





Elon Musk leads 116 experts calling for outright ban of killer robots

Open letter signed by Tesla chief and Alphabet's Mustafa Suleyman urges UN to block use of lethal autonomous weapons to prevent third age of war



▲ A killer robot from the 2014 remake of Robocop. The open letter read: 'lethal autonomous weapons will permit armed conflict to be fought at a scale greater than ever, and at timescales faster than humans can comprehend.' Photograph. Histar/Studio Canal/Sportsphoto Lud /Altstar

Some of the world's leading robotics and artificial intelligence pioneers are calling on the United Nations to ban the development and use of killer robots.

Tesla's <u>Elon Musk</u> and Alphabet's Mustafa Suleyman are leading a group of 116 specialists from across 26 countries who are calling for the ban on autonomous weapons.

1. Not much new under the sun

- Evolutionary rather than dan revolutionary
- 1945-1980: LGB, TV-guided, automated weapons (goal keeper, patriot)
- **1980-2000:** fire-and-forget, enhanced stand-off, accuracy up, GPS, costs down, man-in-the-loop
- 2001-present: armed drones combined with ISR, autonomous navigation, target tracking, return/landing, datalinks (NCW), man-inthe-loop & man-on-the-loop











Five capability objectives:

- 1. increase situational awareness,
- 2. lighten soldiers' workloads,
- 3. sustain the force,
- 4. facilitate movement and maneuver,
- 5. protect the force.





Scientists warn of dangers of 'killer' AI drones in dystopian film

Scientists have called on the United Nations to slow the development of artificially intelligent weapons systems over fears they could lead to "killer robots".



Arguments against drone strikes: it is illegal

(Carvin, Cronin, Gross, Jenkins, Jordan, Stein)

- It equals assassination & extra-judicial killing, just a form of risk management
- no judicial oversight, no trial, which is immoral & illegal
- Overly liberal interpretation of the meaning of terrorist, imminent threat, participating in hostilities, self-defence
- Violation of souvereignty: licence to kill worldwide?





Arguments against drone strikes: moral disengagement

(Carvin, Cronin, Gross, Jenkins, Jordan, Stein)

- Playstation mentality, next step towards robotic warfare
- Physical distance produces emotional distance: de-humanization
- Context & consequences are hard to assess from 7000 miles away
 - No sense of proportionality
 - Problematic accountability
- Loss of reciprocity, too asymmetrical: willing to kill but not to die for the cause
- Risk free tactic which lowers the political threshold for using military force:
- Predator Empire?, Droneworld?, Everywhere War? Drone-ification Of foreign policy



How concerned are you	Very	Somewhat	Not too	Not at all	DK
about whether drones	%	%	%	%	%
Endanger civilian lives	53	28	8	7	4=100
Lead to retaliation from extremists	32	33	17	14	4=100
Are conducted legally	31	35	13	15	7=100
Damage America's reputation	26	31	18	20	5=100
PEW RESEARCH CENTER Feb rounding.	. 7-10,	2013. Figures m	ay not add	to 100% b	ecause o



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- Future:
 - autonomous target recognition, machine learning (AI),
 - swarming/complex behavior,
 - Combined missions of manned & autonomous systems
 - man-on-the-loop & man-out-of-the-loop

Semi-autonomous	Human-supervised	1	Fully Autonomous
<u>"Human in the loop"</u>	<u>"Human on the loop"</u>	I	<u>"Human out of the loop"</u>
Weapon system that, once activated, is intended to only engage individual targets or specific target groups that have been selected by a human operator.	An autonomous weapon system that is designed to provide human operators with the ability to intervene and terminate engagement including in the event of a weapon system failure	5,	A weapon system that, once activated, can select and engage targets without further intervention by a human operator.
Includes "fire and forget" munitions	before unacceptable levels of damage occur.		

From a view to kill

Global, autonomy in existing weapon systems Analysis of 154 systems with automated-targeting capabilities, November 2017

Unarmed systems Armed systems						
	24*	Human "in-the-loop" 50	Human possibly "in-the-loop" 31	Human "on-the-loop" & "out-of-the-loop" 49		
		Decision aid. Human operator retains the decision to engage the target	Decision aid. Unclear whether system can engage autonomously	System can engage with targets without the direct involvement of a human operator [†]		
Sour	rce: SIPRI	*Includes one where armed status is u	nknown [†] In "on-the-loop" s	ystems, human operators can override action		

The Economist





THE MILITARY SHOULD TEACH AI TO WATCH DRONE FOOTAGE

TED JOHNSON AND CHARLES F. WALD SECURITY 11.26.17 08:00 AM



The Military Should Teach AI to Watch Drone Footage



NINOSLAV DOTLIC/GETTY IMAGES

WHEN THE US Air Force deployed Gorgon Stare, a drone video system that consists of 368 cameras covering nearly 40 square miles at a time, in 2011, an official declared, "we can see everything." The technology, named after snakehaired mythological creatures whose gazes turn people to stone, can surveil an area for hours at a time, take composite images of 1.8 billion pixels each, and create several terabytes of data every minute.



2. AWS will come: Proliferation & Normalization

- Dual use/civilian tech
- In US: global civil commercial market 2400 platforms, 900 companies just for air unmanned, 2025 82 Bn\$ turn-over
- Mil spending in 2018 in US: 5 Bn \$
- Global Military robotics spending: 2025 16.5 Bn\$
- Relatively cheap, rapidly declining costs, Moore's law
- Normalization effect: rise of robotics/automation of functions throughout societies
- Ban will not materialize nor be effective



Figure 3: R&D spending by sector, 2014–16 (US\$ billion)

Source: Industrial Research Institute (2016).



https://youtu.be/5LdaWMNKUHs?t=6

https://youtu.be/roTFrB0XrAg?t=25

Intel Choreographed 1,200 Drones for the Winter Olympics Opening Ceremony

It's going for a world record

By Marty Swant | February 9, 2018



BEST AGRICULTURAL DRONES 2019 - REVIEWS AND SPECS

Agricultural drones have been changing the face of farming and cultivation heavily the past 3-5 years, and completely changing the way that many farmers and other entities go about their business. This drones have the ability to check storm damage, monitor crop progress, and make sure that both crops and herds are healthy.







2. AWS will come: Proliferation & Normalization

• Operational advantages & new threats:

- High ops tempo,
- A2AD + use in urban environment (counter sniper, surveillance in streets and buildings, counter IED)
- counter A2AD (high speed swarming saturation attacks)
- Leadership/HVT targeting, counter-terrorism
- No vulnerable data links
- Swarming options overwhelming defence
- Continuation of trend:
 - remote/stand-off warfare, Casualty risk reduction, demassification of battlefield,
 - individuation of warfare, micro-targeting van key leaders and vital command cells

DOD successfully tests terrifying swarm of 104 micro-drones

Dispersed from two F-18s, drones collaborated in "missions" at China Lake facility.









Unmanned infantry ?



https://youtu.be/VMmEW0E2J4E?t=5



Motives?/driving factors

- Geography versus available
 mass
- Lethal/cognitive presence & low human risk
- Civil tech leading
- Occupation/surveillance/ control de-coupled from boots on terrain

- 2. AWS will come: Proliferation & Normalization
- Normative argument:
 - They may be more accurate (no stress/fatigue/info overload), so lower risk of civcas/coll'll damage
 - soldiers under combat stress are not better at moral judgement
 - New tool to conduct humanitarian operations (monitoring/protecting refugees, ethnic groups) without need to prolonged deployment of ground troops in wars of choice
- Strengthening deterrence:
 - Credible autonomous threat without risk
 - negates counter-coercion options

3. Impact on international security: destabilization

- Vatican: risk of deresponsibilization, dehumanization and depoliticization (CCW meeting 2015)
- Available for big, small states & non-state actors













SUIVE III ICIIICII

Meanwhile focus returns to Houthi-controlled port of Hodeidah after peace talks postponed



Yemeni government forces take part in military operations on Houthi positions outside Hodeidah on September 7, 2018. EPA

An Al Qaeda militant killed by a suspected United States drone strike in southern Yemen on Sunday reportedly once served as the right-hand man of the terror group's former leader in the country who died in a drone strike in 2016.

Houthis threaten more drone strikes after Yemen airbase attack

Spokesman says rebels are stockpiling drones as fears for prospects of peace grow



▲ Soldiers inspect the scene of the Houthi drone attack at a military parade. Photograph: Reuters

Houthi rebels in Yemen have threatened to launch more drone attacks after a deadly strike last week on a Yemeni government military parade killed seven people, stoking tension between the warring parties and threatening UN efforts to broker peace.

3. Impact on international security: destabilization

- Proliferation & operational advantage will spur arms race:
 - Incentive to achieve first move advantage
 - Symmetrical escalation attractive because absence of humans
 - Escalation risk with opponents without AWS
- **Drone-inification of foreign policy,** everywhere war, extra-judicial operations:
 - No risk of casualties/riskless war attractive for politicians & risk transfer warfare
 - Ease of riskless violation of souvereignty
 - Can be used in areas/for missions previously too dangerous for soldiers
 - Blurring of war-peace-policing boundaries in response to transnational nonstate threats
 - More frequent and casual use of military force
- Race to the ethical bottom/norm shift:
 - Inhuman/illigitimate use by actors who disregard/violate IHL
 - West may be inclined to follow for operational reasons



3. Impact on international security: destabilization

- Vatican: risk of deresponsibilization, dehumanization and depoliticization (CCW meeting 2015)
- Available for big, small states & non-state actors
- Risk of escalation due to inevitable mistakes/ failures/incidents of complex systems (swarms): stock market flash crash van 2010 (Charles Perrow, Normal Accidents)
- Change in ops context, fluidity and ambiguity in context, hacking, flaws in algorithm, civilian objects similar to military objects
- Algorithms are black box: what does operator know of parameters to ensure proper employment?

The Dehumanization of International Humanitarian Law: Legal, Ethical, and Political Implications of Autonomous Weapon Systems	AMERICAN AMERSITY WASHINGTON COLLEGE OF LAW			
$Markus \ Wagner^{*}$	American University Washington College of Law Washington College of Law Research Puper No. 2017-21			
ABSTRACT				
In the future, a growing number of combat operations will be carried out by autonomous weapon systems (AWS). At the operational level, AWS would not rely on direct human input. Taking humans out of the loop will raise questions of the compatibility of AWS with the fundamental requirements of international humanitarian law (IHI) distinction and proportionality, as we of responsibility for war orimes and or A NATIONAL	DEBATING AUTONOMOUS WEAPON SYSTEMS, THEIR ETHICS, AND THEIR REGULATION UNDER INTERNATIONAL LAW Kenneth Anderson Manthew C. Waxman			
l aw a	Law and Ethics for			
Autor Why a E How the	Autonomous Weapon Systems Why a Ban Won't Work and How the Laws of War Can			
by Kenneth Anderson and Matth Jean Perkins Task Force on Nati	iew Waxman			



Fully autonomous weapons, also known as "killer robots," raise serious moral and legal concerns because they would possess the ability to select and engage their targets without meaningful human control..... There are also grave doubts that fully autonomous weapons would ever be able to replicate human judgment and comply with the legal requirement to distinguish civilian from military targets. Other potential threats include the prospect of an arms race and proliferation to armed forces with little regard for the law.

Fully autonomous weapons themselves cannot substitute for responsible humans as defendants in any legal proceeding that seeks to achieve deterrence and retribution..... humans associated with the use or production of these weapons—notably operators and commanders, programmers and manufacturers—would escape liability for the suffering caused by fully autonomous weapons......

Human commanders or operators could not be assigned direct responsibility for the wrongful actions of a fully autonomous weapon,In most cases, it would also be unreasonable to impose criminal punishment on the programmer or manufacturer, who might not specifically intend, or even foresee, the robot's commission of wrongful acts.

Summary HRW Report

Current Western military perspective: obstacles

Technologica: Autonomous systems need to be more adaptive to operate safely and reliably in complex, dynamic and adversarial environments; new validation and verification procedures must be developed for systems that are adaptive or capable of learning.

Normative: There are increasing normative pressures from civil society against the use of autonomy for targeting decisions, which makes the development of autonomous weapon systems a potentially politically sensitive issue for militaries and governments

Legal: International law includes a number of obligations that restrict the use of autonomous targeting capabilities. It also requires military command to maintain, in most circumstances, some form of human control or oversight over the weapon system's behaviour.





The targeting process

CDE Example



12 februari 2019









CDE LVL 2 civilian structure identified within blast range of PGM







CDE LVL 3 more civilian structures identified closer to target







CDE LVL 3 risk is mitigated



CDE LVL 4 incoming information on Structure Type requires reassessment: time of attack, impact point shift, fuse setting





4. Be afraid, be a little afraid

- Deja vu all over again: replay of drone warfare debate van 2007-2013
- Politics, strategy & context rule
 - Use of AWS may be legitimate in specific contexts: limited geographically, in time and by target category
 - Autonomy not essential against VNSA & leadership targeting
 - Sensitive missions will require man-in-the-loop & control
 - AWS are useful in interstate conflicts where tech superiority matters
- Technological/pragmatics perspective:
 - Immature technology
 - Endurance & range limited, small scale? Ops/strategic Impact also limited
 - More capable systems will be larger and will resemble traditional systems
 - costs advantage will diminish
 - Arsenal will be limited
 - Investments in military robotics are relatively low
 - These will invite suitable counter-measures (TBM or AD)
 - just another new weapon technology: time-honored action-reaction dynamics



Deutsche Telekom to launch drone defense system: report

rts / Entertainment NOVEMBER 7, 2016 BY AGENCIES



Germany's Deutsche Telekom plans to launch a drone defence system this year designed to guard airports, stadiums, car test tracks and critical infrastructure, German weekly Welt am Sonntag reported on Sunday.

4. Be afraid, be a little afraid

- In the west: ethical/legal issues need to be solved first
- Proportionality, distinction, necessity require judgement
- Restricted to predetermined pre-programmed target parameters
- Commanders will want to retain control
- Man-before the loop remains responsible/accountable: meaningful human control
- Relatively restrained use of drones and cyberweapons
- Trend of increasing juridicalization of warfare in the west
- Moral backlash risk: employment counter to western values values? Political fall-out may outweigh tactical advantage
- Setting norms or precedents?
- We need more data: