

Armaments and Munitions for Unmanned Ground Vehicles

an Industry Viewpoint



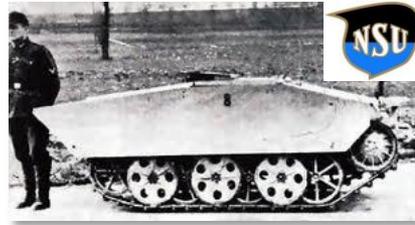
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Historical Perspective

When is a robot weaponized?

For the purpose of this presentation: *when the robot has the ability to defeat an enemy force due to it carrying one or more integrated:*

- Direct Fire Weapons
- Indirect Fire Weapons
- Explosive Charges



NSU Motorenwerke's SdKfz. 304 "Springer"



Captured German SdKfz. 302/303 "Goliath"



SdKfz. 301 "Borgward IV"

Early historical examples of weaponized robots:

WW2 was the first war where weaponized robots were used

German Army:

- Sonderkraftfahrzeug SdKfz. 302/303 "Goliath" (75-100 kg charge)
- SdKfz 304 "Springer" based on Kettenrad (330 kg charge)
- SdKfz. 301 "Borgward IV" (optionally manned) (450 kg charge)

Russian Army:

Teletanks built on T-18, T-26, T-38, BT-5, and BT-7 tanks

British Army:

Mobile Landmine (MLM) "Beetle"



Metropolitan-Vickers' "Beetle"



Soviet TT-2 Teletank

Lessons Learned Over Last Decade

- Remote positioning of weapon systems by means of weaponized UGVs continues to be of interest to many armies. Examples over the last 10 years include:
 - US Army's Future Combat System PoR
 - TALON Robot
 - SWORDS Robot
 - MAARS Robot
 - Ripsaw Robot
 - Russian robots
 - South Korean robots
 - Others
- Weaponized robots can add safety to ground operations while giving small unit leaders better information to act on before engaging.
- Safety is paramount and redundancies are required to pass safety tests.
- Automatic engagement is not desired currently.



Current User Interests:

US Army:

The Maneuver Center of Excellence invited industry to showcase weaponized robots at Ft Benning, GA on 10 Oct 13

Four companies demonstrated their robots firing M240B MMGs, and several others planned to attend but could not due to Government furloughs.



HDT's Protector



QinetiQ's MAARS



Northrop Grumman's CaMEL



iRobot's Warrior

US Marine Corps

The Marine Corps has shown considerable interest over recent years with:

Goliath Robot

MAARS Robot

Weaponized GUSS



Goliath



GUSS



MAARS

Robots Using Weapons Designed for Humans - - *problematic*

Pros:

- Weapons are easy to come by
- Users are already trained and ranges exist
- Common parts, maintenance, ammunition

Cons:

Weapon –

- Selectors are difficult for a robot to handle
- Charging can be difficult for a robot
- Loading ammunition is difficult
- Butt stocks and other traits get in the way
- Single Safety
- Recoil
- Weapon sighting and ballistic solutions
- Immediate action drills are difficult



Ammunition –

- Often limited ammunition onboard
- Feeding issues and clearing issues
- Lack of variety
- Heavy
- Reloading is slow and cumbersome

Weapons Designed for Remote Use

To optimize weapon systems for robot use, they must:

1. Minimize human interactions down range
2. Easily enable remote ammunition handling
 - Feeding
 - Loading
 - Clearing
 - Ejecting
3. Permit rapid change of ammunition types for varied threats
 - Less-than-lethal and Lethal
4. Automatically calculate ballistic solution and target lead
 1. Solution changes with ammunition types
 2. Target tracking
5. Enable quick pointing and control of shot pattern
6. Automatically report weapon state, level of arming, ammunition expenditure
7. Integrate day and night optical systems
8. Ease maintenance, including diagnostics and prognostics
9. Minimal weight and complexity of design
10. Little to no use if captured



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Questions?

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