Technical Issues

Military rationale for autonomous functions in weapons systems (AWS)

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Military rationale for autonomous functions in weapon systems

Current status

- **Automatic munitions**
  - simple/less complex mechanic functions
  - simple environment – static deployment
  - humans out of the loop

- **Precision-guided munitions (PGM)**
  - more complex functions and environment
  - home in on targets or aim at location at far distances
  - predefined target classes

- **Automatic target identification, acquisition, tracking**
  - prior to weapon release, beyond visual range
  - predefined target signatures or target locations
Military rationale for autonomous functions in weapon systems

Current status

- Highly automated/autonomous systems
  - complex functions
  - difficult but unambiguous environment
  - high time pressure: humans on the loop
  - air/missile defense – counter-artillery

- Loitering munitions
  - highly complex functions
  - environment varies due to situational context
  - search & destroy specific targets or target classes in wider area
  - humans on the loop (potential: out of the loop)
Military rationale for autonomous functions in weapon systems

Military Utility

- Improving survivability under time pressure
- Coping with complex tasks under threat
- Reducing risks for own personnel
- Optimizing reconnaissance-impact-network
- Sustaining monitoring-strike operations
- Shortening reconnaissance-strike gap
- Improving penetration capability
- Optimizing technical system control
Military rationale for autonomous functions in weapon systems

Command and Control

Command and control hierarchy:
- strategic level
- operative level
  *net-centric operations*
- tactical level
  *combined arms battle*
- combat team level

No stand-alone role of AWS in conventional warfare

Integration of AWS at tactical / combat level

Commanders design concept of operation and control its execution
Military rationale for autonomous functions in weapon systems
Military rationale for autonomous functions in weapon systems

Denial of access to key terrain

Man in/on/out of the loop?
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Combined arms battle

Autonomous prioritization and engagement of targets;
Target classes preselected, space and time of ops limited
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Limitations

- AWS are no “wonder weapons”
- Utility in combined arms operations
- No elimination of political, military and individual risks of war

- Qualitative improvement of force capabilities globally
- Parallel developments and counter-measures might offset gains
  - Resilience problem
  - Reliability and predictability are crucial
**Military rationale for autonomous functions in weapon systems**

### Technical Control

<table>
<thead>
<tr>
<th>Category</th>
<th>Simple</th>
<th>Complex</th>
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<tr>
<td>Tech functions of AWS</td>
<td>Simple</td>
<td>Complex</td>
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<tr>
<td>Mobility of AWS/</td>
<td>Low</td>
<td>High</td>
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<tr>
<td>range of impact</td>
<td>Narrow</td>
<td>Wide</td>
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<td>Time of deployment</td>
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<td>Long</td>
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<tr>
<td>Environment</td>
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</table>

Human status: out of the loop → on the loop → in the loop
Military rationale for autonomous functions in weapon systems

Tactical Control

- Selection of targets
- Commanders' responsibility
- Area of deployment
- Time of deployment/termination
- Situational context

Commanders' responsibility

Selection of targets

Time of deployment/termination

Area of deployment

Situational context
Military rationale for autonomous functions in weapon systems

Humanitarian concerns and constraints

- High precision / quick response times of strikes
- Higher survivability of own forces
- Less collateral damage
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Stand-off weapons versus loitering munitions
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Humanitarian concerns and constraints

- High precision / quick response times of strikes
- Higher survivability of own forces
- Less collateral damage

- Long-range fire replacing close combat functions
- Targeting of military hardware predominant
- Human emotions less relevant

Basic requirements for compliance with IHL:
- Reliable intelligence and target recognition
- Constraints of military operations / RoE
- Distinction, proportionality, precaution
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Art. 57 AP I – Precautionary measures before attack
Utility and Limitations of the Use of L/AWS in Military Operations

Constraints and Limitations

Precautionary measures in populated areas / asymmetric warfare
- Difficult distinction
- Risk of non-proportional damage

- High standards of thorough scrutiny & tight control!
- No automatic/autonomous targeting of individuals or groups of persons!

- No military need for autonomous targeted killing
- Killing of suspects in gray zone of international law is no military operation
Technical Issues

*Military rationale for autonomous functions in weapons systems (AWS)*

Thank you for your attention

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Utility and Limitations of the Use of L/AWS in Military Operations

International Security and Stability

- AWS might generate new military options
- AWS might replace weapon systems limited by arms control treaties
- Potential to change perception of stability

- Increased transparency and adaptation of existing instruments required, e.g.
  - UN Register of Conventional Arms
  - Vienna Document
  - Conventional arms control in Europe
AWS - Challenges to Arms Control

Purposes and Instruments

- Conventional arms control and CSBM: Military stability
- Global arms restrictions and prohibitions: Humanitarian concerns
UN Register of Conventional Arms

Categories for reporting international transfers of conventional Arms

I. Battle tanks
II. Armoured combat vehicles
III. Large-calibre artillery systems
IV. Combat aircraft
V. Attack helicopters

VI. Warships
VII. a) Missiles and missile launchers
   b) MANPADS

VIII. Small arms & light weapons
Treaty-limited

Battle Tanks

Armoured Combat Vehicles

Combat Aircraft

Artillery

Subject to the Treaty, but not limited

APC / AIFV Look-alikes

Armoured Ambulances

Primary Trainer Aircraft

Combat Support Helicopters

* adapted CFE Treaty

*
Global Prohibitions or Restrictions of Arms for Humanitarian Purposes

Basic requirements for weapons and warfare methods (Art. 35, 36, 87 AP I Geneva Conventions)

- Distinction
- Proportionality
- No superfluous injury or unnecessary suffering
- No widespread, long-term and severe damage to natural environment
- Accountability of commanders
Global Prohibitions or Restrictions of Arms for Humanitarian Purposes

- Bacteriological (Biological) and Toxin Weapons Convention (BTWC 1972)
- Chemical Weapons Convention (CWC 1993)
Global Prohibitions or Restrictions of Arms for Humanitarian Purposes

  I. Non-Detectable Fragments
  II. Mines, Booby-Traps and other Devices
  III. Incendiary Weapons
  IV. Blinding Laser Weapons
  V. Explosive Remnants of War
