Lethal Autonomous Weapons Systems from a Military Officer’s Perspective…this time is different: Offering a Framework and Suggestions

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Note: The views and opinions of authors expressed herein do not necessarily state or reflect those of the U.S Navy or the United States Government
Militaries must succeed today… autonomous machine & LAWS combat is already at Sea and in the Air…but…

But future LAWS may threaten civil society
– Arms controls now might enhance human security of future generations
Why LAWS is Different...this Framework will explain.

- We are in the midst of a strategic ‘paradigm change’ in how we see warfare.

- Caution: distinguish between incremental technological change and the strategic change happening now. (i.e., the “crossbow and the pope” are unhelpful comparisons)

- What indication this is REALLY big?
Calm before the Storm: consider the wide range of debate this week in Geneva Room XIX…

…Disputes over basic terminology, categories, ethics of LAWS… what would Kuhn Say? Signs of something big….
What theories of Technology and War help you put LAWS in perspective?

1. Life Cycle Theory of technological change
2. Cybernetic Theory of Warfare: Sense-Think-Act
3. The New Change: Emergence of a Third Realm of war
Theory 1: Tech Change is three stage, and “late stage” changes are dangerous

- **Early**: society exerts most influence. Change is easy.

- **Middle**: momentum accumulates around the invention (e.g., capital, labor, political)… change is harder.

- **Late**: technology appears “beyond social control”, or “technology out of control”… change all but precluded…

- **Change in “Late Stage” comes with Near Disaster**
  - Cuban Missile Crisis energized Arms talks
  - Fukushima stopped nuclear power trajectory in Japan
Theory 2: Across History, military innovation seeks to improve the “Sensing-Thinking-Acting” cycle (or loop)

- **Sensing**
  - Human Senses
  - Machine sensing: Radar, Sonar, Infrared etc

  (COMMUNICATION LINKS)

- **Thinking**
  - Human Commander
  - Computer/Computation (early analog, now digital)

  (COMMUNICATION LINKS)

- **Acting**
  - Human
  - Human-Machine integration
  - Machine
Theory 3: the Big Change… the Emergence of the Third Realm of Warfare…

- In pursuit of S-T-A advantage, third Realm emerges
  - 1\textsuperscript{st}: Social-Human Realm
    - (apprx 10,000 BC-
  - 2\textsuperscript{nd}: Integrated Human-Machine Realm
    - (apprx 1588AD-
  - 3\textsuperscript{rd}: autonomous Machine Realm
    - (apprx 2014-??

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Why I ask you to consider history... it will show “it is different this time”.
Gain Perspective: step back and understand the historical trajectory of technology.

“... because our teachers ... focus their attention only on the present or at the most on the very recent past, they find the present more and more difficult to explain. They are like oceanographers who refuse to look at the stars because they are too remote from the sea, and consequently are unable to discover the causes of the tides.” Marc Bloch, French historian, veteran of WWI & WW2
At first...there existed one Realm of warfare... the Social-Human Realm of S-T-A

- Most of history, the social-human factor was **decisive**:
  - Humans dominated **sensing, thinking, and acting**, (S-T-A).
  - Tools leveraged human **Action (A)**, or protected the human body.
One Realm of warfare....‘Social-Human’ factors dominate Sensing-Thinking-Acting

Social-Human Factors Dominate S-T-A

Basic Impulse: militaries sought to improve the Sense-Think-Act (S-T-A) loop, to ‘save labor’ and ‘speed up’ friendly loop, extend action
Waves of Innovation increases Human-Machine S/T/A integration in war…evolving the 2nd Realm

Social-Human Realm: 1571 Battle of Lepanto dominated by mass infantry battles fought on/across fleets of galleys....

To Integrated Realm: 1588 Battle of Armada the English embark ZERO INFANTRY, fight artillery duel from new kinds of ships
Waves of Innovation... Machines Assume Increasing Share of the Sense-Think-Act Function

Increasing Role of Machine Factors in S-T-A Functions

Pre-Industrial Age

1. 500-300 BC: Catapult and Galley
2. 1400-1500s: Gunpowder, magnetic compass...shift between Lepanto and Armada 1588
3. 1840-1860s: Ironclad steam ship, Telegraph communications
4. WWI: Machine Gun, Submarine
5. WWI: Tank, Aircraft

Social-Human Realm

Industrial Age

Time (not to scale)

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Increased integration of Human/Machine on Land and Air. Industrial Human Slaughter

“Artillery men with their cold blooded mathematics seemed subversive of all that made a soldiers life heroic, admirable, worthy.” William McNeill, Pursuit of Power
Two Realms of warfare co-exist at sea on land in the air...

Increasing Machine Autonomy (sensing/thinking/acting)

Integrated realm

Human realm

Increasing Speed of Process (sensing/thinking/acting)

Technical limits combine with Ethics/Law/Policy/Empathy, to determine the boundaries between human and machine
Human engineers imbue the Machine with the capacity to Sense, Think, Act without the human operator...the ‘MACHINE Realm’ emerges.

“...modern warfare is more a matter of machines than of men.” Thomas Edison
Waves of Innovation create the Third Realm…Artificial Intelligence and possible Autonomous Machine Warfare

Pre-Industrial Age  Industrial Age  Information Age…and beyond?

Time (not to scale)

Social Human

500-300 BC: Catapult and Galley

1400-1500s: Gunpowder, magnetic compass…shift between Lepanto and Armada 1588

1840-1860s: Ironclad steam ship, Telegraph comms

1901-1914: Tank, Aircraft

Waves of Innovation create the Third Realm…Artificial Intelligence and possible Autonomous Machine Warfare

2001: semi-autonomous armed UAV

2014: armed autonomous vehicle?
Unclassified

Framework: Three Realms Co-Existing

Increased Machine Autonomy (sensing/thinking/acting)

Technical barriers fall... now, Ethics, Law, Policy, Empathy, must limit machine systems

Increasing Speed of Process (sensing/thinking/acting)

Machine realm

Integrated realm

Human realm

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Implications of the Third Realm and the unique role of Human Empathy

- Has empathy placed a check on the usage of advanced weapons when deployed against civil society?

Let's look at the Three Realms graphically…. First, with the capacity for empathy…and second, without capacity for empathy.
Unclassified

Empathy may be the final protection of the Human Realm when military systems “legally” deploy against civilians

Ethics, Law, Policy, Empathy, not technical barriers, will determine the living/dying space for human and machine
Unclassified

Technology unbounded by capacity for Empathy...because the human soldier is absent...

Increasing Machine Autonomy (sensing/thinking/acting)

Ethics, Law, Policy, Empathy, not technical barriers, will determine the living/dying space for human and machine

Increasing Speed of Process (sensing/thinking/acting)
1. What is the potential magnitude of the effect of LAWS on military doctrine?

Answer: perhaps the MOST important of the last two changes in the history of military doctrine.

Why?

….the human is no longer essential to S-T-A.
2. Should Air/Sea be considered distinct from Land systems?

Answer: Yes.

- Why?
- Sea and Air environs: minimal human habitation.
- Land LAWS may operate in proximity to complex socio-human terrain.
- Note: Speed and autonomy offered by LAWS may be needed in sea/air battle… but it is hard to think of a strategic need of electronic speeding machines used against people. Why? Humans move at human speed… why should machines move so much faster?
3. Is the development of LAWS in lines with the growing tendency in military operations to improve the control (not empathy) of the use of force?

Answer: yes, in the short term, but in long term, LAWS may degrade human control.

Why?

Cyber attack… which can attack each component of electronic S-T-A loop, and the communications links between S-T-A as well.
Question: If not banned, should Development of LAWS be slowed?

4. If we don’t “ban” LAWS, should we slow the development of LAWS?

Recommendation: Slowing the Pace of LAWS development may be beneficial.

Why: The emergence of the Third Realm will radically disrupt nation power relations.

Biggest surprise: small countries or non state actors with advanced LAWS or Cyber tools may become new powers. The decoupling of military power from population base is an historic, unprecedented event.
Question: Where to prioritize future research on LAWS?

5. Where to prioritize LAWS research?

a. Priority goal: Limit the infiltration of advanced lethal robotics into “Human Realm” or what might be called “Human Space”.

b. Secondary goal: Sea & Air systems, perhaps for reasons of strategic system stability.
Question: How best to Control LAWS? Software? Hardware?

6. How best to “control” future LAWS?

Recommendation: Focus on the physical aspects of LAWS, the “Hardware”

Why? Control of computer code is almost impossible (witness cyber crime).

Focus on physical LAWS features that can be verified by visual inspection…
  – limits on numbers,
  – limits on size (make it illegal to create ‘smaller than human scale”) 
  – control fuel source (non-bio),
  – outlaw human impersonation.
7. Does Cyber Insecurity erode ethical arguments in favor of Unmanned Systems?

Advocates argue Automated Systems are more discriminating than humans under stress. But which is worse: a human under stress or Unmanned vehicle under systemic cyber attack?
The Third Realm of Warfare is emerging.

The challenge: reconcile competing demand between military use of LAWS in defense today, and the need to protect future generations from misuse of LAWS

The time is now for society to shape the trajectory of LAWS.
Why we need Brave Elder Statesmen and Energized Youth to Question LAWS

Most middle older generation are jaded by early Sci-Fi...

Are fearful of being branded “luddite”...

and are products themselves of momentum...they are economically/politically “captured” by Large Technical Systems (e.g., defense and hi-tech industry… even AMAZON and GOOGLE)
Implications of the Third/Final Realm of Warfare now Upon us?

- Military tends to seek greater autonomy (labor saving) and speed up the S-T-A (OODA Loop) and extend the range of action.
  - LAWS offer a solution…thus military professionals will be compelled to pursue this technology.

- Yet, LAWS technology may threaten human security?

- Thus: where to limit/restrict the use of LAWS across Realms? Where to preserve Empathy

Let's look at this graphically…. First, with capacity for empathy…and second, without…
Just War Theory/Walzer says Semi Autonomous Systems are ‘OK’...??

Just War Theory

**Jus ad Bellum**
1. Just Cause
2. Right Authority
3. Right Intention
4. Reasonable Chance of Success
5. Proportionality
6. Last Resort

**Jus in Bello**
1. Proportionality
2. Discriminacy
3. Military Necessity
Will Mass Production of Semi Autonomous Systems Prove Walzer Wrong?
Cyber Attack... what does this do to legal arguments for Semi Autonomous/LAWS?
Why we need Brave Elder Statesmen and Energized Youth to Question LAWS

Many older generation leaders

1. are complacent due to shrill “Sci-Fi”…

2. Are fearful of being branded “Luddite”…

and 3. are products *themselves* of momentum… economically/politically “captured” by large technical organizations (e.g., defense and hi-tech industry… even AMAZON and GOOGLE)