

MDR Complete Demining AB | Sweden

### GENERAL DESCRIPTION

The *Freeland 3000* flail machine is built on the best of existing technologies in the field of mechanical mine clearing. It introduces new concepts to deliver a clearance capacity exceeding that of much heavier machines.

The *Freeland 3000* is based on a forestry machine developed by the renowned Swedish company Rottne Industri AB. It is an eight-wheel-drive machine with removable steel tracks. The cabin is armoured with 22 mm Armox and 60 mm glass. There is an extra door in the roof if the machine should roll over. An automatic sprinkler is activated in case of fire.

The revolutionary design of the flail unit – with its heavy, specially-designed hammer tools and short chain links – permits a performance equivalent to that of a tiller-equipped machine but without the inherent susceptibility to damage the tools.

Cruise control maintains the desired speed and a GPS maintains course with the chosen overlap. Clearance depth is manually controlled with the help of two indicators. The machine is designed to clear AP and AV mines. In tests so far the flail has been unharmed when exploding an AV mine.

Fully armoured and fitted with a 300 cm wide flail unit, the machine weighs about 19.6 tons, and is therefore classified as a medium-sized flail machine. The machine can process 1,000-3,500 m<sup>2</sup>/h. It can be transported by air in a C-130 Hercules aircraft. (This demands that the cabin is dismounted to lower the height of the machine). For moving on roads an ordinary trailer is sufficient.



FREELAND 3000

## **CLEARANCE AND CUTTING METHODOLOGY**

The 42 hammer-shaped tools on the 3 m wide flail unit are 700 mm long and weigh approximately 10 kg each. They are made from tempered Swedish steel. The heavy weight of the tools and a flail rotation speed of 420 rpm result not only in an exceptional flail performance but also ground penetration characteristics similar to those of a tiller system. The maximum depth is 400 mm while 300 mm is possible in all soil conditions. The tools have a life of up to 500 hours and are easily replaced in the field, resulting in high operational efficiency. The capacity for vegetation cutting varies between 1,000-3,000 m<sup>2</sup>/h.

## **MACHINES IN USE TO DATE**

The Freeland 3000 is a totally new machine built according to well-known and proven concepts, with a unique flailing tool. It is now ready to enter the world market after having been thoroughly tested with very good results.

## **ENGINE, FUEL AND OIL**

The base unit is driven by a John Deere 140 hp diesel engine. The mine-clearing unit consists of an air-cooled Deutz 480 hp diesel engine which runs the flail via a mechanical transmission. Less than 10% of the engine power is lost in the transmission. Fuel consumption is typically 55 litres per hour. (The machine is designed to operate a full day without refuelling.)

## **FACTORY SUPPORT**

Spare parts, consumables, training, a fully equipped workshop and a quality assurance programme are offered and vary from case to case. Basic training for drivers is three weeks and the quality assurance program is one year on site. Manuals are in English but can be translated into any desired language. Warranty period is one year covering design and fabrication errors.

## **MAINTENANCE AND SUPPORT**

The Freeland 3000 operates six hours without any maintenance. About two hours is needed for refuelling, cleaning and changing filters, after which the machine is ready to operate. There are also schedules for weekly, monthly and yearly maintenance. Everything needed for maintenance is included in the container-based workshop.



FREELAND 3000 | Ready to go

## TESTS AND EVALUATIONS

The Freeland 3000 was tested in August 2008 at the Swedish Army EOD and Demining Centre, in accordance with standards set by the International Test and Evaluation Program for Humanitarian Demining.

Two test reports are available at the ITEP website:

1. Capt Patrik Blomander, Pre-Test Assessment of Freeland 3000, SWEDEC, Sweden, 2008: [www.itep.ws/pdf/SwedecFreeland3000\\_2008.pdf](http://www.itep.ws/pdf/SwedecFreeland3000_2008.pdf)
2. Capt Patrik Blomander, Freeland 3000 Test and Evaluation, SWEDEC, Sweden, 2008: [www.itep.ws/pdf/SwedecFreeland3000CWA\\_2008.pdf](http://www.itep.ws/pdf/SwedecFreeland3000CWA_2008.pdf)

## REPORTED LIMITATIONS AND STRENGTHS

Comments from the SWEDEC Test and Evaluation report include:

“The Freeland 3000 triggered or neutralised 450 mines of 450 mines - 100 % of the target mines used in these trials.

“The results in each lane were varying between 44 up to 50 broken or triggered mines. The machine demonstrated the ability to penetrate well beyond the depth required to reach the deepest targets. In all but the most difficult soil, a smooth uniform cut across the whole width of the machine was observed.

“The survivability test went well. The machine was not driven across the anti-tank mine (the Swedish M/41-47) placed at the surface ...because the machine had not done the operator survivability test. The mine was placed in front of the flail and was remotely detonated. The machine suffered no damage from the mine. No tools were missing. The machine could operate again after five minutes.”

### Limitations

- > The system requires transportation on a trailer over longer distances.
- > Creates huge dust clouds, as with all flail systems in dry environments.

### Strengths

- > High clearance rate.
- > Easy maintenance.
- > Low ground pressure gives outstanding terrain mobility.
- > The working tool unit separates from the machine to give easy transportation
- > RTK GPS guidance system with accuracy of 2.5 cm autoguide allows minimal overlap capability.
- > Working tools have an outstanding lifespan.

## DIMENSIONAL DATA

1. Length without attachment	9,150 mm
2. Length total	10,210 mm
3. Width without attachment	2,400 mm
4. Width total	3,850 mm
5. Clearing   Working width	3,000 mm
6. Height   Overall	3,300 mm
7. Mass   Basic vehicle	14,950 kg
8. Mass   Detachable unit(s)	4,700 kg
9. Mass   Overall	19,650 kg

## OPERATIONAL DATA

10. Wheels   Tracks (description)	8 tyres 500/60-22.5 and 4 tracks 600 mm wide
11. Ground Bearing Pressure (kPa)	0.15 - 0.20 kg/cm <sup>2</sup>
> Tracks	—
> Front Wheels	—
> Rear Wheels	—
12. Hill climbing ability (in degrees)	27°
13. Number of Chains   Chisels   Tools	42
14. Beat Pattern (hits per m <sup>2</sup> ) at different operating speeds	390 at speed 1 km/h
15. Length of Chains   Tools	589 mm
16. Diameter of drum	222 mm
17. Rotation Speed	420 rpm
18. Clearance   Working depth in varying terrain	200 - 350 mm, maximum 400 mm
19. Working Speed (m <sup>2</sup> /h)	
> Light Soil   Medium Vegetation	3,500 m <sup>2</sup> /h
> Medium Soil   Medium Vegetation	2,000 m <sup>2</sup> /h
> Heavy Soil   Dense Vegetation	1,000 m <sup>2</sup> /h
20. Control of Clearance   Working depth	Mechanical control, digital indicator in the cabin
21. Additional attachable working tools	N/A
22. Armour	22 mm ARMOX 440T 60 mm glass (tested for AP 762*8)
23. Remote controlled	No
> greatest distance	
24. Transportation	
> short distances	With tracks 7 km/h, dismounted tracks 25 km/h
> long distances	Can be transported with normal trailer without any special permissions
> sea transport	—
> air transport	Can be modified to fit into a Hercules C130

## SYSTEM STATUS AND DEPLOYMENT

25. Machines in use	New on market
26. Other types	No
27. Location of use	—
28. Totally cleared so far (m <sup>2</sup> )	—

## ENGINE | FUEL | OIL

29. Engine	John Deere 140 hp
30. Engine power at the flywheel	N/A
31. Sufficient power supplied to working tool	N/A
32. Fuel capacity	120 l John Deere, 460 l Deutz
33. Fuel consumption	55-60 l/h in total for both engines
34. Separate engine for working unit	Yes, Deutz BF12513L, 353 kw, 19.7 l
35. Cooling system	Air cooled
36. Oil capacity of engine	
37. Hydraulic oil capacity (both engines)	

## COSTS

38. Cost of system	On request
39. Other costs	
> training	
> spare part set chains   belts	
> repair costs for one year	
40. Availability for hire	Yes

## OTHER

41. Operator comfort	Ergonomic chair and controls, radio, GPS guiding and documentation
42. Air conditioning	Yes