Strategic Bombing Survey Summary report (European War)*, ref. 16, p.16.

Active missile defense – pro and contra

Clearly, the ideal defense against nuclear attack is to intercept all enemy missiles. This solution, however, may be not feasible. As US Strategic Bombing Survey put it,³⁷

“It would be rash ... to predict an increase in the effectiveness of defensive control sufficient to insure that not a single enemy plane or guided missile will be able to penetrate. It therefore behooves us to accept the possibility that at least a small number of enemy planes or guided missiles may be able to evade all our defenses and to attack any objective within range.”

Moreover, the optimal reaction by an adversary to costly missile defense (MD) is further military buildup and arms race, where the adversary has cheaper options – acquisition of more missiles. Really, as the history of the Cold War shows us, it was not always so: the Soviet response to the US Strategic Defense Initiative (SDI) was symmetric. Their symmetric response posed a great challenge, adversely impacted their economy and is considered to be one of the main factors contributing to the collapse of the USSR (in that SDI, failing to come even close to its design goals, became a fascinating example of how a tactical fiasco can turn into a great strategic victory). However, the Soviet decision to take symmetric response was probably caused by special interests and competition for budget resources – professionally speaking, it was just nonsense. One of the authors (M.Y.), being directly involved in that symmetric response in the 1980's, heard many off-the-record confessions that the above opinion was true. Such budget competition actually restricts if not undermines rational optimization possibility under military strategy choice process. While such behavior is not uncommon (as described, e.g., by William Niskanen),³⁸ we cannot assume that the adversary will always take non-optimal decisions (as we would probably wish).

Taking particular numbers, the price of the *Iron Dome* MD interceptor (Israel) – probably up to 90 k\$³⁹ – may be two orders of magnitude higher than that of the intercepted Qassam rocket.⁴⁰ Even if we assume that the adversary's military budget is only 10% of ours, the missile offense-defense race favors him by far. And we should also take into account, that for rogue states military budget stake in the national economy is usually by large higher than in democratic countries. Not accidentally, Robert Harney of the US Naval Postgraduate School writes:

“The United States should give careful consideration to implementing any National Missile Defense beyond that needed to defend against the minimal threat (terrorist, renegade, or accidental launches). Any capability beyond the minimum may inspire an adversary to engage in a one-missile-for-one-interceptor arms escalation that could favor the adversary from an economic perspective.”⁴¹

The proponents of active missile defense often argue, that layered and well developed MD systems requires more sophisticated (to penetrate the system) and logically more costly systems, and can therefore, at least hypothetically, dissuade an adversary from further buildup. However, most of the missiles, aimed on saturating the missile defense rather than on actual hitting targets, will be relatively very cheap since they should neither carry warhead nor have good accuracy.

Recent hostilities in Israel provide a good case. The *Iron Dome* MD operation was a considerable tactical success. In March 2012, e.g., it intercepted above 75% (56 out of 73) intended targets,⁴² remarkably decreasing direct material losses. We should mention, however, that no salvos saturating the *Iron Dome* were fired – in such case there are all reasons to expect that the MD efficacy would be

³⁷ *United States Strategic Bombing Survey Summary Report (Pacific War)*, ref. 31, p. 30.

³⁸ NISKANEN, William, *Bureaucracy and Representative Government*, Chicago: Aldine-Atherton, 1971. 241 p.

³⁹ SHARP, Jeremy M., *U.S. Foreign Aid to Israel*, Washington DC : Congressional Research Service RL33222, p. 11. [cit. 2012-03-12]. Available from: <http://www.fas.org/sgp/crs/mideast/RL33222.pdf>

⁴⁰ What are Qassam Rockets? *The Jewish Policy Center, Washington DC* [online] 2012 [cit. 2012-04-15]. Available from: <http://www.jewishpolicycenter.org/prr/qassams.php>

⁴¹ HARNEY, Robert C. *The Enemy's Access Denial System: Potential Competitor Exploitation of U. S. Military Vulnerabilities*, Monterey CA : Naval Postgraduate School, 2000, p. 31. (Report # NPS-JW-01-014)

⁴² Several more rockets fired at Israel, IAF targets terror sites. Israel Defense Forces Website [online], 14/03/2012 [cit. 2012-04-15]. Available from: <http://www.idf.il/1086-15253-EN/Dover.aspx>

lower. It is more difficult to speak about life saving, since statistically these *Qassam* and *Grad* missiles have efficiency of slightly above 1 killed per 100 missiles (according to the results of the 2006 Lebanon War).

Strategically, however, the *Iron Dome* efficiency – as it is used now – can be questioned. The *Iron Dome* failed to be an alternative to a major ground offensive action – see e.g. the analysis of Uzi Rubin⁴³ (since Rubin – the developer of the *Arrow* MD system – is a natural MD supporter, his confession is especially worthy). In the present Israeli case, the main damage is caused probably not by the missiles themselves, but by the disruption of the life routine due to alarms, cancellation of economic activity, public events etc. The latter disruption could have been eliminated, under the present doctrine, only by unreachable 100% MD effectiveness. In that sense we believe that the effect of the *Iron Dome* on the conflict evolution is minor.

Passive, or Civil Defense – pro and contra

On the other hand, civil defense can be expected to be extremely efficient. The US Strategic Bombing Survey (SBS) report, compiled at the onset of the nuclear age and based on the initial data collected after the use of nuclear weapons against Japan, reached conclusion that passive defense can decrease the number of casualties by factor of 20 or more⁴⁴ – which can easily be the difference between victory and collapse.

The above estimation of civil defense efficiency factor as 20-fold, should be considered as a conservative rather than optimistic. This is demonstrated by the following simple calculation. Let us first consider the best available protection – underground shelter. For 20-KT nuclear explosion, such shelter is destroyed and all its inhabitants die at distance of no more than about 200 m from the explosion point.⁴⁵ At larger distances, the shelter suffers at most light damage with near-zero casualties. On the other extreme, of no civil defense actions at all (out-of-the-blue strike) as it was with the two nuclear bombings of Japan, the distance of 50% mortality was estimated as 1,300 m.⁴⁶ For the purpose of rough estimation let us assume that all people closer than 1,300 m are killed, while all the rest are spared (this assumption fits well the estimation, made by the British mission to Japan in 1946,⁴⁷ that the total number of killed by an out-of-the-blue Hiroshima-scale nuclear strike in London will be about 50,000). Then the surface of 1,300-m-radius circle (those killed in case of no civil defense) is larger than the surface of 200-m-radius circle (those killed in case of fully-employed civil defense) by the factor of about 40 (since $[1,300/200]^2 > 40$). And this is before we speak about progressive evacuation and dispersion.

Still years later, the value of civil defense was questioned, culminating probably in an ambivalent and implicitly unfavorable chapter in the report prepared by the US Congress Office of Technology Assessment (OTA) in 1979.⁴⁸ The OTA cited many technical problems pertaining to civil defense but, the truth to be said, failed to pinpoint any unsolvable problems.

The OTA analysis was based on two implicit assumptions: 1) No long-term civil defense effort will be made. 2) In case of nuclear emergency, social order will collapse as soon as the government fails to provide enough consumables and police. Both assumptions are at least questionable. Long-term civil defense planning during peacetime is essential, as stressed already in the original SBS report cited above. The OTA concluded, for example, that “*the installation of shelters in new construction, or “slanting”, is preferable [to adding shelters to existing buildings], but could take as long as 20 years.*” Had the “slanting” program been started in the wake of that report, it would have been completed

⁴³ RUBIN, Uzi, *Iron Dome in Action: A Preliminary Evaluation*.

⁴⁴ *United States Strategic Bombing Survey (Pacific War)*, ref. 31, p. 30.

⁴⁵ GLASSTONE, Samuel, ref. 13, sec. 3.73 and 5.160.

⁴⁶ GLASSTONE, Samuel, ref. 13, sec. 12.17.

⁴⁷ *The Effects of the Atomic Bombs at Hiroshima and Nagasaki: Report of the British Mission to Japan*, London : HMSO, 1946, p. 19.

⁴⁸ *The Effects of Nuclear War*, ref. 20, p. 49-50.

10 years ago; in practice, little if any effort was made. As for the assumption of a relatively immediate collapse of social order – this is actually an unfounded accusation leveled at democratic societies which contradicts the documented experience. E.g., during the recent 2006 Lebanon War, government agencies performed with questionable efficiency in the north of Israel, yet despite this there was not even the slightest sign of a collapse of social order. (In fact, a number of NGOs proved to be much more efficient at providing essential services). More generally, historical experience shows that private initiative really proves to be efficient and competitive even in some niches of pure public goods – private security, local needs to maintain legal order under emergency, self-defense based on the 2-nd Amendment right, and even outstanding cost-efficiency of some intelligence operations, like Simon Wiesenthal's Nazi hunting.⁴⁹

The main reservation of the OTA report regarding civil defense was that “*some observers...argue that a vigorous civil defense program would induce people to believe that a nuclear war was “survivable” rather than “unthinkable”, and that such a change in attitude would increase the risk of war.*” It seems obvious that today just the opposite is the case: by considering nuclear war “unthinkable”, democratic societies actually provide terrorists and rogue states with an additional powerful incentive for increasing their nuclear capabilities, thus increasing the risk of war.

Civil Defense – main points

The mentioned above US Strategic Bombing Survey report stated back in 1946:⁵⁰

“The experience of both the Pacific and European wars emphasizes the extent to which civilian and other forms of passive defense can reduce a country's vulnerability to air attack. Civilian injuries and fatalities can be reduced, by presently known techniques, to one-twentieth or less of the casualties which would be suffered were these techniques not employed. This does not involve moving everything underground, but does involve a progressive evacuation, dispersal, warning, air-raid shelter, and post-raid emergency assistance program, the foundations for which can only be laid in peacetime. The analysis of the effects of the atomic bombs at Hiroshima and Nagasaki indicates that the above statement is just as true and much more terrifyingly significant in an age of atomic bombs than it was in an age of conventional weapons. Similarly, economic vulnerability can be enormously decreased by a well worked out program of stockpiles, dispersal and special construction of particularly significant segments of industry. Such a program in the economic field can also be worked out satisfactorily only in peacetime.”

Civil defense activities in democratic societies “*must have a personal emphasis, not just a governmental emphasis.*”⁵¹ In other words, it needs to be decentralized. The construction of shelters should, to a large extent, be the responsibility of citizenry and local government, with central government providing standards and incentives. Shelters should be dual-use for at least two reasons. Firstly, only continuous routine occupation guarantees that the shelter will be ready for emergency use; experience suggests that non-dual-use shelters tend to become filled with junk, flooded etc. Secondly, dual-use shelters are simply much cheaper. In private homes, basement floors (upgraded to very efficient shelters) may be routinely utilized for such things as home cinema systems, billiards and table-tennis.

It should be noted that Israel has much practical and very positive experience with protected spaces,⁵² demanded by law in every structure and every private apartment erected since the early 1990's. Such spaces in peace time serve the function of a standard room without significant loss of functionality. Only marginally increasing overall construction costs, they not only serve the direct purpose of providing protection from shells and missiles, but also significantly increase the ability of

⁴⁹ *Simon Wiesenthal Website* [online] 2012 [cit. 2012-04-15]. Available from: <http://www.wiesenthal.com>

⁵⁰ *United States Strategic Bombing Survey (Pacific War)*, ref. 31, p. 30.

⁵¹ HARNEY, Robert C., ref. 1, p. 16.

⁵² Israeli protective building standards (in Hebrew) [online]. *Architecture and building in Israel* [cit. 2012-04-15]. Available from: http://www.architecture.org.il/info_hokim_haga.php

structures to withstand seismic activity. The reality in Europe and other Western countries is, unfortunately, that civil defense is (traditionally) a rather neglected issue (except for probably Switzerland). Nevertheless, all big Western cities have well-developed underground infrastructure: subways, underground pedestrian crossings, underground parking lots etc. Most, if not all, such underground spaces can be upgraded to extremely efficient shelters with relative ease.

Finally, it should be noted that many civil defense measures yield considerable side benefits. Reinforcing buildings and infrastructures is beneficial not only in a nuclear warfare scenario, but also in cases of earthquake or tornado, not to mention “conventional” terror. For example: hardening electrical and electronic systems against electromagnetic pulse (EMP) increases costs by only 1-3%, but results in improved stability and performance.⁵³ And dual-use underground shelters in their routine use as subway stations, pedestrian crossings, parking lots, shopping centers etc. will significantly contribute to urban space and energy saving, and therefore environment preservation and general betterment of the society.

CONCLUSION

Concessions, gestures of a good will on the part of a democratic society, are seen as signs of weakness by totalitarian societies and lead only to an escalation of terror and aggression. A steadfast and determined stance – including the willingness and ability to suffer heavy losses, in both human and economic terms – is the price democratic societies must be willing to pay in order to effectively battle aggression at all levels. In the article, we considered two technical issues which are crucial for the security of a democratic society in a multi-polar nuclear world:

Targeting doctrine – targeting primarily rogue state infrastructure and objects of symbolic value, rather than its military objects.

Implementing a nation-wide but decentralized civil defense policy, based on dual-use installations.

Finally,⁵⁴

“...the best way to win a war is to prevent it from occurring... [T]his objective is well served by insuring the strength and the security of [our society. Our society] was founded and has since lived upon principles of tolerance, freedom, and good will at home and abroad. Strength based on these principles is no threat to world peace. Prevention of war will not come from neglect of strength or lack of foresight or alertness on our part. Those who contemplate evil and aggression find encouragement in such neglect.”

These words, written by officers who had just won the bloodiest war in history and ensured peace and security for decades to come, need to be taken to heart.

⁵³ FOSTER, John S. Jr. et al. Report of the Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack, Vol. 1: Executive report [online]. *The EMP Commission*, 2004 [cit. 2012-04-15]. Available from: http://www.empcommission.org/docs/empc_exec_rpt.pdf

⁵⁴ *United States Strategic Bombing Survey Summary Report (European War)*, ref. 16, p. 17.

