

Adapting for Unmanned Systems

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Isaac Asimov's "Three Laws of Robotics"

A robot may not injure a human being or, through inaction, allow a human being to come to harm.

A robot must obey orders given it by human beings except where such orders would conflict with the First Law.

A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.



COSMIC LOG

KILLER ROBOTS ... FRIEND OR FOE?

Posted: Tuesday, February 26, 2008 7:15 PM by Alan Boyle
Thousands of robots are **already on the battlefield** in Iraq and Afghanistan, but what happens when you hand the robot a gun and turn it loose?

Some researchers fear that giving military robots autonomy as well as ammo is the first step toward a "Terminator"-style nightmare, while others suggest that in some scenarios, weapon-wielding robots could someday be more humanely than humans.

The pros and cons of killer robots are taking center stage Wednesday in London, at what's considered the world's oldest military think tank, the **Royal United Services Institute.**

On one side of the issue is Ronald Arkin, a robotics researcher at Georgia Tech who is working on a Pentagon-funded project to build a sense of ethics into battlefield robots - "an artificial conscience, if you will," he told me.

"The basic rule is to try to engineer a system that will comply as best it can, given the information that it has, with the laws of war," Arkin explained. "And it's my belief that eventually we can do better than humans in this regard."

On the other side is Noel Sharkey, a robotics expert at Britain's University of Sheffield who served as chief judge for the long-running TV show "**Robot Wars.**"

Nowadays, Sharkey is sounding the alarm about the prospect of **real-life robot wars.** He's calling



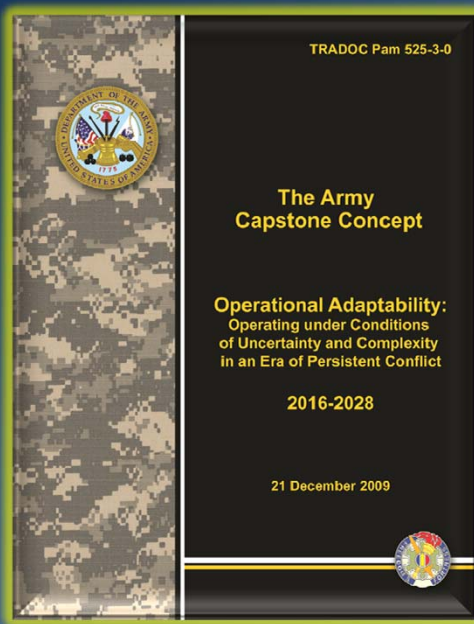
A graphic featuring two spheres. The left sphere is dark blue and partially cut off by the edge. The right sphere is glowing orange and yellow, with a bright light source behind it, creating a lens flare effect. The text 'SINCE 189' is written in a bold, white, sans-serif font across the bottom of the image, partially overlapping the spheres.

SINCE 189

“we must emphasize the integration of technology into capable formations commanded by innovative leaders who are comfortable operating under conditions of ambiguity and uncertainty.

To maximize the potential of technological developments, we must conscientiously evolve and adapt capabilities based on changes in threat capabilities and the operational environment”

GEN Martin Dempsey, CG TRADOC



“...robotics offer the potential to deploy appropriate combinations of manned and unmanned systems to perform an increasing range of tasks” pg 14 Promising Technologies

“Fighting for information will require ...the employment of appropriate combinations of manned and unmanned air and ground systems” pg 18 Supporting Ideas



Guiding Principles ...

- Robotics enable and replace the human
- Humans should not have to accommodate
- Early user and technology developer collaboration
- Use “system of system” to measure effectiveness
- *Get more from force structure ; Cost / Benefit*



Potential Tasks and Feasibility...

Green – feasible Amber – potentially feasible Red – Near-term infeasible

Logistics

- Yard lift and short movement
- **Cargo Packaging, warehouse ops**
- Surface cargo transport and delivery
- Soldier sustainability: improved Solder strength and endurance

Security

- Perimeter security
- Remotely scan personnel/vehicles
- **Casualty evacuation**

Engineering

- **Overcome obstacles, IEDs**
- **Mark, record, report obstacles**
- **Remove & clean contaminated areas**

Medical

- Conduct pharmacy operations
- Perform tele-medicine / surgery
- **Recover battlefield casualties**
- **Dispose of medical waste**
- Perform battlefield first aid

Maintenance

- **Perform diagnostic and PMCS**
- **Perform vehicle recovery**
- Perform advanced manufacturing
- Perform tele-maintenance

• **Impact on available bandwidth and network spectrum management**

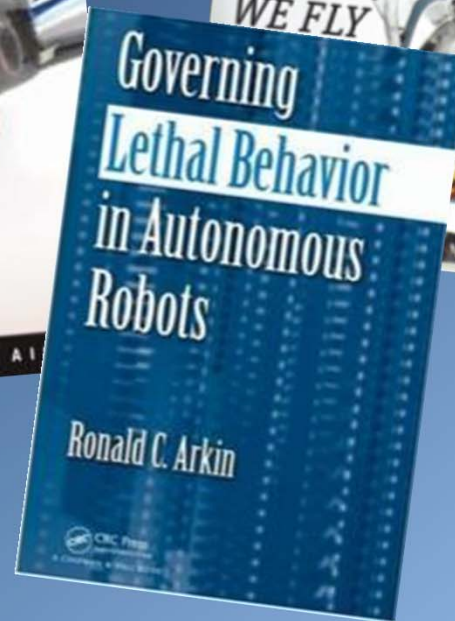
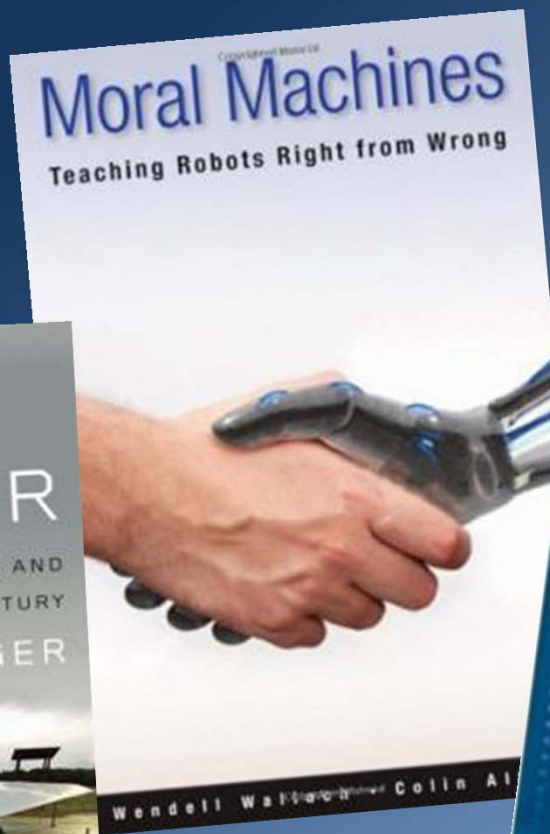
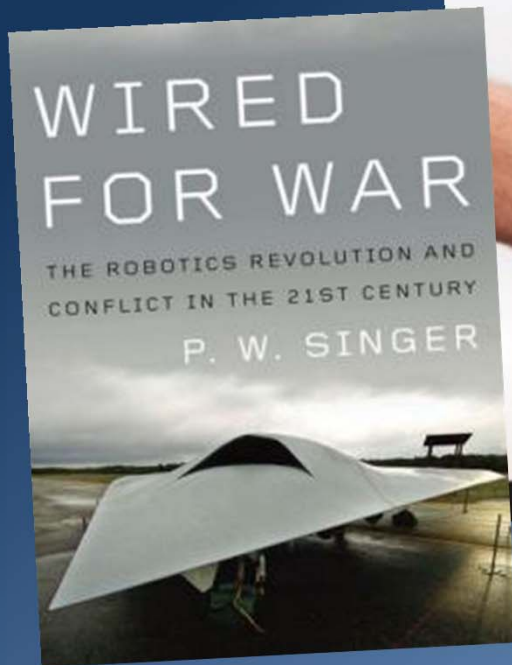
• **Leader training required to ensure effective integration of manned-unmanned systems**

• **Requires sufficient availability of systems to enable training at home station, power projection platforms, and CTCs**

• **Socio-moral implications**



The ethical and moral ...



Thoughts on Autonomous Robots...

- **Seamless integration** of robots into military & civilian society
 - Trust and confidence: transparency of action, cues to activity, tolerance to failure
 - Operating within society: adaptability to varying social cues and context
- **Autonomy is “conditional” ...**
 - Reliability
 - Task complexity
 - Variety of the operational environment

Soldiers must be able to control autonomous systems to suit conditions as they change over time



Robotics Way-Ahead

Some Challenges:

Cultural

- An unwillingness to reduce force structure.
- Trust and confidence issues related to autonomous behaviors
- Appreciation of the potential return on a robotic investment.

Moral

- Responsibilities associated with the Unmanned application of force

Social

- The incurious nature (lack of curiosity in a machine).
- Lack of comfort for people to operate in close proximity to machines.

Robotics are enablers and catching on but, mainly as force multipliers – Not yet replacing force structure

- **Move beyond ONS/JUONS capability gaps**
- **Develop a Small Robotic Environment (Test Bed)**
- **Leverage modeling and simulation for comprehensive DOTMLPF impact**
- **Conduct Independent Robotics Efficiencies Study to:**
 - 1) Determine return on investment for tasks robotics could perform
 - 2) Confirm that at various places along Bloom's taxonomy or some combination of dull, dirty, or dangerous tasks, we can replace humans.
 - 3) Determine personnel life-cycle cost savings
 - 4) Determine potential benefits associated with establishment of a test bed



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