Graphic is from Altera.com website

Emergent Challenges of (Semi)Autonomous Weapons Systems

A Presentation by
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“Danger / Crucial Point”

pinyin: wēijī; Wade–Giles: wei-chi)

Past is Prologue:

British soldiers with captured German Goliath remote-controlled demolition vehicles (Battle of Normandy, 1944)

“There is nothing new under the sun”

-Ecclesiastes (Koholet) 1:9

Northrup-Grumman X47B (L) next to piloted FA-18 (R)

Classification of Systems

- Controlled
- Supervised
- Automated
- Autonomous

Classification of Systems: Defined DoDD 3000.09

Department of Defense

DIRECTIVE

NUMBER 3000.09
November 21, 2012

USD(P)

SUBJECT: Autonomy in Weapon Systems

References: See Enclosure 1

1. PURPOSE. This Directive:

a. Establishes DoD policy and assigns responsibilities for the development and use of autonomous and semi-autonomous functions in weapon systems, including manned and unmanned platforms.

b. Establishes guidelines designed to minimize the probability and consequences of failures in autonomous and semi-autonomous weapon systems that could lead to unintended engagements.

2. APPLICABILITY. This Directive:

a. Applies to:

(1) OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff (CJCS), the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the DoD (hereinafter referred to collectively as the "DoD Components").

(2) The design, development, acquisition, testing, fielding, and employment of autonomous and semi-autonomous weapon systems, including guided munitions that can independently select and discriminate targets.

(3) The application of lethal or non-lethal, kinetic or non-kinetic, force by autonomous or semi-autonomous weapon systems.

Classification of Systems: Controlled

- A system that requires activation, direction and manipulation by a person ("man in the loop").

MQ-9 Reaper taxis in Afghanistan

Foster-Miller TALON / Protector Mini-Flail

Classification of Systems: Supervised

- A system is essentially an automated weapon or that has some degree of self-function but this function is permanently supervised by a human operator.

- Operator supervises, does not initiate every function but may, at any time, block or take over the automated function of the system. ("man in the loop").

Classification of Systems: Automated

- A system functions in an independent manner and does not require the intervention of a human operative for activation, direction, manipulation, nor for any other function.

- System is pre-programmed in a specific manner and cannot adapt its function outside those parameters.

- "Fire-and-forget" or "target-and-forget" systems.

Phalanx CIWS close-in weapon system

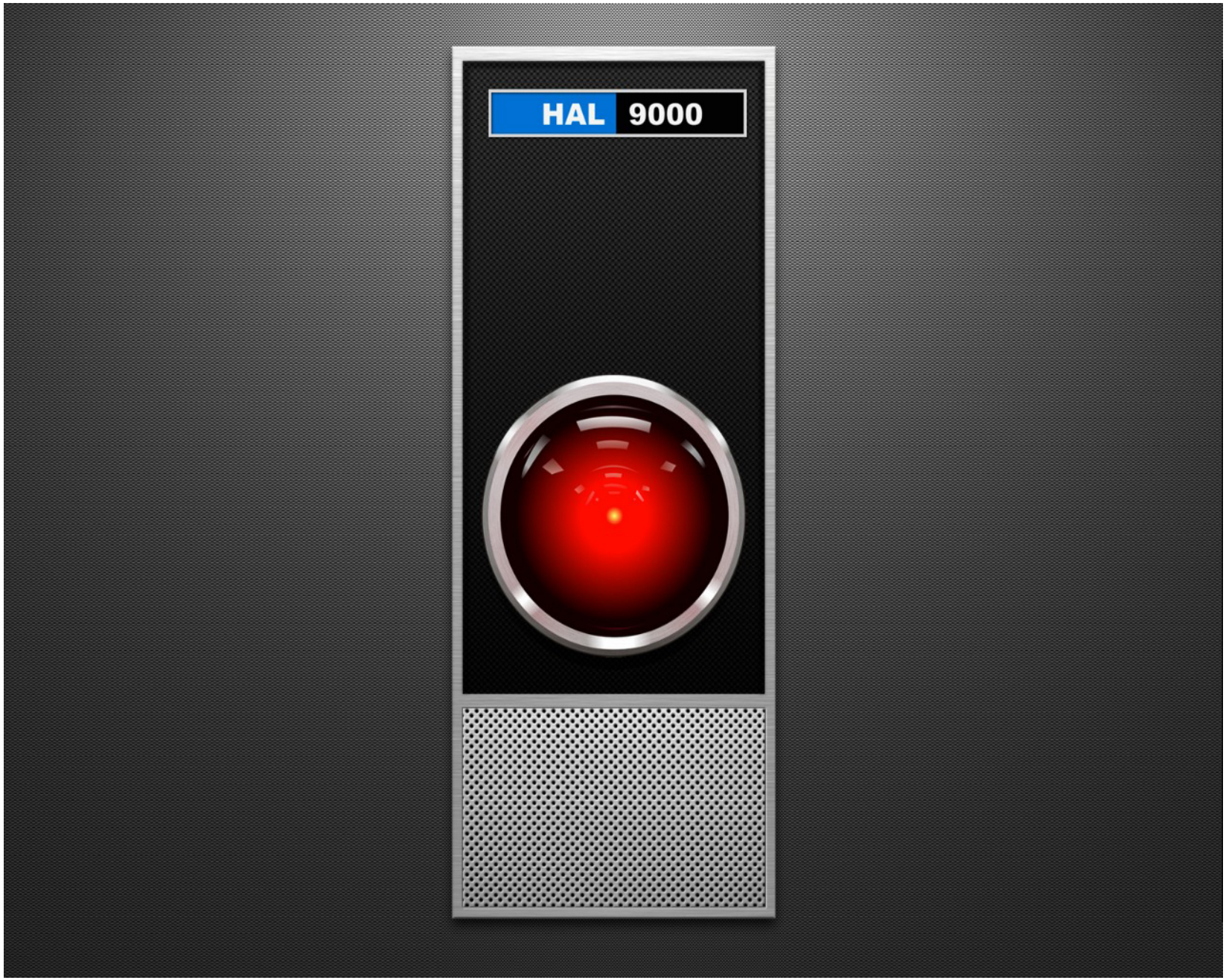
Land Mine

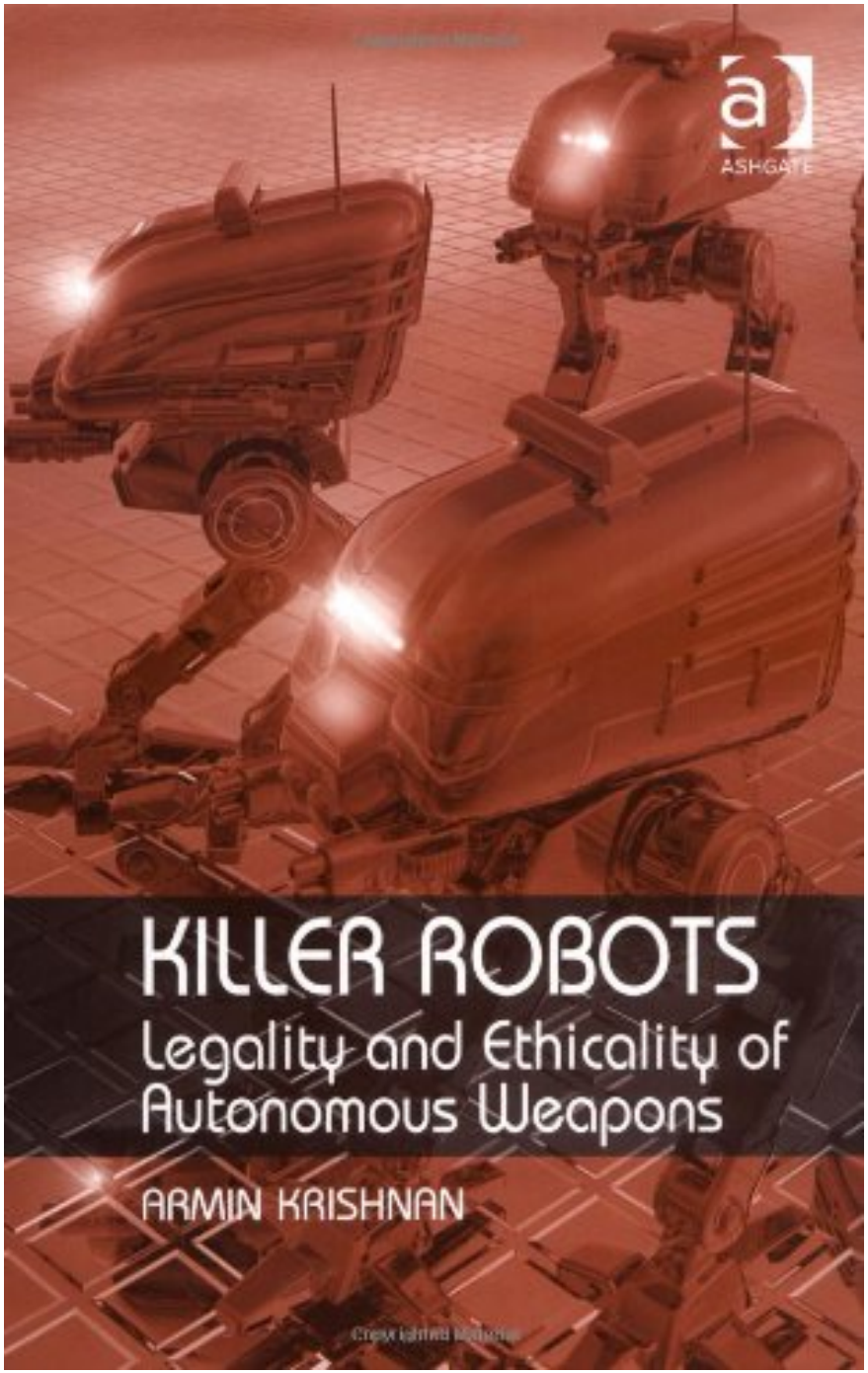
Most of the mines in Colombia are improvised. They are normally made out of common household items, such as coffee cans, soda bottles and jerry cans.

DoDaam South Korean Super Aegis

Classification of Systems: Autonomous

- An automated weapon that can adapt its function to changing circumstances.
- This is the world of artificial intelligence.


HAL 9000


ASHGATE
KILLER ROBOTS
Legality and Ethicality of Autonomous Weapons
ARMIN KRISHNAN

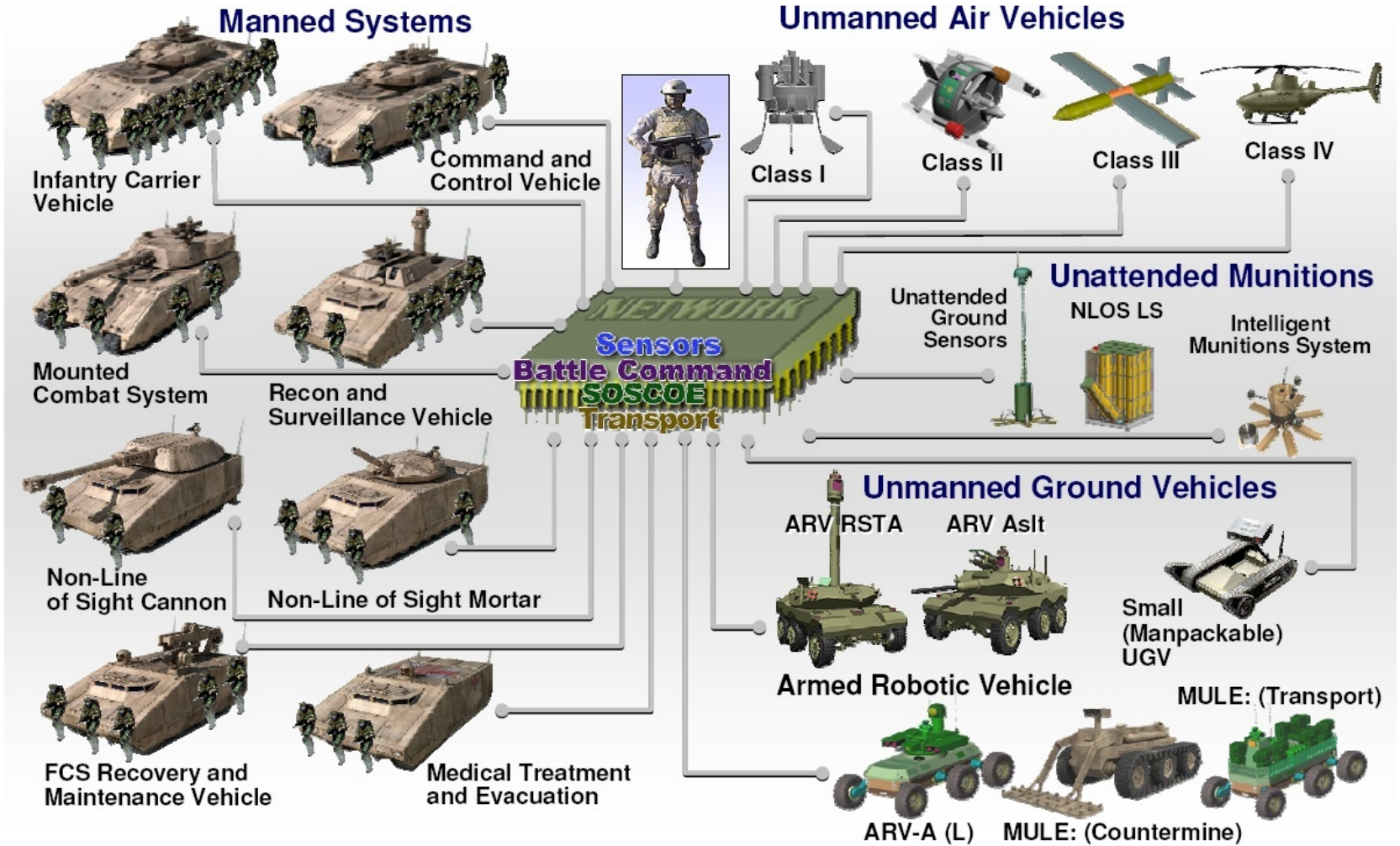
Why (not)?

- No need to encase and protect humans in vehicles: smaller, lighter, less expensive
- Expendable: suicide missions
- More survivable: small signature
- More maneuverable: faster, higher acceleration
- Faster response time: pre-positioning
- No casualties: riskier maneuvers and tactics
- Fearless and aggressive: not deterred by near misses
- Indefatigable: no need for sleep or rest
- Autonomous: fewer personnel can supervise more systems
- Advancing, emerging technology: advantage of U.S. strength and decreasing cost
- Disruptive, transformative technology: can counter new threats
- Swarm tactics: equivalent of ESP

"These aren't the droids you're looking for"
-Obi-Wan Kenobi

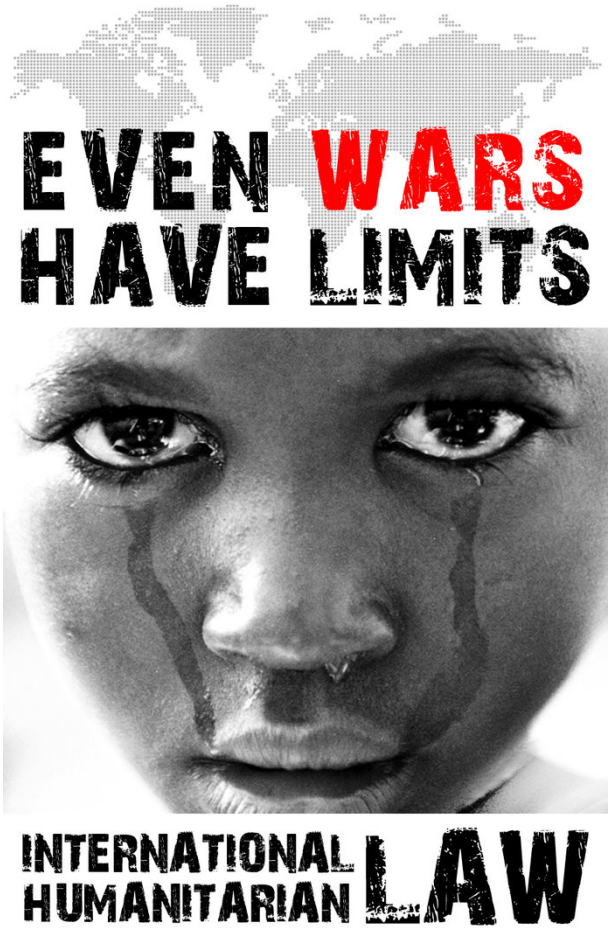
Congress: one-third of all combat vehicles to be robots by 2015

Future Combat System (FCS) Development cost by 2014: $130-$250 billion



Who's Leading The Way On This Technology?

- States that support and fund activities targeted at the development and research on fully autonomous weapons:
  -China, Germany, India, Israel, Republic of Korea, Russia, and the United Kingdom
- Robotic systems (with varying degrees of autonomy and lethality) developed and deployed by
  - United States, the United Kingdom, Israel, and the Republic of Korea.



What does IHL say about all this …

http://imaprince.deviantart.com/art/International-Humanitarian-Law-277894463

Prescriptions and Proscriptions

IHL does **NOT** prohibit technological developments for war fighting **BUT** these developments **MUST** be measured and assessed against existing legal norms.

In the study, development, acquisition or adoption of a new weapon or method of warfare, States Parties have an obligation to determine whether its use would, in some or all circumstances, be prohibited by Add. Protocol I or by any other rule of international law.

– Art. 36 1977 Additional Protocol I

Rule of Distinction

Obligation to distinguish at all times:

- civilians and other protected persons from combatants
- civilian objects from military objectives

Indiscriminate Attacks are Prohibited

- Attacks not directed at a specific military objective
- Means and methods of warfare that cannot be directed at a specific military objective

Proportionality in Attack

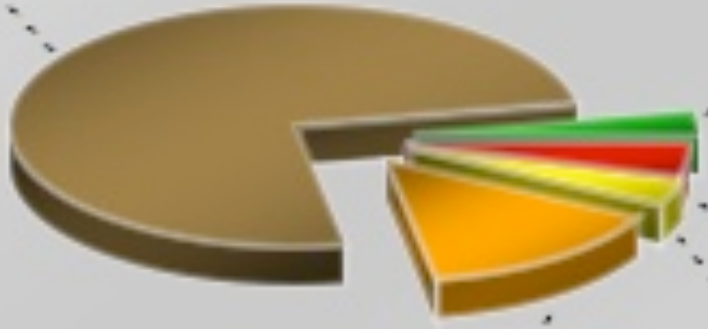
It is prohibited to launch an attack which may be expected to cause incidental loss to civilian life, injury to civilians, damage to civilian objects which would be excessive to the military advantage anticipated.

Rules on Precautions

In the conduct of military operations, constant care must be taken to spare civilians and civilian objects:

- Do everything feasible to verify that the objectives to be attacked are military objectives
- Take all feasible precautions in the choice of weapons with a view to avoid or in any event minimize incidental loss of civilian life

A new campaign led by Nobel Peace Prize winner Jody Williams is calling for a ban on 'killer robots' - armed autonomous systems capable of killing without human input. What's your view on these systems?



http://icrac.net/feed/

Key Principles

The United States considers the four key principles of the law of war (also referred to herein as the "law of armed conflict") as relevant:

(1) Military necessity/military objective;

(2) Distinction/discrimination;

(3) Proportionality; and

(4) Humanity/avoidance of unnecessary suffering.

Issues and Concerns

- Autonomy: the absence of a "man in the loop" and related issues of target identification
- Application of IHL rules distinction, proportionality and precautions. Is it feasible to program IHL compliance?
- Where would legal liability and/or moral responsibility lie for failure or violations?

Is It Like Comparing:

to

?

Other Issues

- Should the decision over death and life be left to a machine?
- Can fully autonomous weapons function in an ethically “correct” manner?
- Are machines capable of acting in accordance to international humanitarian law (IHL) or international human rights law (IHRL)?

Other Issues

- Are these weapon systems able to differentiate between combatants on the one side and defenseless and/or uninvolved persons on the other side?
- Can such systems evaluate the proportionality of attacks?
- Who can be held accountable?

Pragmatic Issues

- Further increasing remoteness and distance from the battlefield
- Equip the man or man the equipment, dilemma, and how many "men in the loop" for 1 system or how many systems for 1 "man in the loop?”
- Information overload
- Increasing human-computer interface and reliance

Propositions

- Current US defense policy covers controlled, supervised, automatic, autonomous systems
- Current IHL covers controlled, automated systems
- Current law should cover automatic systems
- Current law may not be enough for autonomous systems

"The Real Debate Should Focus On:"

- The philosophy behind utilizing these systems: "what are they designed to do, and can they be made to do it more effectively?"
- "Automated … systems reflect the attitudes and assumptions of the people who program them:" do they reflect American values and priorities?
- Can these technologies actually "make warfare less deadly, more accountable and more humane?"

http://www.pbs.org/wnet/need-to-know/uncategorized/the-false-fear-of-autonomous-weapons/15835/

Questions?

Your Questions, Please?