New weapons dangers: Drone swarms, killer robots, nuclear and space

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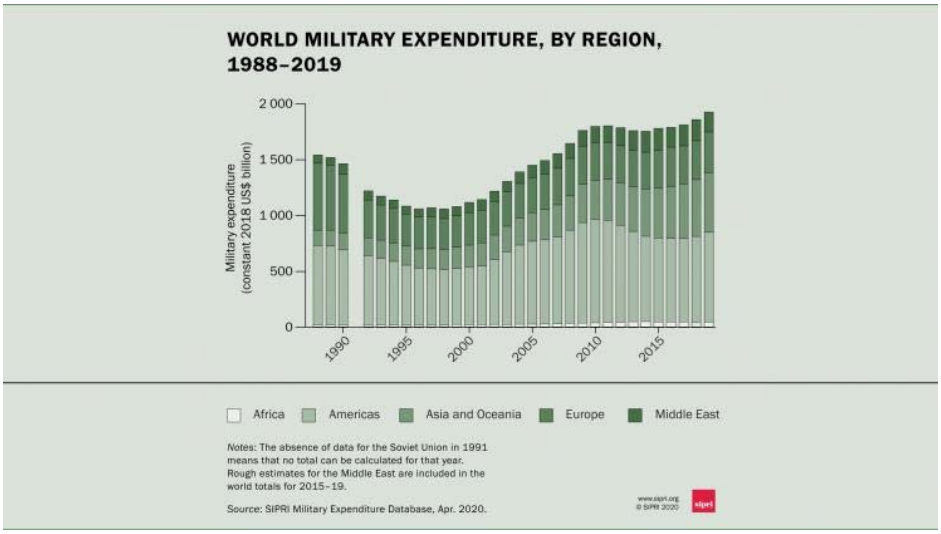
Key areas in weapons development

- Military robotics & Artificial Intelligence (AI)
  - Including armed drones & killer robots
- New nuclear weapons
  - Including ‘usable nukes’ & hypersonic missiles
- Space weapons
- Cyber warfare



[image credits in slides 4,9,12,13]

Global military spending: record level



Global military spending in 2019: $1,900,000,000,000

SIPRI (2020). https://www.sipri.org/media/press-release/2020/global-military-expenditure-sees-largest-annual-increase-decade-says-sipri-reaching-1917-billion

Military Robotics and AI: the basics

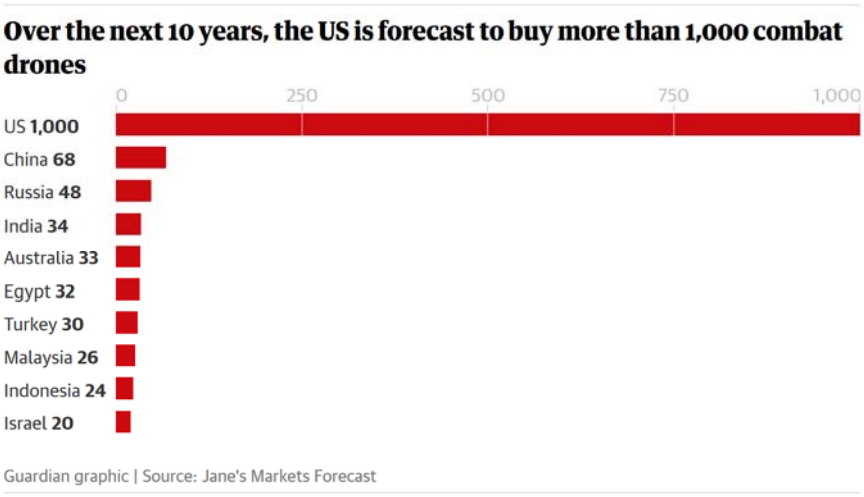
- Drones
  - Robotic ‘remotely piloted’ aircraft (also sea/land)
  - Military deployment for surveillance since 1990s
  - Armed deployment since 2001
- Artificial Intelligence
  - Increasing use of automation in military technologies for basic functions, especially drones
  - Arms race to develop ‘killer robots’ since mid-2000s
- USA is technology leader

The Guardian (2019). https://www.theguardian.com/news/2019/nov/18/killer-drones-how-many-uav-predator-reaper

Sharkey N (2020). https://www.scientificamerican.com/article/fully-autonomous-weapons-pose-unique-dangers-to-humankind/

[image: Reaper; credit: USAF]

Combat drones: projected numbers



UK plans to buy 16 'Protectors' by 2023 at cost of £415m

The Guardian (2019). https://www.theguardian.com/news/2019/nov/18/killer-drones-how-many-uav-predator-reaper

Military Robotics and AI: current developments

- Drone swarms
  - Co-ordinated group of drones flown by a single operator or following pre-programmed flight
  - Much active R&D – including in UK
  - Was 2019 militia attack on Saudi oil facilities a drone swarm attack?
- Killer robots
  - Technical name: Lethal Autonomous Weapons (LAWs)
  - Artillery, planes, warships, and tanks with autonomous functions close to deployment by major military powers
  - Taking the decision to kill humans is small extra step – is it already here?

Drone Wars UK (2018). https://dronewars.net/2018/05/17/new-research-shows-rise-in-number-of-states-deploying-armed-drones/

Burt P (2019). https://www.sgr.org.uk/resources/lethal-and-autonomous-coming-soon-sky-near-you

Sharkey N (2020). https://www.scientificamerican.com/article/fully-autonomous-weapons-pose-unique-dangers-to-humankind/

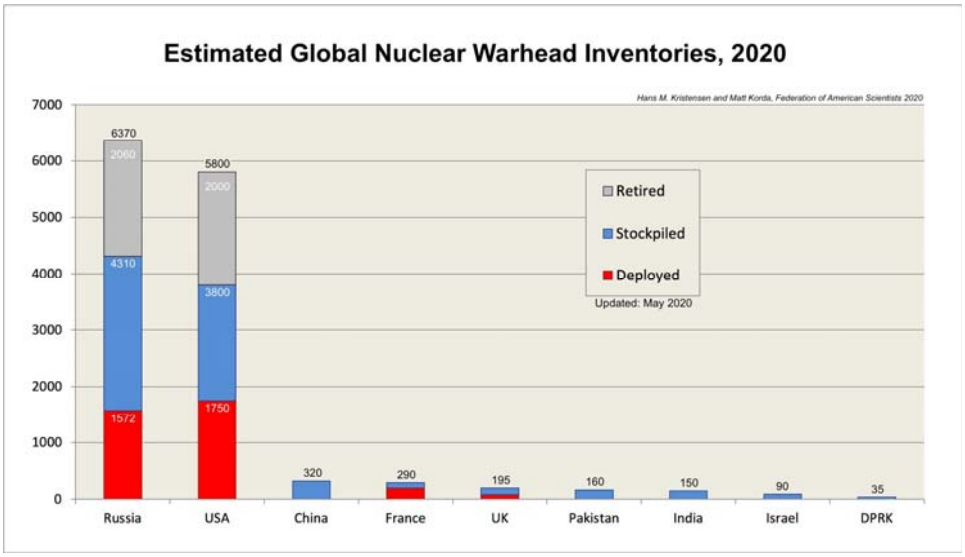
Military Robotics and AI: key issues

- Undermining/ breaking international law
  - e.g. drone use for assassination
- Lower threshold for war
  - e.g. lower risk of casualties for attacking forces, removal of human physical limitations (e.g. tiredness)
- Greater civilian casualties
  - e.g. due to greater use of air strikes, greater speed of response, differing fallibility of computers

Drone Wars (2016). https://dronewars.net/2016/10/03/drone-wars-out-of-sight-out-of-mind-out-of-control/

Sharkey N (2020). https://www.scientificamerican.com/article/fully-autonomous-weapons-pose-unique-dangers-to-humankind/

Nuclear weapons: current numbers



Total: approx. 13,400

Federation of American Scientists (2020). https://fas.org/issues/nuclear-weapons/status-world-nuclear-forces/

Nuclear weapons ‘modernisation’

- All 9 nuclear weapons nations are ‘modernising’ their arsenals
- Latest technological developments
    1. Increasing computer control: quicker response
    2. ‘Useable nukes’: smaller size for ‘battlefield use’
    3. New ‘fuze’: greater accuracy
    4. Hypersonic missiles: more manoeuvrability

  (2) and (3) – US-led

  (4) – China/Russia-led

Chinese hypersonic missile (concept)

- Dozens of corporations involved in nuclear weapons work worldwide
- ‘Useable nukes’
    - US Nuclear Posture Review 2018 has led to production of new ‘low yield’ nuclear warhead
- New ‘super-fuze’ in US warheads
    - Greater accuracy, therefore same number of nuclear warheads can be used to hit a greater number of targets
- Hypersonic missiles
    - Travel 5x faster than sound – includes: ballistic missiles (already widely deployed); cruise missiles (powered; under development); glide missiles (unpowered; under development)
    - Military advantage of cruise/ glide missiles: more manoeuvrable so they can more easily evade any defences – hence an attack would have greater chance of ‘success’ and/or would cause greater amount of destruction
- Sources:
    - PAX (2019). https://www.dontbankonthebomb.com/nwproducers/
    - Nuclear Threat Initiative (2020). https://www.nti.org/learn/countries/united-states/
    - Kristensen et al (2017). https://thebulletin.org/2017/03/how-us-nuclear-force-modernization-is-undermining-strategic-stability-the-burst-height-compensating-super-fuze/
    - US Congressional Research Service (2019).

https://assets.documentcloud.org/documents/6189872/Hypersonic-Weapons-Background-and-Issues-for.pdf

[Image: https://commons.wikimedia.org/wiki/File:Project_0901_Flying_Vehicle.jpg]

Nuclear weapons modernisation: key issues

- Recent dismantling of nuclear treaties means arms race is now underway
- Latest technical developments lead to shorter decision-making times – increasing potential for **accidental nuclear war**
- Latest scientific research shows even 'small' nuclear war could cause catastrophic climatic cooling, i.e. **'nuclear winter'**

- Treaty problems
  - US withdrawal from JCPOA (Iran nuclear deal)
  - US then Russia withdrew from the Intermediate-range Nuclear Forces (INF) treaty
  - New START treaty due to expire in early 2021 unless renewed – Russia willing to renew, US currently not
  - Other nuclear treaties undermined
- 'Small' or 'regional' nuclear war, e.g. between India and Pakistan – or the launch of all the warheads on a UK Trident submarine
- For more info on risks of accidental nuclear war and nuclear winter, see: SGR (2020). https://www.sgr.org.uk/resources/nuclear-weapons-beginner-s-guide-threats

[Image credit: Gerd Altmann]

Space weapons: the basics

- Long-term/ widespread military use of space
  - e.g. surveillance, communication, co-ordination of Earth-based weapons systems
  - Military bases in UK involved
- 'Missile Defense' systems and drone control systems especially reliant on military space-based technology
- Restrictions on weapons deployment due to Outer Space Treaty, 1967
  - Especially nuclear weapons

Webb D (2020). https://cnduk.org/space-for-peace-not-war/

GNAWNPS (2020). http://www.space4peace.org/

Space weapons: current developments

- Recent growth in military use of space
- Weapons deployment – is it already here?
  - USA, Russia, China, India have demonstrated anti-satellite missile capabilities
  - Jamming tech hard to detect
  - Russian test of anti-satellite spacecraft this year?
- US Space Force founded in 2019
  - 77 space craft
- Earth's satellite communications networks especially vulnerable

Mehta A (2020). https://www.c4isrnet.com/battlefield-tech/space/2020/05/27/defining-what-a-space-weapon-is-and-who-has-them/

BBC News online (2020). https://www.bbc.co.uk/news/world-europe-53518238

Wikipedia (2020). https://en.wikipedia.org/wiki/United_States_Space_Force (and references therein)

Cyber weapons: the basics

- Malware
  - Computer programmes with malicious intent, including viruses, worms, ransomware, spyware
- Cyber terrorism/ cyber attack
  - Occurs when damage becomes comparable with physical/ military attack
- Computer-based society vulnerable
  - Especially: medical facilities, energy infrastructure, military systems, civilian aircraft, financial/ industrial systems

- A lot of debate even over the definitions of 'cyber weapons', 'cyber war', 'cyber terrorism' etc – but agreement that huge physical damage and loss of life could be caused
- Dozens of major attacks over past 15 years – majority are for espionage
- Most leading industrial nations now have cyber security branches of their militaries, with some thought to be engaged in 'offensive' operations
- Main source (and references therein):
  Wikipedia (2019). https://en.wikipedia.org/wiki/Cyberwarfare (and references therein)

[Image credit: Gerd Altmann]

Cyber weapons: the issues

- Cyber warfare is especially attractive due to:
  - Low cost/ high potential damage
  - Invisible/ hard to attribute blame
- Key risks
  - Most areas of modern society are vulnerable
  - Increases potential for **accidental nuclear war** via infiltration of control systems

- 'Air-gaps' (where computer equipment is not connected to the internet) are not sufficient to protect military systems, due to international nature of components industry, software updates, smartphones, USB drives etc
- Some cyber attacks specifically target nuclear weapons command and control systems
- Source:
  SGR (2018). https://www.sgr.org.uk/publications/artificial-intelligence-how-little-has-go-wrong

[Image credit: iStock]

Other areas

- Most military R&D is focused on 'refinement' of existing 'reliable' technologies
  - Piloted combat aircraft, battleships, submarines etc
- Continued R&D on Directed Energy Weapons
  - e.g. lasers, microwaves

US PHASR rifle (being testing)

- UK DEW system 'Dragonfire' undergoing testing – involving: MBDA; QinetiQ; Leonardo; GKN; BAE Systems
- For more info, see:
  Parkinson S (2019). https://www.sgr.org.uk/resources/threats-emerging-weapons-technologies

[Image: PHASR 'dazzling' laser rifle (USAF)]

Key conclusions

- Military R&D on new 'disruptive' technologies accelerates arms races
  - Often fails, but can lead to key military advantage
- Disruptive technologies increase security risks
  - Especially of nuclear war
  - Proliferation to smaller nations/ groups
- Diverts resources from tackling major civilian risks
  - e.g. poverty, pandemics, climate emergency
- Trust-building is only way out of arms races
  - e.g. arms control/ disarmament treaties

- Major civilian problems often contribute to root causes of conflict

For campaigners

- Highlight risks of arms races to public, politicians, scientists etc
  - e.g. dangers of emerging technologies, waste of money/ expertise
- Campaign to reduce/ eliminate military R&D
  - e.g. universities – with SGR, INES, CAAT, SKR
- Support and publicise existing/ new treaties
  - e.g. on nuclear weapons (TPNW, New START); on autonomous weapons; on space weapons
  - Campaign coalitions: e.g. ICAN; SKR; GNAWNPS

- SGR – Scientists for Global Responsibility (UK)
- INES – International Network or Engineers and Scientists for Global Responsibility
- CAAT – Campaign Against Arms Trade (UK)
- ICAN – International Campaign for the Abolition of Nuclear Weapons
- SKR – Stop Killer Robots campaign
- GNAWNPS – Global Network Against Weapons and Nuclear Power in Space

http://www.space4peace.org/

Thankyou!

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