

Kawasaki Heavy Industries Ltd. | Japan

### GENERAL DESCRIPTION

*Minebull* is produced by Kawasaki and belongs to the Bulldog family, Kawasaki's humanitarian mine detection and demining system. The components are the Minedog, a mine detection system, and the Minebull, a mechanical demining machine.

The Minebull is a four-wheel drive, heavy demining machine equipped with a high-speed digging drum (tiller) at its front. The Minedog electronically detects and marks the AP mines detected; the Minebull detonates the mines by smashing them against the digging drum and drum covers. At the same time, buried metal fragments are automatically collected with permanent magnetic pulleys.

The digging drum is made of 30 mm steel plates. The number of digging bits and their arrangement are designed to prevent unexploded AP mines being carried away with the dirt. The design is based on studies of how AP mines and surrounding dirt move when they encounter the digging drum. The drum takes a 2.23 m-wide swath and can penetrate the ground to a depth of 35 cm. A clearance rate of 3,345 m<sup>2</sup>/h (at 1.5 km/h) is claimed, but depends on ground conditions.



THE MINEBULL

The vehicle body is protected from AV mine shrapnel as follows:

- > the cabin window is 67 mm, bullet- and dust-proof glass
- > the cabin is armoured with a 16 mm steel plate on the front and a 12 mm steel plate on the side
- > the engine room access door is a composite plate made of iron and Zylon, a synthetic fibre with outstanding thermal properties that is ten times stronger (static strength) than iron
- > the engine room, fuel tank, tyres and joints are armoured with 12 mm steel plating protection.

The Minebull's metal fragment collection system uses strong magnetic pulleys to collect metal fragments into a bucket while the dirt mixed with the metal fragments is removed via a conveyor belt after detonation. The system sweeps up nearly 100% of all exploded shrapnel including small metal fragments in the soil. The machine is normally remotely controlled but also allows for manned operation. It is equipped with two rescue winches at the rear of its chassis capable of towing 12 tons each (total 24 tons) in case of sticking or mechanical failure of the driving system. For long-distances, the Minebull can be transported on a low-bed trailer, but it can be self-driven for site changes over short and medium distances with a speed up to 20 km/h.



THE MINEBULL | Detail of the tiller system

### **CLEARANCE METHODOLOGY**

Minebull's digging drum rotates anti-clockwise to dig up AP mines and the intercepting bits (chisels) implanted inside the drum cover destroy those mines uncrushed by drum. The drum's rotation speed can be varied depending on the minefield's soil characteristics from 60 rpm (Low First) to 200 rpm (High Third).

Maximum clearing depth is 35 cm but usually the depth is set at 30 cm or 20 cm and such depths are maintained automatically by digging depth sensors. The digging drum is made of 30 mm steel plate and has 249 bits, while the drum cover has 81 intercepting bits.

### **MACHINES IN USE TO DATE**

The first Minebull was delivered to Afghanistan in August 2007 and started operation in September 2007.

### ENGINE, FUEL AND OIL

- > The engine is a 243 kw (330 hp) Nissan diesel and the driving system has hydrostatic transmission for ultra-low speed traction.
- > Fuel capacity is 420 litres.
- > Fuel consumption depends on the particular site conditions but during the test trials mentioned below the fuel consumption varied from 21.3 to 47.3 litres per hour.

### FACTORY SUPPORT

- > Two months of training for two operators and one mechanic are provided at the construction factory in Japan.
- > Training courses and manuals (operation and maintenance) are provided in English and are included in the purchase agreement.

### MAINTENANCE SUPPORT

Kawasaki recommend employing at least two operators and one engineer (with some technicians in support) to operate the Minebull. It is also recommended to have access to heavy construction machinery maintenance shop.

Federal Trading Corp., with its main factory in Karachi, Pakistan and branches elsewhere in Pakistan and Kabul, Afghanistan, has been appointed as a service centre for maintenance and operation support to Minebull.



MINEBULL | With support vehicles

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## TESTS AND EVALUATIONS

One test report is available at the website [www.itep.ws](http://www.itep.ws) Japan International Cooperation System (JICS), *Final report (summary) for humanitarian mine clearance equipment in Afghanistan under the research project for developing mine clearance related equipment in Afghanistan, 2004-2005*. At a minefield near Kabul airport the Minebull destroyed 32 mines in 50 minutes.

## REPORTED LIMITATIONS AND STRENGTHS

### Limitations

- > The system is not designed for clearance of AV mines.
- > Complete with the tiller attachment, the system weighs 34 tonnes. For transport over longer distances, a low loader is required.

### Strengths

- > The additional collection system for metal fragments.
- > GPS available for mapping.
- > Suitable for various terrains.
- > Able to detonate or neutralise all AP mines.

**DIMENSIONAL DATA**

1. Length without attachment	N/A
2. Length total	9,293 mm
3. Width without attachment	N/A
4. Width total	3,240 mm
5. Clearing   Working width	2,388 mm
6. Height   Overall	3,820 mm (without antenna) 4,420 mm (with antenna)
7. Mass   Basic vehicle	N/A
8. Mass   Detachable unit(s)	N/A
9. Mass   Overall	34,000 kg

**OPERATIONAL DATA**

10. Wheels   Tracks (description)	Four wheel drive Wheel base: 2,798 mm   Wheel track: 1,715 mm
11. Ground Bearing Pressure (kPa)	Normal tyre 706 kPa (front) / 373 kPa (rear) Wide tyre (optional) 490 kPa (front) / 255 kPa (rear)
12. Hill climbing ability (in degrees)	10° (in operation) / 20° (travelling)
13. Number of Chains   Chisels   Tools	Cutting bits: 249 (drum)   81 (drum cover)
14. Beat pattern (hits per m <sup>2</sup> ) at different operating speeds	N/A
15. Length of Chains   Tools	N/A
16. Diameter of drum	1,005 mm (tip of cutting bit)
17. Rotation Speed	From 60 rpm at low 1 <sup>st</sup> to 200 rpm at high 3 <sup>rd</sup>
18. Clearance   Working depth in varying terrain	Digging depth maximum 35 cm
19. Working Speed (m <sup>2</sup> /h)	
> Light Soil   Medium Vegetation	3,345 m <sup>2</sup> /h at 1.5 km/h
> Medium Soil   Medium Vegetation	Depending on specific condition
> Heavy Soil   Dense Vegetation	Depending on specific condition
20. Control of Clearance   Working depth	Automatic (can be set at 20 and 30 cm depth)
21. Additional attachable working tools	
22. Armour	Armoured with 12 - 16 mm thick steel plate and 60 mm anti-bullet glass
23. Remote controlled	Yes
> greatest distance	Max 900 m
24. Transportation	
> short distances	Sea and land
> long distances	Self deployable for short/medium distance
> sea transport	
> air transport	

## SYSTEM STATUS AND DEPLOYMENT

25. Machines in use	1
26. Other types	No
27. Location of use	Afghanistan
28. Totally cleared so far (m <sup>2</sup> )	Not given

## ENGINE | FUEL | OIL

29. Engine	Nissan Pe6t diesel engine
30. Engine power at the flywheel	243 kw (330 ps)/2,000 rpm
31. Sufficient power supplied to working tool	N/A
32. Fuel capacity	420 l
33. Fuel consumption	Depending on specific condition
34. Separate engine for working unit	N/A (power for working unit is extracted from main engine with hydraulic pump and motor)
35. Cooling system	Conventional radiators
36. Oil capacity (both engines)	Approx. 30 l
37. Hydraulic oil capacity (both engines)	120 l for HST 120 l for loading system

## COSTS

38. Cost of system	Approx. 800,000 US\$ including training and initial spare parts
39. Other costs	
> training	Included in purchase agreement for two operators and one engineer
> spare part set chains   belts	Included in purchase agreement for initial spare parts set
> repair costs for one year	Depends on the operation
40. Availability for hire	One machine is available

## OTHER

41. Operator comfort	Operator can remotely operate the Minebull in the remote operation vehicle equipped with air conditioner (two passenger car type operators seat with noise insulation interior and air conditioning in case of manual driving for short transportation)
42. Air conditioning	Provided for cabin cooling