Group of Governmental Experts of the High Contracting Parties to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects

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Human-Machine Interaction in the Development, Deployment and Use of Emerging Technologies in the Area of Lethal Autonomous Weapons Systems

Submitted by France

I. Emerging technologies in the area of LAWS: Background information

1. It must first be recalled that although autonomous technologies are growing quickly, LAWS are still very much a long-term initiative: there are currently no fully-autonomous lethal weapons systems.

2. Secondly, these technologies are inherently dual-use. Current research on autonomy deals with both civilian and military applications. Militarily, innovations relating to artificial intelligence could lead to considerable capability increases in a very wide range of applications, such as assisting decision-making, improving training systems, optimizing maintenance or detecting targets or hacking.

3. However, the digitization and robotization of the battlefield is not intended to completely replace human involvement. The aim, rather, is to assist humans and expedite the decision-making process, which must ultimately remain under human command by increasing human capabilities and freeing humans from repetitive and tedious tasks. It also aims to achieve quicker, more relevant analyses to minimize unnecessary civilian and military casualties. Developing artificial intelligence must thus be viewed as a decision-making tool for the command, in a complex and ever-changing operational situation.

II. Developing autonomy and human-machine interaction

A. The human command must be aware of and be able to assess system reliability and "predictability"

4. Technological developments linked to autonomy raise questions about the "predictability" of future weapons systems. The most important factor to take into consideration is not system predictability in itself, but the ability of the operator (with the assistance of the designer) to assess and control it.

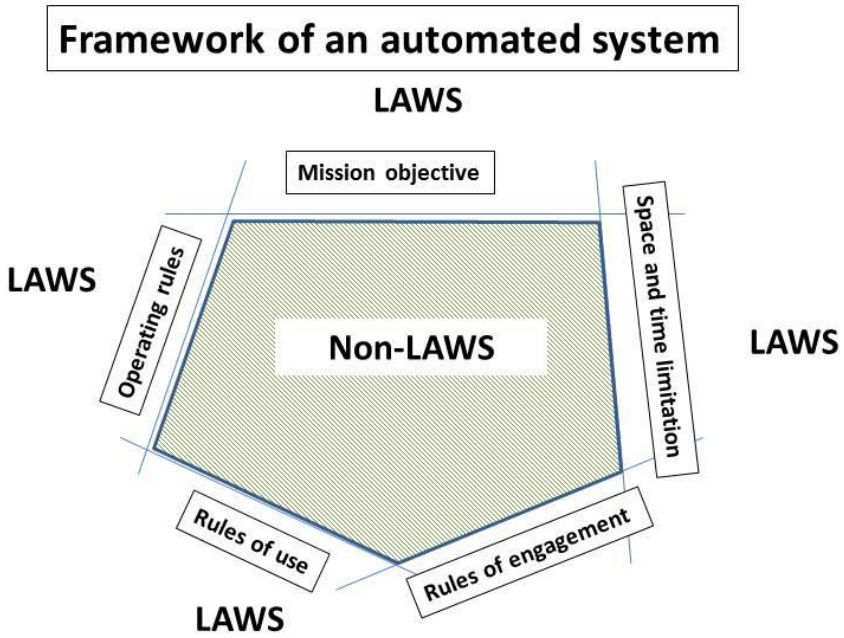
5. Thus operators and human command must be able to understand how systems operate - and their potential effects on the theatre of operation - and to exercise their judgement accordingly when they are being implemented. This requires:

- appropriately implementing strong system verification, assessment and validation procedures;
- where necessary, carrying out stringent and exhaustive tests on system algorithms under difficult or even deteriorated or statistically abnormal conditions.
- developing a lesson learned-style process.

B. Systems must remain subordinate to human command

6. The principle of command responsibility must remain, even when using systems with high levels of autonomy. This subordination is particularly necessary when deciding to deploy systems and when defining the mission framework, which must be done by humans.

7. The operating rules, the rules for use, the rules of engagement and the missions of autonomous systems must always be validated by humans and included in a precise and defined framework, as missions are essentially limited in time and space to a specific battleground.



8. Systems can have capabilities to adapt to their environment based on artificial intelligence techniques, provided that the mission framework is observed. They can, however, during a mission, based on the mission data they have collected and analyzed, deem that the framework defined by the command prevents them from properly carrying out their mission, and thus suggest changes to it: in such situations, this assessment must be validated by the command (e.g. request to validate the right to pursue a target beyond the initially-defined area).

9. Currently, for armies observing international law, there are no identified operational advantages in adopting systems with self-learning capabilities, enabling them to reprogramme themselves during missions to the extent that they could go beyond their

framework, without referring to the chain of command, or allowing them to set their own objectives without human validation.

C. In the field of LAWS, communication links, even intermittent ones, are required between the human command and systems.

10. To be able to change the mission framework, communication links, even intermittent ones, are necessary during its execution, between the military chain of command and the relevant system. These links allow the chain of command to constantly interact with systems.

11. Systems whose mission framework does not require changes can do without these communication links because they operate automatically based on human programming and thus strictly follow the framework designed for them.

D. A central role for human command in the use of force.

12. The foremost need of armed forces is to control the effects of the weapons used. In this regard, the command must retain the ability to take final decisions regarding the use of lethal force including within the framework of using systems with levels of autonomy or with various artificial intelligence components.

13. The use of force remains an inherent responsibility of human command, particularly in cases of violations of international humanitarian law.