Chapter 5

The Decline of Combat Casualties: Trends and Implications

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War is the ultimatum confronting adversaries from a failure to resolve a political dispute peacefully with the tragic consequent loss of human life. While warfare has occupied most of civilized human history,[1] its nature has and continues to evolve. In the last hundred years, for example, as a somewhat simplistic but illustrative generalization, World War I could be considered a chemist's war, World War II a physicist's war, and the Cold War an intelligence war.[2] A significant portion of post-Cold War and future warfare might be aptly described as Grey War,[3] characterized by complexity, confusion, and above all, uncertainty as to the identity of the adversary. In Grey War, the adversaries' use of a mix of conventional weapons, asymmetrical threats, and irregular tactics challenge the operational effectiveness, ethics, and legality of countermeasures. Cyber attacks and disruptive social behavior add to the complexity of adversarial options.[4] In large part, these challenges have spawned the recognition of the *Human Domain* as the essential foundation for future joint force development.[5] Yet, despite these variations in the transformation of warfare, the loss of life remains a persistent feature of war.

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[1] John Keegan, *History of Warfare* (New York: First Vintage Press, 1993), p 123-125
[2] Sara B. King, "Military Social Influence in the Global Information Environment: A Civilian Primer," *Analyses of Social Issues and Public Policy* 18, no. 1 (Dec 2011), 1-26
[3] Peter Tikuisis, Fred Buick, Andrea Hawton et al., "Futuristic Outlook on Human-Centric S&T," DRDC Toronto TM 2013-060 (Toronto Research Centre, ON, Defence R&D Canada, 2013)
[4] Frank G. Hoffman, "Hybrid vs. Compound war. The Janus choice: Defining Today's Multifaceted Conflict," *Armed Forces Journal* (Oct 2009): http://indianstrategicknowledgeonline.com/web/4198658.pdf
[5] Frank G. Hoffman and Michael C. Davies, "Joint Force 2020 and the Human Domain: Time for a New Conceptual Framework?" *Small Wars Journal* (Jun 2013): http://smallwarsjournal.com/print/14125

Casualties, however, are on the decline. Indeed, the number of deaths (civilian and military) in major conflicts has declined markedly over time[6] and has continued to do so even recently[7] with a further projected decline.[8] Although weapon lethality has steadily increased,[9] so have improvements in troop protection[10] and combat casualty care[11] that collectively have contributed to a marked decrease in troop casualties. Other more phenomenological factors such as the increasing reliance on technology for fighting at a distance, societal pressure for less bloodshed, and the evolutionary shift from kinetic to non-kinetic warfare are also contributing to fewer casualties. This chapter focuses on this trend by examining the chronological decline of combat troop casualties.[12] It investigates whether current trends, primarily focused on US combat casualties, point to a future time when casualty numbers might no longer be a significant determinate of conflict termination, especially with unpopular interventions.[13] The implicit assumption is that wars paid only in treasure, rather than blood, should be more politically acceptable and sustainable.

Methodology

The appropriate unit of measure of combat casualties is not trivial. Casualty rates are sometimes simply reported as the percentage of the troops that served[14] and are occasionally reported as a

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[6] Steven Pinker, *The Better Angels of Our Nature: Why Violence Has Declined* (New York, NY, Viking, 2011), p 297-305

[7] Peter Tikuisis and David R. Mandel, "Is the World Deteriorating? *Global Governance* 21 (Feb 2014): 9 – 14; Bethany Lacina, "Explaining the Severity of Civil Wars," *Journal of Conflict Resolution* 50, no. 2 (Apr 2006), 276-289

[8] Håvard Hegre, Joakim Karlsen, Håvard Mokleiv Nygård, Håvard Strand, and Henrik Urdal, "Predicting Armed Conflict, 2011–2050", *International Studies Quarterly* 57, no. 2(2013), 250-270

[9] e.g., Lethality and Casualties**:** http://www.au.af.mil/au/awc/awcgate/gabrmetz/gabr0022.htm

[10] See for example Bob Reinert, "Bringing Immediate Protection to Soldiers," (U.S. Army, Feb 2012): http://www.army.mil/article/73818/Bringing_immediate_protection_to_Soldiers/

[11] John B. Holcomb, Lynn G. Stansbury, Howard R. Champion et al., "Understanding Combat Casualty Care Statistics," *Journal of Trauma - Injury Infection & Critical Care* 60, no. 2 (Feb 2006), 397-401

[12] Herein casualties refer to military deaths.

[13] Christopher Gelpi, Peter D. Feaver, and Jason Reifler, "Success Matters: Casualty Sensitivity and the War in Iraq," *International Security* 30, no. 3 (Winter 2006), 7-46

[14] Marcus Baram, "Overall, Afghanistan More Lethal For U.S. Soldiers Than Iraq," The World Post (2011): http://www.huffingtonpost.com/2009/10/15/overall-afghanistan-more_n_319194.html

percentage of the home nation population. However, neither of these metrics is sufficiently informative since the number of casualties per conflict can vary widely depending on the size of the force, and on the duration and intensity of the conflict. Indeed, Kuhn has suggested that force size, which has generally declined since WWII,[15] conflict duration, and operational scenarios should all be factored into any meaningful expression describing casualty rates.

One approach is to express the number of casualties per total number of troops served over the duration of the conflict, yet this metric is also potentially ambiguous. For example, suppose that 100 casualties occurred in the first year of a conflict involving 10,000 troops for a casualty rate of 10 per 1,000 troops per year (1%). If the conflict extended for another year with an additional 150 casualties among 15,000 replacement troops, then the casualty rate suggested above would be 250/25,000 troops/2 years = 5 per 1000 troops per year (0.5%), or half the single year rate even though the ratio of casualties to number of troops per year is unchanged. This ambiguity is due to the division of the total number of troops irrespective of how long they served.

A better ratio would be the total number of casualties divided by the total number of troop-years. To borrow from the above example, the sum of troop-years equals 25,000 (i.e., 10,000 + 15,000) for a resultant casualty rate of 1% per troop-year.[16] Unfortunately, however, reliable historical data on troop-years are scarce.

An alternative approach adopted herein is to normalize the average number of casualties per year by the peak number of troops served, which is more readily available and invariant to how long all troops served in the conflict. Using the above example once again, this metric would yield a casualty rate of 250/15,000 peak number of troops/2 years = 8.3 per 1,000 peak number of

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[15] Kuhn, 1992. Total US troops per population have declined steadily by approximately 70% since 1955: http://www.vetfriends.com/US-deployments-overseas/historical-military-troop-data.cfm

[16] More complicated mixtures of troop numbers, duration, and casualties than used in the text example would demonstrate that the troop-year normalization generally yields a different casualty rate than simply dividing the total number of casualties by the total number of troops. Specifically, the former yields a higher rate than the latter if troops served less than one year and a lower rate if otherwise.

troops per year (0.83%) with the understanding that this value is generally lower than that obtained by normalizing the total number of casualties by the sum of troop-years, if known.[17] We use the metric involving peak troop number to define the casualty troop ratio (CT Ratio). It is also understood that the number of troops involved in actual combat is usually a small fraction of the total number deployed, which will add variability to the analysis. However, to minimize this variability, we limit our analysis to military interventions since the Second World War conducted by a single nation (the US in this case) involving combat troops.

Using the above metric, the chronological trend of combat casualties suggests a reduction over time that, if reliable, points to a future convergence of the CT Ratio to unity.[18] Consequent policy implications, not of the convergence itself, but of its underlying causes are considerable, potentially reflecting a greater reliance on technology to replace human combatants with alternative means of conducting 'hard' warfare concomitant with changes in operational doctrine. The purpose of this study is to present an analysis of this decreasing casualty trend with a specific focus on US combat casualties in major military interventions since WWII.

Data

US combat casualty data were obtained from the *Military Intervention by Powerful States* (MIPS) database.[19] The selection of cases was based solely on whether ground combat was the primary type of force used (i.e., where "the intervening state deployed more than 2,000 combat-ready

[17] For example, suppose in a 2 year conflict that 5 rotations of 1,500 troops each served 8 months in overlapping periods such that 1,500 served in the first 8 months, the second deployment of 1,500 troops began serving 4 months later, etc. until the final deployment of 1,500 troops began after 16 months. The total number of troops served would be 7,500, the peak number of troops would be 3,000, and the sum of troop-years would be 5,000. Suppose further that each rotation suffered 1 casualty per month during their 8 month deployment for an overall total of 40 casualties. The net casualty rates would then be 0.53% per 1,000 troops served, 0.67% per 1,000 peak troops per year, and 0.80% per troop-year.

[18] Convergence can be gauged in numerous ways; herein we refer to one casualty per thousand peak number of troops per year of conflict. Projection to zero casualties is not considered a realistic option.

[19] Patricia L. Sullivan, "War Aims and War Outcomes: Why Powerful States Lose Limited Wars," *Journal of Conflict Resolution* 51, no. 3 (Jun 2007), 496-524: http://thedata.harvard.edu/dvn/dv/tsulli/faces/study/StudyPage.xhtml?globalId=hdl:1902.1/15519

troops and conducted ground combat operations"). Fourteen interventions between World War II and 2003 qualified,[20] however, three interventions were excluded and one was updated for this study. Two of the three interventions (Operation Blue Bat 1958 Lebanon and Operation Uphold Democracy 1994-95 Haiti) were excluded since no combat actually took place. The third case of Lebanon (1982-84) was excluded from the analysis since the vast majority of casualties were the result of a suicide bombing (Beirut, 23 Oct 1983). Operation Enduring Freedom (OEF, 2001 Afghanistan) was updated to include recent data. Finally, Operations Iraqi Freedom (OIF) and New Dawn (OND) in Iraq were combined and added to the analysis as a single case. Table 1 provides descriptions of the final twelve selected US interventions including the peak number of troops deployed, the duration of the intervention, and the total number of troop casualties.

Table 1. Peak number of troops, conflict duration, casualties, and CT Ratio

Case	Year(s)	Location	Troops (peak)	Duration (days)	Total Casualties	CT Ratio	ln CT Ratio
1	1950	South Korea	340,833	96	5,145	57.4	4.05
2	1950-53	North Korea	440,000	1,030	32,000	25.8	3.25
3	1962-73	Vietnam	543,482	4,013	58,209	9.7	2.28
4	1962	Thailand	5,000	68	243	260.9	5.56
5	1965-66	Dominican Rep	20,463	510	47	1.6	0.50
6	1983	Grenada	7,355	48	19	19.6	2.98
7	1989-90	Panama	27,500	42	26	8.2	2.11
8	1991	Kuwait	541,425	43	269	4.2	1.44
9	1992-93	Somalia	30,000	152	14	1.1	0.11
10	1993	Somalia	4,000	241	29	11.0	2.40
11	2001-12	Afghanistan	109,200	4,103	2,160	1.8	0.57
12	2003-11	Iraq	218,500	3,208	4,400	2.3	0.83

Notes: Interventions were (Case 1) Korean War--defense of South, (2) Korean War--unification, (3) Second Indochina War, (4) Cease-fire Collapse: Nam Tha, Laos, (5) Op Power Pack, (6) Op Urgent Fury, (7) Op Just Cause, (8) Op Desert Storm, (9) Op Restore Hope--UNITAF, (10) Op Continue Hope--UNOSOM, (11) Op Enduring Freedom (although OEF continued beyond 2012, it was truncated for this analysis), and (12) Ops Iraqi Freedom and New Dawn.

[20] Database is limited to the period 1946 – 2003.

Analysis

Table 1 also provides the casualty troop ratio obtained by dividing the total number of casualties by the product of the peak number of troops served (in thousands) and the duration of the conflict (converted into years). Statistics of the campaign in Afghanistan were truncated to the end of 2012 for this analysis. Casualty statistics for Afghanistan and Iraq were obtained from Military Times.[21]

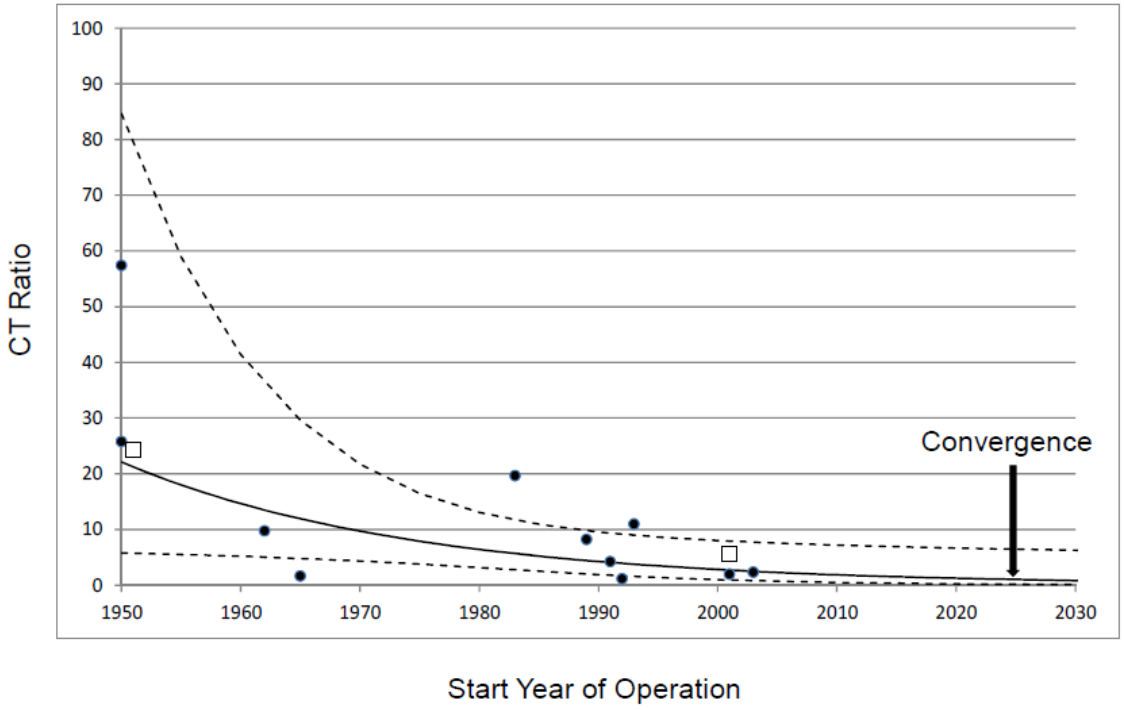
The logarithm of the CT Ratio (see Table 1) was regressed against the start year of the intervention. The resultant exponential fit ensured that any projection beyond the study period would remain above zero (i.e., it could only approach zero asymptotically). The 1962 intervention in Thailand (case 4) with an exceptionally high CT Ratio of 260.9, which is at least two orders of magnitude higher than the four lowest ratios, is considered an outlier and was excluded from the regression, although it is re-considered later on. The best fit with the remaining eleven cases is given by:

$$\text{CT Ratio} = e^{(83.46 - 0.0412 \cdot \text{start year})}; \qquad r = 0.632;\ p = 0.037$$

which extrapolates to a convergence of unity (i.e., CT Ratio = 1) in 2025. This is shown in Figure 1 where the CT Ratio is plotted against the start year of the intervention (see Table 1 for the closed circle data points; not shown is the data point for the 1962 intervention in Thailand). The half-period of the CT Ratio is 16.9 years[22] meaning that the ratio is reduced by half approximately every 17 years.

[21] http://projects.militarytimes.com/valor
[22] Obtained by the ratio of $ln2/0.0412$.

Figure 1. CT Ratio over time



Notes: The solid line is the regressed/projected CT Ratio and the dashed lines depict the 95% confidence interval. 'Convergence' indicates the year (2025) when the CT Ratio is projected to reach unity. Canadian CT Ratios for the Korean (1951) and Afghanistan (2001) campaigns are indicated by the open squares.

For comparative purposes, the number of casualties per year per home population (taken at the start of the intervention) was similarly regressed with the significant result (and caveats) that 1 combat death per year per 100,000 capita is projected in 2016 with a half-period of 8.2 years. This accelerated rate compared to the reduction in above CT rate is attributed to population growth.[23]

The open squares in Figure 1 show the CT Ratios for two Canadian combat operations, Korea (Feb 1951 – Jul 1953) and Afghanistan (Dec 2001 – Jul 2011) to demonstrate similarity to the US casualty trend. These CT Ratios are approximately 25.4 (516 casualties[24]/8123 peak

[23] United States Census Bureau: http://www.census.gov/ipc
[24] Canadians in Korea: http://www.korean-war.com/canada.html

troops[25]/2.5 years[26]) for the Korean campaign and 5.6 (158 casualties/2922 peak troops/9.7 years) for the Afghanistan campaign.[27] Both ratios fall within the 95% confidence interval of the US values.

Discussion

Notwithstanding the small sample size of data used in this study and the rather large confidence interval of the data fit, the implication of this finding is profound, as it suggests that US casualties involving major combat operations is trending to a reduction of less than one per thousand peak number of troops per year of conflict after 2025. Additional data or different data selection criteria would undoubtedly alter the quantitative findings,[28] but not likely the qualitative conclusion of a progressive geometric reduction in casualties. Even a crude metric such as the number of combat casualties per year per home population indicates a significant geometric reduction.

Although this study has focused on US combat interventions, the above conclusion of combat troop casualty reduction pertains to all modern forces of advanced nations, noting in particular that the Canadian CT Ratios for the Korean and Afghanistan campaigns both fall within the confidence interval of the US CT Ratio (see Figure 1).

That is, combat casualties of future interventions similar in scale to those analyzed herein should also trend downwards to a convergence of a unit CT Ratio, albeit at different rates and endpoints. In other words, while operational intensity in certain cases might skew or dislocate the downward trend, it is unlikely to reverse it.

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[25] Herbert F. Wood, "Strange Battleground: The Operations in Korea and Their Effects on the Defence Policy of Canada," (Ottawa, Canada, National Defence, Queen's Printer and Controller of Stationary, 1966), p 70, 276, and 286

[26] Based on first contact in Feb 1951 until armistice in Jul 1953 (Wood 1966)

[27] CBC: http://www.cbc.ca/news2/interactives/canada-afghanistan-casualties/

[28] e.g., Inclusion of the 1962 intervention in Thailand would result in a projected CT Ratio of less than one after 2019.

A viable exception is the possibility of war between peer powers, which falls outside the parameters of this analysis. However, it is plausible that the CT Ratio might still be low even if large troop numbers are involved. That is, while total casualties between major peer adversaries could be high, their numbers compared to peak troop numbers might be relatively low due to continued advancements in force preparation, protection, and casualty care.

Indeed, emerging technologies can further improve combatant performance, both physical and mental, and survivability.[29] Examples include i) counteracting fatigue and stress through advancements in biochronicity, pharmaceuticals, and genomics; ii) more effective training through virtual and immersive technologies;[30] iii) man-machine interfacing and physical/ physiological enhancements; iv) modelling and training of critical and adaptive thinking in complex situations;[31] and v) improving battlefield survivability (e.g., tissue engineering to speed the healing process).[32]

Such advancements will continue to contribute to the reduction of combat casualties in parallel to a continued decline in troop deployment. US overseas troop deployments[33] normalized by the nation's population have decreased by approximately 70% since 1955. Coincident with this marked reduction is an increased public awareness of conflict casualties, especially in an era of immediate global media coverage of violent conflicts and their *i*-dissemination via social networks. High casualty levels are increasingly intolerable in protracted and unpopular

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[29] Committee on Assessing Foreign Technology Development in Human Performance Modification 2012; Academy of Medical Sciences 2012; Kenneth Ford and Clark Glymour, "The Enhanced Warfighter," *Bulletin of the Atomic Scientists* 70, no. 1 (2014), 43-53

[30] US Office of the Under Secretary of Defense (Personnel & Readiness) 2010 Kresimir Cosic, Sinisa Popoviv, Marko Horvat et al., "Virtual Reality Adaptive Stimulation in Stress Resistance Training," in NATO Science and Technology Organization RTO-MP-HFM-205 AC/323(HFM-205)TP/379, Mental Health and Well-being Across the Military Spectrum (Brussels, BE, 2011), p 4-1– 4-18

[31] Grisogono and Radenovic 2011 Anne-Marie Grisogono and Vanja Radenovic, "The Adaptive Stance—Steps Towards Teaching More Effective Complex Decision-making, (Quincy, MA, Eighth International Conference on Complex Systems, 2011), 714-728: http://necsi.edu/events/iccs2011/papers/177.pdf

[32] Anthony D. Metcalfe AD and Mark W.J. Ferguson, "Tissue Engineering of Replacement Skin: The Crossroads of Biomaterials, Wound Healing, Embryonic Development, Stem Cells and Regeneration," *Journal of the Royal Society Interface* 4, no. 14 (Jun 2007), 413-437

[33] See Stat Planet: http://www.vetfriends.com/US-deployments-overseas/historical-military-troop-data.cfm

conflicts.[34] Indeed, "… it is not so much the passage of time as the prevalence of a particular class of operation that explains the apparent recent low tolerance for casualties in U.S. military interventions".[35] Not surprisingly, the 2006 US counterinsurgency field manual stated that "at the strategic level, gaining and maintaining US public support for a protracted deployment is critical." [36] The current field manual states "Where the U.S. is supporting a host nation, long-term success requires supporting viable host-nation leaders and institutions that are legitimate and capable. The longer that process takes, the more U.S. public support will wane and the more the local population will question the legitimacy of their own forces and government."[37] Domestic audiences, especially in democracies - but not necessarily exclusive to them, are particularly influential during international interventions.

As Barron argues in his contribution to this volume,[38] weapons such as improvised explosive devices are employed not just to target US soldiers deployed to Iraq, but also to foment American public opinion to question the mission as casualties mount and are brought home. This connection between the soldier and the society they are charged to protect constitutes a major preoccupation for political leaders and is connected to a broader theme in this volume, namely the conditions that will impact the conduct of military interventions in the near future (next five to ten years).

Moreover, an analysis of a much larger dataset from which the present study relied upon revealed no relationship between intervention outcomes and military capability,[39] indicating that

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[34] Christopher Gelpi, Peter D. Feaver, and Jason Reifler, "Success Matters: Casualty Sensitivity and the War in Iraq," *International Security* 30, no. 3 (Winter 2006), 7-46; and Bob Martyn, 2015 (this volume, Chap 6)
[35] RAND: http://www.rand.org/pubs/research_briefs/RB2502/index1.html
[36] US Army, *FM 3-24/MCWP 3-33.5: Counterinsurgency* (Washington, DC, December 2006), p 1-24: http://www.militaryfieldmanuals.net/mwg-internal/de5fs23hu73ds/progress?id=sDaSRZkBxi
[37] US Army, *FM 3-24/MCWP 3-33.5: Insurgencies and Countering Insurgencies* (Washington, DC, May 2014), p 7-2: http://armypubs.army.mil/doctrine/DR_pubs/DR_a/pdf/fm3_24.pdf
[38] Christopher Barron, 2015 (this volume, Chap 4)
[39] Patricia L. Sullivan, "War Aims and War Outcomes: Why Powerful States Lose Limited Wars," *Journal of Conflict Resolution* 51, no. 3 (Jun 2007), 496-524

'might' is no guarantee of success,[40] as recently echoed by Eikenberry.[41] Consequently, future interventions might be executed more judiciously with greater emphasis on *brain vs. brawn* resulting in fewer casualties.

An important implication of these findings is that technological solutions will be increasingly relied upon to replace human combatants in harms way. In fact, US Army Training and Doctrine Command predicted that "future battles will have unmanned systems as forward sensors/observers detecting and identifying high-value targets and calling for fires".[42] The precedent for remote weapon deployment has already been established by US drone attacks of al Qaeda leadership since 2002.[43] Mechanical surrogates such as (semi-) autonomous combat-capable robots are also being developed to replace human combatants.[44] This operational advantage will also offer the additional benefit of alleviating public tension arising from operations in theatres of potentially lethal consequences, albeit with the associated legal and ethical dilemma of "fighting at a distance."[45] For example, compliance with *Just War* precepts of discrimination (between combatants and non-combatants) and proportionality (military gain relative to civilian harm) with the use of technological combatants is and will continue to be controversial and thus quite challenging to justify.[46]

The conduct of future warfare by other means (such as space and cyber warfare) might also supplant the requirement for large numbers of human combatants. Indeed, cyber warfare is considered a very high level threat that can potentially incapacitate national security, and without

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[40] e.g., New York Times (03 May 2014) opinion by Thomas L. Friedman: http://www.nytimes.com/2014/05/04/opinion/sunday/friedman-its-not-just-about-obama.html?_r=1

[41] Karl Eikenberry, "The American Calculus of Military Intervention," *Survival* 56, no. 3 (2014), 264-271

[42] Thomas K. Adams, "Future Warfare and the Decline of Human Decisionmaking," *Parameters*, 31, no. 4 (2001), 57-71

[43] First publicly known targeted killing (Qaed Salim on 03 Nov 2002 in Yemen), BBC: http://www.bbc.co.uk/news/world-us-canada-18896236

[44] Caroll, 2012, Work and Brimley, 2014, and Aaron Ettinger, 2014 (this volume, Chap 7)

[45] Economist, "Morals and the Machine," (02 June 2012): http://www.economist.com/node/21556234

[46] Kenneth Anderson and Matthew C. Waxman, "Law and Ethics for Robot Soldiers," *Policy Review*, 176 (2012), 35-49

bloodshed.[47] Interestingly, Russia's *New Generation Warfare* guidelines for developing military capabilities by 2020 include a shift "from war in the physical environment to a war in the human consciousness and in cyberspace".[48] In other words, the human mind is the main battlespace to be dominated by influence,[49] a key guiding principle of information operations.[50]

What then are the implications for future force planning? It is not the convergence of combat casualties to a unit CT Ratio, *per se*, but the reasons underlying this convergence that will ultimately impact force planning. Such planning will be increasingly reliant on technology to further protect and replace human combatants in kinetic operations with a concomitant transformation in operational doctrine to ensure an ever-decreasing CT Ratio. This challenge cannot be taken lightly since, as noted earlier, casualty minimization is an essential condition for sustaining public support, especially for protracted expeditionary military interventions.

The challenge is further exacerbated by the trend of decreasing troop numbers. It is noteworthy that modular, multi-purpose, and rapidly responding smaller units will be preferentially deployed.[51] These smaller units include doctrine such as Canada's Directorate of Land Strategic Concepts research into 'tactical self-sufficient units' and American deployment of special operations forces.[52] With the use of these small, multi-purpose units, a single casualty can elevate the CT Ratio appreciably, although this falls outside the present context of major military interventions: i.e., beyond single-purpose 'surgical' strikes.

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[47] Richard A. Clarke and Robert Knake, *Cyber War: The Next Threat to National Security and What to do About it* (New York, Ecco, 2010)

[48] Janis Berzins, "Russia's New Generation Warfare in Ukraine: Implications for Latvian Defense Policy," National Defence Academy of Latvia, Center for Security and Strategic Research Policy Paper No. 2 (2014), p 5

[49] Consider, for example, "I say to you that we are in a battle, and that more than half of this battle is taking place in the battlefield of the media." by Ayman al-Zawahiri in a letter to Ayman al-Zawahiri of Al-Qaeda, July 2005: http://www.globalsecurity.org/security/library/report/2005/zawahiri-zarqawi-letter_9jul2005.htm

[50] US Joint Chiefs of Staff, *JP 3-13: Information Operations* (Washington, DC, February 2006), p I-2: http://www.carlisle.army.mil/DIME/documents/jp3_13.pdf

[51] Karl Eikenberry, "The American Calculus of Military Intervention," *Survival* 56, no. 3 (2014), 264-271

[52] Jim Thomas and Chris Dougherty, "Beyond the Ramparts: The Future of U.S. Special Operations Forces," (Washington DC, Center for Strategic and Budgetary Assessments, 2013): http://www.csbaonline.org/publications/2013/05/beyond-the-ramparts-the-future-of-u-s-special-operations-forces/

If "War is not a mere act of policy but a true political instrument, a continuation of political activity by other means,"[53] then any morally and legally defensible means are worthy of consideration with particular emphasis on non-lethal methods.[54] Indeed, the logical extrapolation from ongoing developments in influence science and cyber technologies points to a future of far fewer human combatants with even fewer combat casualties. In the interim, kinetic warfare will continue to exact a not insignificant toll in human casualties, but the continued pace of developments in technology, social pressures, and operational doctrine will ultimately reduce combat casualties to the convergence of a unit CT Ratio, presently projected in 2025 for the US, and similarly anticipated for other advanced nations.

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[53] Carl von Clausewitz, *On War* Eds. Trs. Michael Howard and Peter Paret, Princeton; Princeton University Press, 1976, p 87

[54] Tracy J. Tafolla, David J. Trachtenberg, and John A. Aho, "From Niche to Necessity: Integrating Nonlethal Weapons into Essential Enabling Capabilities," *Joint Forces Quarterly* 66, no. 3 (2012), 71-79