Area Preparation Tractor
APT

Andy Smith, University of Genoa, Italy
See www.nolandmines.com and www.ddasonline.com
Over twenty years in demining, many machines have been improvised to help in area preparation.

Based on existing plant and agricultural machinery, their success has often been ignored because they are not commercially available.
Not all improvised machines have been that big.

For example, for a particular task involving small gelignite pressure mines in Myanmar in 2015, I made this area preparation machine to prepare the ground in advance of manual demining.

This was a task specific machine, only suitable for that threat, on level ground, but it did the job well.
What I needed was a more versatile small machine - one that could cut heavy undergrowth, avoid obstacles, climb steep inclines, and be radio controlled when working in areas with all AP mine hazards.

At that time the Italian Locostra ‘pink’ tractor was unfinished and unproven.

I knew about it because I had designed the prototypes for its blast resistant wheels.
The machine has since matured. It now has a bigger engine and a new name.

Because the machine was singularly “appropriate” for its purpose, its new name is APT, the Area Preparation Tractor.

APT does not pretend to be something it is not: it is not a mine clearance machine.
Based on a well proven agricultural tractor that is widely used in steep Italian vineyards, APT can work on gradients much steeper than other machines.

Its flexible chassis means that it can manoeuvre tightly around obstacles without having to leave a wide area unprocessed.
Its hydrostatic drive allows it to move forwards and backwards with the same ease and speed, so allowing the user to choose which approach is best suited at a specific task.

The area preparation tool is attached using a heavy duty fork-lift mechanism proven on show-plough variations.

The hydraulically powered rotor is adapted from a high quality implement used widely in motorway maintenance.
Adaptations

An industrial grade radio control system was fitted while retaining the standard driving controls, so allowing the machine to be driven to the area of use, then remotely controlled.

The cooling system was revised to allow for extended use in high temperatures.

Blast resistant wheels that prevent damage to the bearings and chassis were developed and tested.

Armouring and cameras complete the adaptations.
Advantages

1. Versatile and able to traverse steep terrain while cutting undergrowth.
2. Can also process the ground surface.
3. Can work for long hours.
4. Can be driven over roads for deployment, towing a trailer.
5. Has a simple and robust remote control that is easy to use.
6. Spare parts are easy to obtain and servicing simple.
7. APT has a low total cost of ownership.
Limitations

All small machines are vulnerable to the detonation of AT mines even when they are designed to be repairable.

AT mines are designed to destroy a battle tank and can throw them high the air if they detonate underneath them.

Even big machines designed to withstand AT mine blasts can be severely damaged by them.
Limitations

The attempt to make small machines survive AT mines leads to them being too heavy. They can dig themselves into soft ground – and push explosive hazards deep into the ground.

An AT mine detonation underneath them will send them into the air and their weight increases the damage when they land.
APT is lighter than its competitors at around 4 tonnes.

It’s blast resistant wheels and armouring are only designed to protect it against the detonations of AP mines while it prepares the ground for the thorough manual search and clearance that will follow.

Because it does not waste energy carrying heavy armour or trying to apply pressure deep in the ground, it has more power for traction and manoeuvring.
Video

Because it always better to see things for yourself, I think that a two minute video will explain the machine better…

APT_Movie_3_2017.wmv
APT C-IED

The C-IED APT is designed for use when responding to IED threats in an urban environment.

The C-IED platform can simply replace the area preparation tool on a demining APT or can be fitted to a dedicated C-IED APT with upgraded (rifle resistant) armour and refined decontamination features.

The C-IED platform includes a dozer blade, large manipulator arm, small manipulator arm with disrupters, winch and extra cameras.
C-IED utility

The C-IED APT will be able to:

1. move rubble and obstructions aside (delicately when appropriate);
2. conduct a rapid camera survey of an area, producing accurate map records;
3. investigate suspicious objects either robustly or delicately;
4. collect ordnance that may not be considered safe to move by hand;
5. disrupt potential IEDs with either a water charge, frangible or solid projectile: each of three disrupters feature three pre-loaded barrels - 25.4mm and 40mm;
C-IED utility

6. fire a closed grapnel and line that can then be used to pull the target;

7. place explosive charges to disrupt/destroy IEDs;

8. attach hooks and a winch cable to drag heavy items to another place or deploy cutting equipment able to cut an additional entry into a vehicle/container;

9. deploy a COTS freeze neutralising kit;

10. gain safe entry to a vehicle for internal camera inspection;

11. carry a multi-channel (selective) wireless signal jammer.
Unlike other C-IED assets

1. It can be driven on board to the area of need: its small footprint and manoeuvrability will allow it to drive over sidewalks when traffic is gridlocked following an incident.

2. It has plenty of power and can be used for more than six hours continuously.

3. Its design enables access through or over rubble.

4. It can carry smaller robots and place them when required.
CONTACT
University of Genoa
Andy Smith or Matteo Zoppi
andrew.vian.smith@edu.unige.it
zoppi@@dimec.unige.it