

BRITISH LANDMINES

November 1996

"A weapons designer is not, first and foremost, a killer; he is a statistician, a metallurgist, an engineer. He is trained for his profession and he thinks in its terms. Enter the world of the munitions designer. It is filled with 'lethal area estimates' and 'kill probabilities', 'effective casualty radius' and 'expected damage to a circular target area'."

Eric Prokosch, *The Technology of Killing* (1)

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Appendix 1 - The companies and their banks

This report was prepared by the UK Working Group on Landmines and Mines Advisory Group. The UK Working Group on Landmines would like to see a comprehensive worldwide ban on the production, stockpiling, export, sale and transfer, and use of anti-personnel mines.

Introduction

The privatisation of Royal Ordnance in April 1987 (sold to British Aerospace) and the reduction in government-funded research and development throughout the 1980s produced a distinct change in the process of weapon development and procurement in the United Kingdom. Previously, weapon development was essentially responsive to the military's stated needs. Now, companies involved in the development and manufacture of mines must convince the military of the utility of the weapons that they are producing. The recent International Committee of the Red Cross report 'Anti-Personnel Landmines: Friend or Foe?' suggests that this change "has placed the responsibility for mine production more squarely in the hands of the industry" (2). Landmine development is driven by the producers as much as by the customers.

For the producers, there is an incentive to produce weapons that will be marketable beyond the domestic military - the weapons must fit into a broader international market if manufacturers are to be confident of recouping development costs (and thus keeping the price down for the domestic military). The UK Government in recent years has worked hard to support arms sales overseas. The system of Export Credit Guarantees and the linkage of arms and aid evidenced in the Pergau Dam affair are indications of the extent to which the arms industry and the government are bonded. This appears to be further evidenced by Government statements to the effect that "the manufacture of landmines in this country is a matter for companies concerned rather than the Government" (3). In turn, however, companies appear to be looking to Government for leadership and for instructions: "the company must reserve its right to consider designing and manufacturing defence equipment of any type, including mines, if it is requested to do so by Her Majesty's Government" (4). There is much doubt (see below) as to the legality of anti-personnel mines (APMs) but the above suggests that companies do indeed view weapons production as an engineering task encouraged by economic interest rather than a moral and political one.

The Government has claimed that it is pursuing a "humanitarian but realistic" policy regarding landmines. A desire not to compromise the effectiveness of our armed forces is generally cited as the basis for this realism. Increasingly, doubts are being raised as to the effective military utility of anti-personnel mines relative to their effects on the ground. Over 40 senior officers from around the world, including Generals Norman H. Schwarzkopf and Sir Peter de la Billiere, have to date endorsed the view that "*the limited military utility of AP mines is far outweighed by the appalling humanitarian consequences of their use in actual conflicts. On this basis their prohibition and elimination should be pursued as a matter of utmost urgency by governments and the entire international community*" (5).

This view complies with International Humanitarian Law which, amongst other things, requires the military to weigh the military advantages of a weapon against the effects of its use on civilian lives and property. Some believe that APMS are indeed already outside the law. "The nature of mines makes them indiscriminate as to their effect; as such, they are prohibited under international humanitarian law, and practical measures should be taken to put that prohibition into general practice" (6). If this is the case, then the legality of the production of APMS and their components may be questionable. By down-playing or perhaps conveniently ignoring the legal aspect, it is equally possible then that our Government's view is based on an economic 'realism' and a desire not to compromise British industry's potential outlets overseas (It must be stressed here that the production, stockpiling and use of APMS in or by the UK is not currently illegal under domestic law).

The 'smart' (self-destruct) mines that the Government has promoted the use of are well suited to the high-technology production capabilities of the UK. Whilst the UK has withdrawn from the anti-personnel mine market in recent years, many companies remain active in other aspects of the landmine trade - particularly the development and production of fuses (7). It is in complex new fusing technologies, being developed by companies like Ferranti, that we find the brains of the self-destruct mines. Significantly, the US Defense Intelligence Agency predicts that demand will continue to grow for integral and add-on fuses which resist demining and incorporate anti-disturbance, delayed arming, self-destruction and self-neutralising features (8). More recently, self-deactivation has been added to this list of 'desirable' features.

The view of companies may be that the potential economic advantage of adopting these 'smart' weapons as a miracle cure for the problems caused by landmines almost certainly outweighs any doubts as to their humanitarian effects. The UK Government's 'realism' may in reality be little more than a cynical prioritisation of a perceived economic interest over international humanitarian need.

The stance adopted by the UK at the recent review Conference of the 1980 UN Inhumane weapons Convention typifies this. Hunting Engineering's HB876 is at the forefront of the current trend in landmine design and production (ie. the destruction of armour and personnel at the same time). It is a high-technology weapon that has been produced in collaboration with a number of specialist agencies - experts in the engineering of complex fuses, parachutes and sub-munition distribution. It is a weapon that blurs the boundaries that have traditionally been used for the categorisation of mines. Historically, anti-personnel mines

were developed to make the clearance of anti-tank mines more difficult; the HB876 combines both functions being hazardous both to vehicles and to personnel.

Rather than hand-emplaced, HB876 is delivered from a container that is itself dropped from an aircraft. It is a 'hybrid mine' and it is a 'sub-munition'. Neither of these developments from the model of the anti-personnel mine as it was developed after World War II alters the impact of the HB876 from a potential victim's perspective.

Such developments have opened up a grey area in the categorisation of landmines. The Government has been eager to assert that the HB876 is not an anti-personnel landmine. Yet for those involved in the campaign to ban landmines, the HB876 is of fundamental importance because of the fear that Governments may circumvent restrictions or statements of opposition to APMs by asserting that *de facto* anti-personnel mines were made for a different primary purpose.

Such fears have turned out to be well founded. The recent review of the 1980 UN Inhumane Weapons Convention has adopted a revised definition of anti-personnel landmine as a "'mine' primarily designed to be exploded by the presence, proximity or contact of a person and that will incapacitate, injure or kill one or more persons". The HB876 will kill people when they approach it but the Government argues that it was not designed primarily for this purpose. Such a distinction is possible only if we accept a categorisation of weapons from the producer's perspective - it has little validity from a victim's perspective. The actual effect of weapons, which is clearly the cause of humanitarian concern regarding landmines generally, is being neatly side-stepped. The UK Government was a driving force behind this rewording of the definition of anti-personnel mine, and lobbied effectively to ensure that the term 'primarily' was inserted and retained in the amended text.

Until mid-1995, Government statements indicated that the UK had not manufactured landmines 'for over a decade'. This then became 'for several years' when it was discovered that the PJRAD had been manufactured up to 1986.

There are several other indications that suggest that the UK's position on anti-personnel landmines may not be completely forthright. In 1994, a Parliamentary Question asking "to which countries the United Kingdom has exported casings or components for anti-personnel mines since 1982" went unanswered: "[D]etails of any export licences approved for this equipment could not be obtained without disproportionate cost" (9). Two years later, in 1996, when questioned about the export of components for landmines since 1990, the President of the Board of Trade answered that "no export licences have been applied for or

granted for anti-personnel landmines or for specially designed components for such mines during the period in question" (10). Given the difference in words used (ie 'landmines' in the question and 'APMs' in the answer, one can surmise that components for landmines other than those classified by the UK as APMs may have been exported from the UK.

The 1994-95 session of the House of Commons' Foreign Affairs Select Committee was told by the Foreign and Commonwealth Office that "no United Kingdom company had won a contract or been issued with a license to export an anti-personnel landmine, falling under the terms of the March 1995 extension of the anti-personnel landmines moratorium, for the last five years" (11).

The March 1995 criteria mentioned were that non-self-destruct APMs could not be exported but that self-destruct mines could be exported to countries that had ratified the 1980 UN Inhumane Weapons Convention (before amendment). The APM moratorium did not then, and does not now, formally cover components such as fuses, casings or explosive fillings etc. The above statement would put the last license issued at around early 1990. This is at odds with Government statements at the time that no APMs had been produced or exported since 1986.

"When asked recently "how many anti-personnel landmines were a) exported and b) transferred from the United Kingdom between 1979 and 1985 inclusive", the Government replied that "the information requested is not available" (12).

There must even now be some doubt regarding the UK's real involvement in the export of APMs and their components. Until transparent information is made public, this doubt will probably persist.

The UK Government has stated that the issue of export licences for APMs is considered i) on a case by case basis, ii) in the light of established criteria including the guidelines agreed by the five permanent UN Security Council members, the EU and by the Conference on Security and Cooperation in Europe (taking into account the purchaser's human rights record), iii) in the light of government policy. In August 1996, the Foreign and Commonwealth Office confirmed that "while our moratorium does not specifically cover components, an application to export specifically designed APL components for either military use or for the manufacture of APL in a third country would not be granted. Such approval...would go against the spirit, if not the letter, of our moratorium." In the absence of full and public information on export applications and licences, it is difficult to be completely satisfied with such assertions.

The material below is on landmines as a general category, not on anti-personnel mines only, and not all of the weapons included here are deserving of the same degree of opprobrium. It is alarming, however, to note how many of the anti-tank mines listed below are equipped with anti-handling fuses designed to kill any deminer or person who touches or handles them. Despite the technical sophistication of the new anti-tank fuses at which British companies excel, the mines are not being made less threatening to civilian populations.

This paper gathers together technical information on particular weapons as well as often contradictory statements from the advertising materials of the manufacturers and the Government's or the manufacturers' spokespersons. A changing presentation of mine systems by manufacturers and politicians is to be expected in the light of the rapid development of the international campaign calling for them to be banned - there have, however, been some interesting changes in the presentation of British mines in technical literature.

The final draft of this report was sent in early August 1996 to all UK companies mentioned or their parent companies for their comments. We promised to incorporate any further information and to correct any errors or omissions they pointed out. Companies were asked to go on the record with a statement against anti-personnel mines. Some have done so.

For the purposes of the above-mentioned draft report, the definition used is as follows: "A mine is a munition placed under, on or near the ground or other surface area and designed to be exploded by the presence, proximity or contact of a person or vehicle. 'Mine' includes remotely delivered mines not directly emplaced but delivered by artillery, missile, rocket, mortar or similar means, or dropped from an aircraft. Anti-personnel mine is a mine designed to be exploded by the presence, proximity or contact of a person and that will incapacitate, injure or kill one or more persons."

Finally, the companies were told that should they not reply by mid-August, we would assume they had nothing to add. Some of them did not reply at all.

To the best of our knowledge, the information contained in this report is correct. The UK Working Group on Landmines considers this report to be a basis upon which to build further research.

The Group is committed to keeping this report under review and will publish relevant information given to us by companies should any errors or omissions be pointed out in future.

"They made a wasteland and called it peace" Tacitus

BRITISH LANDMINES

The UK has had a considerable inventory of mine warfare equipment and components. Mines that may no longer exist in British Army stocks are included below to give some indication of the extent of invention and capability in this area - some of the older models can be found in mine-affected countries. A US report from 1993 mentions that the UK has been a significant source for the "landmines most commonly encountered in use" over the past 10 years. The same report places the UK in the "Top 10 list for sources of landmines found in the ground throughout the world" until the mid-1980s and as being one of the major producers of landmines over the last 25 years. The UK is also listed as being one of the primary export countries of "advanced mine and countermine technology and equipment" (13).

While some of the mines listed below might be regarded by the military as 'old', in some cases they have been used fairly recently in other countries. It would be useful to know how many of the mines described here have been exported, transferred or otherwise 'disposed of' and where. The period before the mid-80s is of particular concern in the case of older mines.

At 2 May 1995, the British Army's current stocks were of C3A1 Elsie, Ranger, L1E1 PJRAD and M18A1 'Claymore' anti-personnel mines according to the then Minister for Defence Procurement, Roger Freeman. The UK has recently declared a complete export moratorium on all APMs to all destinations. On 24 June 1996, the Minister of State, David Davis, declared that "we hope that all EU member states will adopt an equally wide-ranging moratorium". This was confirmed by the Council of Ministers on 2 October 1996. This welcome news is to be qualified however by the re-definition of APM mentioned earlier. This definition may sadly exclude from controls some of the mines described below and other munitions that may act at least partly as anti-personnel mines, particularly from the perspective of the potential victim.

1. ANTI-PERSONNEL MINES

MK2 The Mark 2 is a bounding fragmentation mine designed to be

triggered by trip wire.

'OINTMENT BOX' This is a small blast mine with a main charge of TNT.

No.5 is a small blast mine made of cardboard.

No.6 'Carrot mine' The No.6 is a relatively simple blast anti-personnel mine. The mine is detonated when pressure is applied to any one of the three plastic pressure prongs of the No.2 fuse. The body of the mine is made of plastic and it incorporates a detector ring that can be removed so as to reduce metal content to the fuse components only. When the detector plate is removed, the mine is almost impossible to detect. According to Human Rights Watch, the No. 6 has been found in Mozambique.

"At independence, the Rhodesians inherited stocks of this mine from the Southern Rhodesian colonial authorities." It is not known how the mines found in Mozambique arrived there. This mine was first manufactured by Forpeach Ltd which was later taken over by Royal Ordnance (14).

No.7 'Dingbat' The Dingbat is a relatively simple pressure-initiated, blast anti-personnel mine. The mine is designed to be scattered on the ground (it comes with a cloth camouflage cover for use if there is not enough time to bury it) or buried, and will function even if the mine is stepped on while upside down. The metallic casing makes the mine readily detectable by mine detectors. This mine was in use for several decades (1950s to approx. 1980) by the British Army and was eventually fully replaced by the C3A1 'Elsie'. The No. 7 was manufactured by Royal Ordnance.

'DORIS' The Doris is an anti-personnel blast mine. The explosive 'shaped charge' is formed into a conical shape to direct the blast in one direction. The Doris is emplaced in the ground as a complete assembly and then armed by removing the safety clip.

C3A1 'Elsie' This mine was developed by SNC Industrial Technologies Inc in Canada for the Canadian and British armies. The British purchased these mines between 1965 and 1968 from Canadian Arsenals Ltd. It comes in two parts, a body assembly and a small charge assembly. It contains just 7.6gr. of explosive. The charge assembly is placed into the body assembly, and then a safety clip is removed to activate the mine. It is olive or sand-beige coloured. It is undetectable although "if

required a detector ring can be fitted to enable the mine to be detected". There are reports that this mine was found in Iraqi arsenals. There are also reports in popular literature that the SAS may have used this mine inside Iraq (15). The UK Government has recently announced that it will destroy its stocks of this mine as non-detectable APMs (containing less than 8gr of metal or equivalent) are now prohibited.

L1E1 PJRAD 'PADMININE'

PJRAD (Projected Area Defence Mine), also known as the PADMININE (Position Attack Defence Mine) was made by Royal Ordnance up to 1986 and is still in the stocks of the British Army. It is a directional fragmentation APM based on the American M18A1 or 'Claymore'. It can be activated either by manual detonation with a Shrike exploder (also used for other demolition purposes) or by trip-wire. It fires 650 steel balls with a lethal range of 50m. According to *Jane's* (16), "[it] was developed originally for local defensive use at fixed installations in Northern Ireland". According to a report in *The Times* (4 May 1995), the mine was developed in the UK when America refused to supply Claymore mines upon learning where they would be used.

M18A1 - 'Claymore'

Although this mine is not of British manufacture, the British Army stocks an unknown quantity. Like the Padminine, it is a directional fragmentation APM. The American-made M18A1 has a curved rectangular casing containing 700 steel balls embedded in a convex fragmentation face. It can be activated by a hand-held 'pulse generator' or by pull-wire or trip-wire. When the explosive is detonated, the steel fragments are projected in a 60 degree arc to a range of about 50m and a height of about 2m.

Many countries make this mine under license, or copies of it and there has been much recent debate about whether some of these should indeed be classified as anti-personnel mines. Some say that their versions can only be fired in 'command-detonated' mode, that is by a soldier in ambush who could thus be sure to discriminate between civilians and enemy soldiers. The soldier commands the mine to detonate, it is not triggered by its victim. These claims have frequently been contested, in Austria and in Sweden for example where it has been shown that one can very easily convert even a command-detonated mine into a victim-activated mine by changing the fuse and inserting a trip-wire. The UK has classified its two mines of this type as APMs except when used exclusively in command-detonated mode (in which case they are classed as "other devices").

RANGER BARRIER DEFENCE SYSTEM

The Ranger system was developed by Thorn EMI Electronics Ltd in collaboration with the Royal Armament Research and Development Establishment. It is a vehicle-mounted scatterable mine system that launches L10A1 anti-personnel mines. Up to 1296 mines can be fired at one time to form a random pattern to a range of about 100m.

It has a plastic body and very little metal content as part of its mechanism, thus is difficult to detect. The mine is normally camouflaged green but can also come in a variety of colours, it is water-proof and can function underwater. The mine cannot be disarmed.

According to Human Rights Watch, Thorn-EMI actively marketed its Ranger system in the 1980s and sold more than 1 million units to at least four unspecified nations (17).

Other information indicates that in its present form, Ranger has been exported to a Middle eastern country and to one West African country - not Angola (18). The British Army is reported to have procured as many as 1,3 million units up to 1986. "[A] slightly smaller number [has been supplied] to a total of 4 overseas customers". Two other potential customers, one quite substantial, were interested at the time (19). We were recently told that the Army possesses far fewer than 1.3 million Ranger mines (20) - it is not clear how the large stock has been depleted.

Up to 1986, Thorn EMI developed, with Ministry of Defense funding, a man-portable version of Ranger. This development may well have foundered subsequently, probably for lack of further funds.

Some of the applications of Ranger are listed as "...covering rows of anti-tank mines as they are being laid, covering an existing anti-tank minefield by firing anti-personnel mines from outside the field, delaying the repair of demolitions, rapid infesting of woods, roadsides and tracks to impair and canalise enemy movement, infesting the far bank of a canal or river to impede enemy movement" (21).

An amendment (introduced by the UK) to the new Landmines Protocol of the UN Inhumane Weapons Convention ensures that mines delivered from a land-based system to ranges of under 500m are not considered to be 'remotely delivered' (ie. scattered by air or artillery - scattered APMs are now required to self-destruct and self-deactivate). They are thus not required to be self-destructing provided the resulting minefield is clearly marked and monitored - a difficult job in woods, across canals and rivers, or indeed in existing anti-tank minefields,

especially where the rapid rate of deployment is considered as one of the systems main advantages.

The UK Working Group on Landmines (UKWGLM) learned that the UK sought this loophole in international law for economic reasons: the mines cannot be retro-fitted with self-destruct mechanisms and would be costly to replace (22). This loophole was certainly not appreciated by all. The delegation of Mexico reportedly wanted to know why the UK delegation insisted on a distance of 500m and were told that it was the line of sight. Israeli delegates then apparently asked what would happen if there was a hill in the way. The humour of this exchange nevertheless indicated serious doubts about the UK's reasoning or its need for this particular exemption (23).

It has however come to light that the UK is planning to replace Ranger anyway. Thus a dangerous loophole in international law has been created for nothing. The UK has also recently agreed to destroy some of its Ranger stocks.

The Procurement Minister, James Arbuthnot, announced in the House of Commons on 7 May 1996 that "[a] representative of Valsella attended a presentation given to officials of my department in September 1995 by the manufacturer of the Ranger landmine delivery system about the potential for upgrading that system." It is as yet not clear what was discussed at this meeting.

Valsella is an Italian anti-personnel mine producer from which seven officials were convicted in 1991 for illegally selling \$180 million worth of munitions to Iraq, including 9 million anti-personnel and anti-tank mines. It was the largest unitary sale of landmines ever recorded (24). Italy currently implements a moratorium on the export of all anti-personnel mines. Copies of Italian mines are also produced, presumably under licence, by Chartered Industries in Singapore, by Sociedade Portuguesa de Explosivos in Lisbon, by Explosivos Alaveses SA in Madrid.

2. ANTI HELICOPTER MINE - AHM

Ferranti Technologies Ltd has developed a number of helicopter identification systems which they state in their advertising material could be developed into a mine fusing system. The HIBIRD and HIBRAD systems use infra-red and radar detection respectively to distinguish enemy helicopters. The HIBAT system uses acoustic recognition.

In collaboration with Alliant Techsystems (see also VLSMS and M15), Ferranti have submitted a proposal for AHM to the US Army.

It has a dual acoustic/infra-red sensor system and 'friend or foe identification' "ensuring the safe passage of friendly forces". The mine can be scattered or hand emplaced and can incorporate a "Command and Control module" to allow for remote arming and disarming. It is reported to have a multiple explosively formed penetrator (EFP) warhead. After the mine is emplaced, the acoustic sensor listens for a valid noise signature (ie. an enemy helicopter). The mine then aims the warhead towards the noise and turns on the infra-red sensor. The mine is detonated when the infra-red sensor acquires the target. The EFP warhead has sufficient energy to do significant damage to a helicopter.

A development contract worth \$8,380,421 has been awarded to Ferranti which is currently undertaking 'Advanced Technology Demonstration' of their AHM technologies (25).

3. ANTI-VEHICLE MINES

Although anti-tank mines are not as such at issue with the campaign against APMs, and the question of their military utility is quite different, it is important to document the development and use of these mines in the UK. Of the 100 million landmines already laid, perhaps 20 million are anti-tank, but they nevertheless close relief roads and hinder or prohibit access for refugees, peace keepers, police and relief/aid workers. Anti-tank mines are responsible for the deaths of British soldiers in Bosnia and for the deaths and injury of UN and aid workers around the world. Anti-tank mines may not have caused as large numbers of civilian casualties as APMs have, but they contribute to their misery in other ways (26).

The booby-trapping of anti-tank mines is often provided for in the design of the mine; today, they are usually equipped with anti-handling devices. When an inexperienced mine-clearer or a civilian tries to remove or move such a mine, the consequences are never less than disastrous. Mines so-equipped effectively become *de facto* anti-personnel devices. At the recent Review Conference of the UN Inhumane Weapons Convention, there was some talk of making anti-tank mines detectable and prohibiting anti-handling devices. Nothing came of it. The UK and other governments stated that anti-vehicle mines fitted with anti-handling devices were excluded from the definition of anti-personnel mine (because they are not 'primarily designed' to attack personnel) (27).

There is also considerable concern about the use of remotely-

delivered (air/artillery scattered) anti-tank mines and anti-tank mines with low or variable pressure-thresholds.

Very few controls exist with regard to anti-tank mines. The recent UN conference hardly addressed the question. Remotely-delivered (ie. air/artillery scattered) anti-tank mines should be "equipped with an effective self-destruction or self-neutralization mechanism and have a back-up self-deactivation feature" but only "to the extent feasible". If they are to be scattered from the air, "effective advance warning" shall be given "unless circumstances do not permit". Hand- or vehicle-emplaced anti-tank minefields must be accurately recorded and mapped. But the recording of air-scattered anti-tank mines need only be "estimated" and "when feasible marked on the ground at the earliest opportunity". Anti-tank mines do not need to be detectable, nor are there minimum specifications for the reliability of their self-destruct mechanisms (28).

DRAGONFISH This is an anti-landing craft mine for deployment under water on beaches.

No. 75 The World War II No.75 Mk.2 is a simple, pressure initiated, metal-cased, blast anti-tank mine. When pressure is applied to the top of the mine, the pressure plate bends and crushes one or both of the chemical fuses. The resulting chemical reaction causes a flame which sets off the booster, and then detonates the mine.

Mk. 5 This steel-cased mine from World War II may be found in two different models: the Mk.4 GS (general service) and the Mk.5 HC (higher content). The two mines are identical in appearance and size. The HC model has explosives on both sides of the inner wall of the case. Both mines may be fitted with either the Mk.1 or Mk.2 pressure 'spider' (an early attempt to give the mine a full-width capability), which is held in place by four slotted metal straps. This mine has been replaced by the Mk.7. The mine was made by Royal Ordnance.

L3A1 The L3A1 anti-tank mine was developed in the late 50's by Royal Ordnance. This is a relatively simple, pressure initiated (100-200kg), blast anti-tank mine. The mine's casing is plastic. The mine would be very difficult to detect when its detector ring is removed. The mine cannot be neutralised. It can only be disarmed by employing a special key.

Mk.7 - including Tilt Rod L93A1 The Mk.7 mine was manufactured by Royal Ordnance. It is a metallic anti-tank mine which normally needs a great deal of pressure to set the firing train in motion (275kg). The mine has a main charge of 8.89kg of TNT

and will cause massive damage to any vehicle.

Although the mine normally needs a large weight to set it off, this is not the case when it is fitted with a Tilt Rod (L93A1) which is comprised of a number of frangible carbon rods each containing a pre-stressed spring mechanism which operate the detonator once the rod is broken. These rods are variable in length and are designed to be set off by the belly of a vehicle striking them. They are however extremely delicate and need only a slight strike (3-18kg) to set the mine off. It is believed that L93A1 tilt rods were not entirely satisfactory as the action of humidity both in the field and in stockpiles has caused the carbon/graphite materials to crumble. Nevertheless, such sensitive tilt-rod design is a source of concern regarding the potential consequences of anti-tank mines for civilians. In addition the Mk.7 can be booby-trapped to dissuade clearance. The Mk.7 is said to have been replaced by the L9 Barmine.

The Mk. 7 has been found in : Afghanistan, Angola, Eritrea, Ethiopia, Namibia, Oman, South Africa, Zambia and Zimbabwe (29).

BARMINE (L9)

Nearly one million Barmine anti-tank mines have been manufactured by Royal Ordnance, initially as a replacement for the Mk 7 anti-tank mine. It can be hand-laid, but is designed to be laid by the "Barmine Layer" a dedicated plough system towed by an armoured personnel carrier or other vehicles. The layer was developed from a plough system used by the former GPO to lay telephone cables. The elongated shape of the mine also greatly increases the chance of a vehicle running over it, thus reducing the number of mines needed to be laid per 'mine run'. One 3-man crew can lay up to 700 mines per hour.

"The L9 Barmine is plastic with only a few components in the fuse and is difficult to detect using current electro-magnetic mine detectors." (*Jane's Military Vehicles and Logistics* 91-92 and 94-95). This sentence has been omitted from the 1995-96 edition though no mention is made of alterations to the mine.

The mine can have pressure-operated single-impulse or double-impulse fuses (these latter counteract clearance by mine-roller). Additional fuses are also available offering anti-disturbance and Full Width Attack Mine (FWAM) capability.

The FWAM fuses were developed and manufactured by Marconi Radar and Control Systems. The FWAM mechanical fuse has a sensor mast which is activated by contact with the underbelly of a tank.

Over 100,000 units are reported to have been made. The FWAM electronic fuse, produced under licence by Royal Ordnance as the RO 150, is activated by seismic disturbance coupled with electromagnetic signature recognition. It was originally developed by Nea-Lindberg of Denmark as the M/88 anti-tank mine fuse.

An anti disturbance fuse "employs an inertial system and counteracts mine-plough clearance and other methods of mine removal" (30). Such a sensitivity to disturbance would be extremely dangerous to civilians or mine clearance personnel. The mine has a main charge of 7.2 kg of RDX/TNT. The Barmine is understood to be in service with the armies of Britain, Denmark (Pantermine M/75), Egypt, India and some other countries (India manufactures it under license as the Mine Anti-Tank 3A Non detectable).

Vehicle-launched Scatterable Mine System - VLSMS

VLSMS is based on the Volcano Multiple Delivery Mine System manufactured by Alliant Techsystems of the USA. The VLSMS version is to be mounted on a Stormer armoured personnel carrier to be manufactured or adapted by Alvis Vehicles Ltd for use by the UK. While the Volcano fires a mix of anti-tank and anti-personnel mines, the VLSMS is said to be purely anti-tank.

The UK recently purchased 29 Vehicle Launched Scatterable Mine Systems from Alliant Techsystems (31). This is reported to have cost some 110 million pounds. As yet, no information has been supplied as to which type of mine has been procured for use in this system. Other companies are said to be involved in this deal under "industrial participation arrangements" but, with the exception of Alvis, it is not yet known which.

It is believed that the UK purchased VLSMS and not Volcano because the US has a moratorium on the export of anti-personnel mines. The mine canisters used by the two systems are identical and interchangeable. In the case of joint US/UK operations, this could prove problematic from the point of view of shared use of equipment.

IMP Hunting Engineering was at the forefront of the Infantry Mine Project (IMP) during the 1980s. The 1992-93 edition of *Jane's Military Vehicles and Logistics* lists the IMP Lightweight Anti-tank mine as being under development.

The IMP mine was designed to be small enough to be carried inside a soldier's ammunition pouch. It has an 'influence fuse' which detonates the mine after a short delay so as to ensure

that the target vehicle is directly overhead. *Jane's* states that "The IMP's internal controls are electronic and incorporate an anti-handling device armed shortly after the mine is armed". The mine has a self-destruct facility. Hunting Engineering has informed us that none of these mines have ever been sold.

4. ANTI-TANK ROCKETS AND 'OFF-ROUTE' MINES

LAW 80 This is a portable anti-tank rocket launcher, manufactured by Hunting Engineering, that fires a 94mm rocket with an effective range from 20 to 500m. It can penetrate armour in excess of 650mm thick. It is used as a mine when incorporating the following systems:

ADDER - A Hunting Engineering private venture which enables a soldier to fire a LAW 80 remotely from up to 200m away using a standard Shrike initiator.

ADDERMINE - This is an 'off-route' mine, that is designed to be placed by the side of a road or other route and camouflaged. When a trip- or break-wire is actuated, the LAW 80 is fired.

ADDERMINE/AJAX - This is a fully autonomous off-route mine system employing the AJAX passive infra-red sensor system developed by British Aerospace, Systems and Equipment.

ARGES The 'Automatic Rocket Guardian with Electronic Sensor' is being developed to "meet an Anglo/French/German requirement for an Aimed Controlled-Effect Anti-tank Mine" (ACEATM) (32). The consortium of manufacturers also includes Giat Industries (France), Dynamit Nobel (Germany) and Honeywell Regelsysteme (Germany).

ARGES consists of a target detection and firing system, an anti-tank rocket projectile and a tripod-mounted launch tube. Firing is initiated by passive and active infra-red detection. The warheads are the responsibility of Hunting Engineering Ltd (subcontracted by Giat). Hunting Engineering also developed the launch tube and tripod. the projectile's rocket motor is believed to derive from that developed by Royal Ordnance for Hunting's LAW 80.

An interesting and cynically amusing discussion of this weapon and its utility by Alan Clark, the then (April 1990) Minister of State for Procurement, who had been "resisting expenditure (some hundreds of millions) on a completely unnecessary new piece of Army Equipment known by its acronym as ACEATM" (33).

In its response to the UK Working Group on Landmines' draft report, Hunting Engineering wrote that "The ARGES mine cannot be initiated by the presence of a person. If the mine is disturbed it automatically neutralises itself and cannot be reused: it does not self-destruct. When being laid, ARGES is programmed for a set period of activity after which it self-neutralises".

5. MINE FUSES

FULL WIDTH ATTACK FUSE - FWAF

Marconi Radar and Control Systems, a subsidiary of GEC, and Ferranti Technologies (34) have both been involved in this production designed to improve the mine's chances of seriously disabling the tank (see also p.23 on GEC-Marconi's historical involvement). Such fuses could also enable old style anti-tank mines to have a Full Width underbelly attack capability using a combination of pressure, acoustic and algorithm sensors.

Marconi's FWAFs have been noted above in relation to Royal Ordnance's Barmine. Marconi produces four types of anti-tank mine fuse designed to be adapted to a wide range of existing mines - two are FWAF and two are simpler, and cheaper.

Options for all fuses include anti-handling protection, self-neutralisation and self-destruction (35). They are:

MM/E An electronic FWAF using a special sensor and algorithm system.

MM/MPA combination of belly and track pressure sensors, the latter using pressure-processing for maximum effectiveness.

MM/M Provides effective belly attack under the most vulnerable part of the target.

MM/P The Marconi Pressure Fuse with pressure-processing sensor.

ATIS - 'Anti-tank influence sensor' and Intelligent Influence Fuse (I²F)

ATIS is described in Ferranti sales literature as "the most advanced intelligent influence mine developed to date", part of

the "latest generation of anti-tank mines". This technical sophistication is founded on the fusing system produced by Ferranti Instrumentation Ltd. The mine itself is produced by Technovar Italiana and was originally intended to compete for a contract for the Italian Army. The contract apparently later fell through.

The fuse can determine the speed of the approaching target by processing seismic sensor information. It can also establish the vehicle's front edge. With a combination of this data, the mine seeks to detonate beneath the central portion of the vehicle - recognised as the tank's most vulnerable point.

The fuse is designed not to assist detection equipment (probably by not responding to electro-magnetic fields). "Anti-handling devices prevent removal or manual disruption."

M15

The M15 is a first-generation (heavy, metallic, pressure activated) American anti-tank mine. In cooperation with the US company Alliant Techsystems, Ferranti Technologies has produced an upgrade kit for the mine which consists of the I²F fuse and Alliant's 'Safety and Arming Unit'. The system effectively gives the M15 the more effective targeting ability noted above for the ATIS mine.

6. OTHER COMPONENTS

Graseby Dynamics Ordnance and Marine Division is listed in the 1995 International Defense Directory (IDD) as: "specialists in the field of electronic/electrical & mechanical engineering fulfilling UK & overseas government's requirements in areas relating to: (a) Electronic electro-mechanical fusing, safety and arming..."

Graseby appears under mine-related headings in the Product-Supplier Link Index of the 1995 IDD including: 'air-launched anti-personnel', 'air-launched anti-tank', 'scatterable anti-personnel', 'surface-laid' and 'off-route anti-tank', 'fuzing systems, mine'.

In a recent letter, the Managing Director of Graseby Dynamics wrote: "Graseby Dynamics Ltd originally appeared in the

International Defence Directory, under several headings relating to mines, as a statement of capability only. The information has been there many years without being updated and is incorrect" (36).

In an earlier letter, the same Manager had written that "as far as can be ascertained by the group management, no company within the Graseby Group has ever been involved with the manufacture of anti-personnel mines or any components or sub-assemblies of anti-personnel mines" (37).

Motorola Ltd are manufacturers of electronic equipment including integrated circuits, semi-conductors and defense electronics. Motorola is listed in the 1995 IDD under the Product-Supplier headings: 'Mines', 'Mines, land launched/laid' and 'Mines, land, anti-tank, surface'. It is probable that Motorola microchips (or copies thereof) are incorporated into a number of mines including the Chinese Type 72B APM.

In July of this year, Motorola Inc., the parent company of Motorola Ltd of the USA, issued the following policy statement: "...We will do everything reasonably possible to make sure that Motorola does not knowingly sell any part that is intended for use in an anti-personnel mine. Although it is impossible for a manufacturer to trace each component through to its ultimate application, we believe that we have an obligation and a unique opportunity to proactively support the elimination of anti-personnel mines".

This move should be applauded. The UK Working Group on Landmines hopes that such initiatives will be taken by other companies in the near future.

ML Holdings Plc is listed in the Defence Manufacturer's Association List of Member Companies of March 1995 (p47) as specialising in "aircraft weapons carriage and release systems". This carriage and release technology is used in the HADES and JP233 delivery systems for Hunting Engineering's HB876 mine (see pages 21-22 for further information).

Plalite Ltd This company has been mentioned in the House of Commons as a possible producer of anti-personnel mines. The 1994 Defence Manufacturers' Association lists the company's specialisations as "MoD design and development (explosive weapons)". Company brochures also show that it makes "Drill and Training Mines and Charges" including all in-service British anti-tank mines. The company also has competence in plastics and moulding, including "tough, impact resistant elastomer".

In response to the draft of this report, the company informed the UK Working Group on Landmines that "we have been involved with work on anti-personnel and anti-tank mines for the British Ministry of Defence for forty years. The work has included feasibility and design studies, investigations, evaluation of foreign mines and design and development." The company has also "manufactured anti-tank and anti-personnel mines for trials to establish that stores met the specified performance, rough usage, climatic and safety requirements. Explosive filling was carried out by a Royal Ordnance factory."

Plalite Ltd has "not been involved in the production of any live in-service anti-tank or anti-personnel mines and will not be involved in such work in the future...all the work we have done on landmines has been for the British Ministry of Defence and we will not accept such work from any other source".

Other companies Other companies listed in 1995 or 1996 IDD under landmines-related headings (included in brackets) are: Alkan (UK) Ltd (see p23), Machine Technology Ltd ('fusing systems-mine'), Interarms UK Ltd ('Mines, land-launched/laid', 'Mines, land, anti-personnel', 'Mines,land, anti-personnel, scatter' and 'Mines, land, anti-tank'), Vickers Shipbuilding and Engineering Ltd (VSEL) Armaments Division ('Mine systems', 'Mine systems, ground-based', 'Mine systems, vehicle launched/laid', 'Mine systems, vehicle launched/laid, scatter type'). Machine Technology, Interarms and VSEL have said they have no past or present involvement in landmines. It is not known whether any of these companies have in the past or are currently producing or selling mines or components. The UK Working Group on Landmines is actively seeking answers to these questions.

7. OTHER MINE DEPLOYMENT SYSTEMS

MLRS AT2 (Phase II)

MLRS (Multiple Launch Rocket System) is manufactured by MLRS International Corporation. This is a joint programme between USA, Germany, UK, France and Italy. The prime UK contractor is Hunting Engineering Ltd which is responsible for integrating the AT2 warhead. It is a medium range (10 to 40km) vehicle-launched artillery rocket system, launched by the M270 launch vehicle. The Phase II version dispenses 28 AT2 anti-tank mines manufactured by Dynamit Nobel of Germany. The MLRS AT2 has now been delivered to the British Army and is currently under field trials before full deployment. The AT2 mines were due to be

delivered in 1995.

The AT2's fusing system employs a tilt rod and electronic sensors. It is also fitted with an anti-disturbance device thus proving extremely hazardous to clear. The mine has a self-destruct mechanism said to be "for fixed periods of up to several days" according to Hunting Engineering. According to the UK Government, "the role of the system is the rapid deployment of minefields" (38). It is unclear how the British Army intends to reliably map and record minefields laid from such a distance and at such speed.

Hunting Engineering claims that the "AT2...is easily visible to personnel on foot". It is unclear how this claim can be upheld for mines that are delivered by rocket, often to some considerable distance from the launch point.

MLRS AT2 is reportedly in service with several other NATO countries as well as Britain. MLRS systems are fielded by France, Germany, UK, Italy, Turkey, Netherlands, Greece, Bahrain, Israel and Japan.

ATACMS

A further rocket-delivered cluster bomb system that uses the same launcher as MLRS is reported to be under consideration by the UK Ministry of Defence. The ATACMS (Army Tactical Missile System) incorporates the M270 launcher. Manufactured by Loral Vought Systems of USA (Atlantic Research Corporation, Honeywell - Military Avionics Division, Martin Marietta Electronics and Missiles Group) the ATACMS currently has a range of about 90kms and in its present form can deliver 950 M74 antipersonnel/anti-materiel submunitions per rocket. This weapon was on display at Britain's RN&BAEE 1995 arms fair. Not enough is known about the weapons fusing system to be able to classify it as a landmine deployment system. However, an undated company brochure shows that other warheads may be under consideration including a mine warhead.

HB876

The HB876 is the product of collaboration between a number of Britain's leading arms and related technology manufacturers. The HB876 incorporates technology from Hunting Engineering, Ferranti Instrumentation Ltd, ML Aviation Company Ltd, Royal Ordnance Plc, Irvin Great Britain Ltd and Venture Technology Ltd (39).

Hunting's promotional material states that the 'mission' of the mine is "to close down, for prolonged periods, HQ sites, command and control areas, choke points, dockyards, ammunition dumps, cratered runways and other high-value fixed logistics target

areas by air-delivered mines".

The UK Government stresses that "[The HB876] is designed specifically to destroy military airfields and prevent repair. Not the place where you would expect to find ordinary civilians" (40). However, it seems clear from the above that the weapon is not restricted to use on air-fields. In fact Ferranti advertising literature states that the "HB876 can be used wherever there is a concentration of troops or vehicles in the open."

HB876 IF incorporates an 'influence fuse' which means "the mine can not only be detonated by disturbance, pressure or random delay, it can now sense movement nearby and thus stop personnel or vehicles from approaching it" (41). Ferranti literature states "random detonation and anti-disturbance roles make ground clearance...a hazardous operation".

In its response to the draft of this report, Hunting Engineering informed us that "the HB876...become active on striking the ground, erect themselves and then detonate at random intervals or when disturbed, over a period of a few hours by which time they have all self-destructed". This explanation does not sit well with the claim (above) that HB876 will close off areas for "prolonged periods" nor with reports that many of the weapons did not self-destruct when used in the Gulf.

Hunting Engineering also claims, as does the UK Government that "HB876...is easily visible to personnel on foot". This claim may be true for weapons used on flat ground free of undergrowth, but is difficult to understand in any other context.

When triggered, HB876 fires an armour-piercing slug designed to disable clearance vehicles and capable of perforating the metal blade of a bulldozer. The sides of the mine consist of pre-formed fragmentation - metal that has been weakened in a particular pattern - so that the mine produces a 360 degree swathe of metal fragments. These are designed as a threat to "soft-skinned targets, including personnel" (42). This is reiterated in Ferranti's advertising literature which applauds the "multiple 'P-charge' fragments for disabling personnel and soft-skinned targets".

According to Hunting advertising literature, "the mine also contains effective anti-countermeasure facilities, making it exceptionally difficult to clear in large quantities" (43).

The 'drogue' and retarding parachute employed by the HB876 which "ensures the correct ground pattern of the mines" after deployment, is made by Irvin Aerospace, a branch of Irvin Great Britain, both subsidiaries of Hunting Plc.

JP233

The JP233 is a "low level airfield attack weapon system" which dispenses 30 SG357 cratering munitions and 215 HB876 "area denial mines". The system was designed, developed and manufactured by Hunting Engineering. Once craters are formed in a runway for example, HB876 deters airfield repairs. Delivered by Tornado aircraft, JP233 was used in the Gulf War and is in service with the RAF. Hunting advertising literature states that JP233 incorporates high technology from Thorn EMI Electronics Ltd as well as those companies involved in the production of HB876.

HADES

The 'Hunting Area Denial System' is an air-delivered weapon for the "attack and closure of high value fixed targets and choke points such as airfields, road and rail concentrations, river crossings, munition dumps and HQ sites" (44). HADES' exclusive payload is made up of 49 HB876 area denial mines. Hunting Engineering has informed us that none have ever been sold.

Further more detailed information on HB876 and associated systems is available on request (45).

RAYO

The Rayo is an artillery rocket system which is designed in its Phase I form to fire either a high explosive fragmentation warhead or bomblets "designed primarily for anti-personnel". These two warhead options are fused to detonate at 9m above the ground or on impact respectively.

The RAYO system is being developed jointly by Royal Ordnance and FAMAE, a division of the Ministry of Defense of Chile, under the company name FAMAE Ordnance. It is reported that the rocket casings and warheads "will come from the UK" (46). The joint company FAMAE Ordnance was apparently set up in 1992. Chile's General Pinochet had previously visited Royal Ordnance in 1991. FAMAE is listed in IDD 1995 and in *Jane's Military Vehicles and Logistics* as makers of anti-personnel and anti-tank mines. The company in Chile directed our UK-based enquiries to Royal Ordnance Rocket Motors Division.

The RAYO is said to be a 'cheaper' version of the MLRS. As "other types of rocket and warhead are being considered" (47), one must consider the possibility that future developments may include mine delivery warheads. British Aerospace has informed the UK Working Group on Landmines that "the suggestion that future developments (of RAYO) may include mine delivery warheads are speculative".

8. DETAILS ON COMPANIES LISTED

Alkan (UK) Ltd

Listed for the first time in *Jane's International Defense*

Directory in 1996 under the name R. Alkan (UK) Ltd, this company is a branch of the French company Alkan. *Jane's* mentions R. Alkan (UK) Ltd under the following Product-Supplier headings: 'Mine systems', 'mine systems, helicopter-launched' and 'weapon pods for aircraft'. At the 1994 Eurosatory arms fair in Paris, the French parent company, listed under "grenades, grenade launchers, close defense", shared a stand with Alsetex SAE, a well-known former producer of anti-personnel mines (the production of APMs in France is now prohibited).

At this year's Farnborough Air Show, Alkan Carriage Systems Division exhibited "pyrotechnic ejector release units". These units enable the installation of weapons pods beneath fixed wing aircraft and helicopters (48). Such pods could include mine dispensing bombs. It is not known whether Alkan has supplied units for such use.

Alkan (UK) Ltd
Robert House
2A Shute End
Wokingham
Berks RG40 1BJ

Alvis

Product: Vehicles for use with VLSMS anti-tank mine scattering system.

Holding Company:
Alvis Plc
215 Vauxhall Bridge Road
London SW1V 1EN

Subsidiary:
Alvis Vehicles Ltd
The Triangle
Walsgrave
Coventry CV2 2SP

"...We are providing the tracked armoured vehicles which will carry an anti-tank mine laying system for the British Army" (49).

British Aerospace - Royal Ordnance

Product: L3A1, Mk.5, Mk.7, and L93A1 tilt-rod, L9 Barmine, RO150 electronic FWAM fuse, No.6, No.7, L1E1 PJRAD, HB876 explosive filling, and presumably other explosive fillings.

Holding Company:
British Aerospace Plc
Lancaster House
PO Box 87
Farnborough
Hampshire GU14 6YU

Subsidiaries:
Royal Ordnance Plc
Corporate Head Office
18 Euxton Lane
Euxton
Chorley
Lancashire PR7 6AD

British Aerospace Systems and Equipment
Clittaford Road
Southway
Plymouth
Devon

Royal Ordnance Rocket Motors Division
Summerfield
Kidderminster
Worcestershire DY11 7RZ

FAMAE Ordnance
Avenida Pedro Montt 1606
Santiago
Chile

Royal Ordnance has produced a number of mines as prime contractors as well as working on collaborative projects. The company has recently stated that "Royal Ordnance has, since 1 April 1987, not undertaken any work whatsoever on the research, design and development of anti-personnel mines. As an ammunition manufacturer, Royal Ordnance has the capability to research and develop landmines and has been active in the past. But Royal Ordnance is not currently procuring landmine components and has in fact not done so since April 1987, Royal Ordnance does not manufacture any landmines, has not licensed the production of landmines to any other company or subsidiary in the UK or elsewhere and does not currently employ personnel on landmine research, design and development." (50)

In response to our draft, we were told that "British Aerospace

does not wish to be involved in the manufacture or sale of anti-personnel mines and is not pursuing any business in that area" (51)

Royal Ordnance also has a subsidiary in Holland, called Muiden Chemie International Bv which, well before its purchase by Royal Ordnance in 1991, had been involved in an informal cartel of explosives manufacturers supplying explosives to Iran and Iraq during the early 1980s. It is reported that Valsella made use of cartel explosives in the supply of underwater mines to both sides (52).

Muiden Chemie International Bv
Kruitpad 16
1398 CP Muiden
Netherlands

Ferranti

Originally, Ferranti Instrumentation Ltd belonged to Ferranti International Inc of Lancaster, Pennsylvania, USA. After a management buy-out in the UK in the early 90s, part of the company became Ferranti Technologies Ltd. A brochure available at Farnborough '96, mentions as part of the company's "comprehensive range of products", 'intelligent fuzing, mines and submunitions...minefield detection...mine countermeasures'.

Product: Technology for HB876, Anti-Helicopter Mine, FWAM fuses for Mk7, I²F fuse for ATIS mine, upgrade kit for M15 mine.

Ferranti Technologies Ltd
Cairo Mill
Waterhead
Oldham OL4 3JA

GEC-Marconi

Product: Full Width Attack fuses for Barmine, MM/E, MM/MP, MM/M and MM/P fuses for anti-tank mines.

As well as naval mines through their Underwater Weapons branch, Marconi has also been involved in the development and production of a number of fusing systems for landmines. But the company recently stated that "...you are not alone in spotting the erroneous reference to our company as a manufacturer of landmines. Thank you for the opportunity to correct the record: we can state categorically that we do not produce such products" (53).

In response to the draft of this report, the Rt. Hon Lord Prior, the company chairman, wrote that "While historically it is correct that the company has been involved in the development of mine fusing systems, that activity ceased some 7 or 8 years ago...On a constructive note...GEC-Marconi is actively involved in research into the detection and disposal of landmines in cooperation with European partners".

Holding company:
The General Electric Company Plc
1 Stanhope Gate
London W1A 1EH

Subsidiary:
Marconi Command and Control Systems
Chobham Road
Frimley
Camberley
Surrey GU16 5PE

Graseby

Holding Company:
Graseby Plc
7/12 Tavistock House
London WC1H 9LT

Subsidiary:
Graseby Dynamics Ltd
Ordnance and Marine Division
459 Park Avenue
Bushey
Watford
Herts WD2 2BW

"Graseby Dynamics Ltd originally appeared in the International Defence Directory, under several headings relating to mines, as a statement of capability only. The information has been there many years without being updated and is incorrect" (54).

The Hunting Group

Product: HB876, JP233, HADES, IMP, LAW 80 (Adder, Addermine, Addermine/Ajax), ARGES, MLRS

Holding Company:
Hunting Plc
3 Cockspur Street
London SW1Y 5BQ

Subsidiaries:
Hunting Engineering Ltd
Reddings Wood
Amphill
Bedford MK45 2HD

Hunting Defense Ltd
Reddings Wood
Amphill
Bedford MK45 2HD

Irvin Great Britain Producers of the drogues for HB876
Icknield Way
Letchworth
Herts SG6 1EU

Hunting Engineering Ltd is one of the UK's most significant defense companies engaged in the development and large-scale production - often as prime contractor - of weapons systems for Her Majesty's Government and 'approved overseas customers'.

In its response to the draft of this report, the company stated "that neither Hunting Engineering nor any other company in the Hunting Group has ever manufactured or been involved in the manufacture of an anti-personnel landmine, booby trap or similar device. However, the company must reserve its right to consider designing and manufacturing defence equipment of any type, including mines, if it is requested to do so by Her Majesty's Government. It will also consider the manufacture and export of defence equipment of any type if such manufacture and export is within the laws and regulations laid down by HM Government and within international rules and conventions to which HM Government has agreed to abide." (55).

Londesborough

Londesborough Security Equipment Plc designs and produces anti-terrorist and security equipment, including 'vehicle arresting equipment' such as portable spiked road barriers designed to stop speeding cars.

In the parliamentary magazine "Defence Review 1996", an article by Londesborough's managing director described 'Scatterjacks'. These are "tyre destructive elements mounted within a spherical container...dispersed from an aircraft via a carrier pod over a designated target...On contact with the ground, the scatterjack bounces into the air, during which time it becomes armed...It is principally used in areas of heavy vehicle concentration on battlefields."

The same publication carried an advertisement for the company's products that included a further description of the Scatterjacks Airfield Denial Weapon System: "Designed to prevent aircraft taking off or landing. Lightweight spheres from airbourne delivery vehicle contain explosive tyre destructors, which impinge and destroy aircraft tyres. Scatterjacks unused become anti-personnel mines, which are very lethal, and would take a long time to sweep clear from an infected airfield. Very low cost weapon system."

A longer, probably unpublished, article sent to interested parties reveals that "[w]hen activated by an aircraft tyre passing over them, or being contacted by a vehicle or human element, the projectile will fire off its elements in different directions. This will cause injury in the case of the humane element, and if the explosive charge detonates within an aircraft tyre it will bring about instant deflation and cause the aircraft to veer and crash...This device may also be effectively used against troop concentrations using vehicle transport. Additionally, a version capable of destroying tank tracks, rendering the tank a static target, is also available."

While the above implies that the weapon is already produced, the UK Working Group on Landmines believes that the concept is probably only at the design stage and is unlikely to have been exported. According to the *Independent* (20 October 1996), the Prime Minister has ordered an investigation into whether exports have indeed taken place.

Holding company:
Londesborough Plc Group of Companies

Subsidiaries
Londesborough Security Equipment Plc

8 Gordon Court
Victoria Rd
Stechford
Birmingham B33 8AN

ML Holdings Plc

Product: Carriage and release technology for HADES and JP233.

Holding Company:
ML Holdings Plc
664 Ajax Avenue
Slough
Berks SL1 4BQ

Subsidiary:
ML Aviation Company Ltd
(same address)

The Managing Director of ML Aviation Ltd wrote to the UK Working Group on Landmines to tell us that "There are a number of inaccuracies in your report, and I would just like to point out that a large proportion of the equipment produced by this company is used by the British Armed Forces to ensure the security of the Nation - much of it in a defensive role" (56). The company did not elaborate on the inaccuracies it mentioned.

Motorola

Product: Electronic chips used in at least one APM. The firm is listed in the 1995 IDD under the Product-Supplier headings: 'Mines', 'Mines, land launched/laid' and 'Mines, land, anti-tank, surface'. Has since stated it will not knowingly supply components for APMs.

Holding company:
Motorola Inc, USA

Subsidiaries:
Motorola Ltd
110 Butt Road
Slough
Berkshire SL1 3S7

Motorola Ltd
Government Electronics Group
Aerospace and Defence Electronics Group
Ste 5
Intech House
Wilbury Way
Hitchin
Herts SG4 OAP

Plalite Ltd

Product: Research and development. Production of training mines. Mentioned in Parliament as possible landmine producer.

Plalite Ltd
Star House
8 Star Hill
Rochester
Kent ME1 1UX

Thorn EMI

Thorn EMI sold the missile and ordnance fusing activities of its Defense Group to Thomson CSF of France in 1995. This is now known as Thomson-Thorn Missile Electronics. At the recent Eurosatory arms fair in Paris, Thomson-Thorn is listed as producing "fuses, homing and guidance systems" and drones. Thorn EMI Electronics retained its sensor activities. Thorn EMI has stated that it "completely ceased manufacturing and marketing the 'Ranger' minelaying system in 1982". It is as yet unclear whether manufacturing/marketing rights for the Ranger system were also handed over in the sale. Recent requests for information on Ranger have been directed to Thomson Thorn Missile Electronics. It now seems likely that, by 1997, Thomson will have merged with the Lagardere Group of France whose defense branch, Matra, would presumably control Thomson's.

Thorn EMI Plc
4 Tenterden Street
Hannover Square
London W1A 2AY

Thomson Thorn Missile Electronics/Thomson CSF

Product: May now own the licence for Ranger. The parent company in France, Thomson CSF, is a major developer/producer of high technology weapons including anti-tank mines. The production of anti-personnel mines is prohibited in France.

In the company's response to the draft of this report, we are informed that "Thomson-Thorn Missile Electronics produces electronic systems and sub-systems for European and US missiles. It does not produce anti-personnel or anti-tank mines systems nor does it have any intention of doing so...[It] is heavily involved in the research...into sophisticated sensing techniques for the detection of metal and plastic anti-personnel mines..."

Through its subsidiary Thomson TRT Defense, Thomson CSF (France) produced the HPD series of anti-tank mines.

In July 1994, another Thomson CSF subsidiary, Thomson Brandt Armements, created a joint venture with Daimler Benz Aerospace of Germany. The company is called TDA in France and TDW in Germany. "According to TDA vice-president Gerhard Nowicki, all business would be transacted by...TDA...except where this is inappropriate for legal reasons...". The new company "will manufacture 'smart' munitions, mines and motor systems" (57). The production of APMs in Germany was prohibited in April 1996.

Thomson CSF (UK) Ltd
81 Piccadilly
London W1V 0HL

Thomson-Thorn Missile Electronics Ltd.
121 Blyth Road
Hayes
Middlesex UB3 1DL

Other Foreign Companies mentioned

Technovar Italiana
Via Argiro 95
70121 Bari
Italy

Valsella Meccanotecnica
25014 Castenedolo
Brescia
Italy

A 50% share of Valsella was sold to Fiat in 1986. Fiat stated in 1994 that it had sold its shares in Valsella. However the Chairman of Valsella denied the withdrawal of Fiat at a board meeting in December 1994. According to recent documents, Fiat still half-owns Valsella through a subsidiary called 'Fiat Componenti e Impianti per l'Energia e l'Industria' (58).

Alliant Techsystems Inc
Defense Systems
7225 Northland Drive
Brooklyn Park
Minnesota 55428
USA

Dynamit Nobel AG
PO Box 1261
53839 Troisdorf
Germany

ENDNOTES

- (1) *The Technology of Killing*, Eric Prokosch, ZED Books, 1995, ISBN 1-85649-358-X
- (2) *Anti-personnel Landmines - Friend or Foe?*, International Committee of the Red Cross, Geneva, March 1996
- (3) Letter from the Rt Hon Nicholas Soames to William Cash MP, 27 August 1995
- (4) Letter to a campaigner from C.I.P. Martin, Manager, Marketing and PR, Hunting Engineering, 31 May 1996
- (5) *Anti-personnel Landmines - Friend or Foe?*, and 'An open letter to President Clinton' signed by 15 retired US officers, New York Times, 3 April, 1996
- (6) *The Landmine Crisis*, Boutros Boutros-Ghali, Secretary General of the United Nations, in 'Foreign Affairs', September/October 1994. This view is also shared by Human Rights Watch.
- (7) *Landmines, A Deadly Legacy*, The Arms Project/Physicians for Human Rights, Oct 1993, ISBN 1-56432-113-4, p86-87
- (8) *ibid.* p46
- (9) *Hansard*, Written Answers, 1 November 1994, col 1018
- (10) *Hansard*, Written Answers, 16 May 1996, col.540
- (11) Foreign Affairs Committee, House of Commons, 2nd Report on *UK Policy on Weapons Proliferation and Arms Control in the Post-Cold War Era*, Volume I, p xxxiv, 30 March 1995
- (12) Parliamentary Question from Ann Clwyd MP, 1 July 1996
- (13) Answers from US Army Foreign Science and Technology Center to 'Questions for FSTC - from the Arms Project - Human Rights Watch', 1993
- (14) *Landmines in Mozambique*, Human Rights Watch Arms Project/Human Rights Watch Africa, March 1994, ISBN 1-56432-121-5
- (15) *Bravo Two Zero*, Andy McNab, Corgi Transworld. The author mentions that the patrol carried Elsie mines into Iraq and emplaced them. The book also includes photographs of the mine.
- (16) *Military Vehicles and Logistics*, published by Jane's Information Group, 1986; various other editions of the manual are cited in this paper.
- (17) *Landmines, a Deadly Legacy* p86
- (18) Letter to a campaigner from Thorn EMI Electronics Ltd, 24.3.1995
- (19) Jane's *International Defense Review*, 1 August 1986
- (20) UKWGLM conversation with civil servant, Cambridge, 5

September 1995

(21) *Military Vehicles and Logistics 1991-92*

(22) UKWGLM conversation with civil servant, Cambridge, 5 September 1995

(23) UKWGLM conversation with a delegate to the preparatory meetings of the UN Inhumane Weapons Convention review conference, Geneva, 12 Jan 1995

(24) *Landmines, a Deadly Legacy*, p79

(25) *Military Vehicles and Logistics 1995-96*, p240

(26) British landmines of WWII vintage can be found in Belgium, Egypt, Libya, Netherlands, Tunisia. Later models are reported in Egypt and the Republic of Korea - *Hidden Killers, The global problem with uncleared landmines*, United States Department of State, Political-Military Affairs Bureau, Office of International Security Operations, 1993

(27) The statement was also made on behalf of Austria, Bulgaria, Canada, Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Netherlands, Norway, Romania, South Africa, UK, Sweden, Poland, USA in Geneva, 3 May 1996.

(28) *Amended Protocol on Prohibitions or Restrictions on the Use of Mines, Booby-traps and other Devices*, CCW/CONF.I/14 dated 1 May 1996

(29) *Hidden Killers*, and US Department of Defense CDROM 'Minefacts', 1995-96

(30) *Military Vehicles and Logistics*, 1995-96, p235

(31) Hansard Written Answers, 29.11.95, col. 768

(32) *Military Vehicles and Logistics 1995-96*, p206

(33) *Diaries*, Alan Clark, Phoenix, 1993, p290. Alan Clark continues a revealing account of the weapons procurement process and suggests the sluggish response of Britain's military to the fall of the Soviet Union: "From the first moment I saw the papers it was clear that this was a complete waste of money, conceived at the height of the Cold War, and now totally unnecessary. Trouble is, I'm not really meant to question 'Operational Requirements'. I'm meant to 'seek' and then, by implication, follow advice on anything about which I have doubts. In the nature of things, the advice comes from the same people who drafted the 'Requirements' in the first place." Clark then describes a meeting on the question: "'You leave them behind, you see, to slow up the enemy's advance.'

'What advance?'

'Well, er, his advance, Minister.'

'What enemy?'

'The Warsaw Pact, Minister.'

'The Warsaw Pact no longer exists. It's disintegrated.'

'In villages, in built-up areas,' shouted somebody else, also in uniform...

'I thought the first rule in deploying armour was to avoid built-up areas?'

'Roads, Minister. Choke-points.'

'What happens if a truck goes past? That would be a waste, wouldn't it. How does it know not to shoot?'

'Well it knows, Minister. It's programmed with all the Warsaw Pact silhouettes.'

'Warsaw Pact?'

(34) *Military Vehicles and Logistics* 1994-95

(35) *Military Vehicles and Logistics* 1991-92 p196

(36) Letter from CP Fowler, Managing Director, Graseby Dynamics to Mrs M Cranfield, Directorate General for Research, European Commission, 12 March 1996. Curiously, the information on Graseby Dynamics contained in the 1997 edition of IDD has not been changed.

(37) Letter from CP Fowler to Environmental Investigation Agency, 11 October 1995

(38) Hansard 10.01.95, written answers, col. 109

(39) Venture Technology is the US-based Venture Technologies Group, 23642 Calabasas Rd, Ste 104, Calabasas Ca 91302-1592. The company specialises in the R&D and application of terrestrial and satellite communications systems

(40) *The Guardian*, 3.10.95, David Davis MP, Minister of State for Foreign and Commonwealth Affairs

(41) *Air Launched Weapons*, Jane's Information Group, 19

(42) *Air Launched Weapons*, Issue 20

(43) *Ibid*

(44) *Air Launched Weapons*, Issue 19

(45) *Briefing paper on Britain's HB876 landmine*, UK Working Group on Landmines, March 1996, 10pp

(46) *Jane's Defense Weekly*, 16 September 1995

(47) *Ibid*

(48) The brochures available in 1996 were dated March and April 1993 and carried the address of the French parent company.

(49) Letter from David Brittain, Managing Director of Alvis Vehicles Ltd to a campaigner, 8 March 1996

(50) Letter from Terry Morgan, Managing Director, to Ann Clwyd MP, 10 May 1996.

(51) Letter to UK Working Group on Landmines from Peter McLoughlin, Director of Government Affairs, 12 August 1996

(52) *The Death Lobby*, Kenneth R. Timmerman, Bantam Books 1992, p231. Also published by the French weekly *L'Evenement du Jeudi*, 23-29 July 1987. Another member of this cartel, the Belgian company PRB, was later bought by the British company Astra Holdings in 1989. It has since been acquired by Giat Industries of France.

(53) Letter from Alan Tull, Director of Public Relations for GEC-Marconi, to Ann Clwyd MP, 24 May 1996

(54) see note 36

(55) Letter from C.I.P. Martin, Manager, Marketing and PR for Hunting Engineering, 13 August 1996

(56) Letter from R.C Bolter, 16 August 1996

(57) *Jane's International Defense Review*, vol. 22, p8 and vol. 28 p24, 1994 and 1995 respectively.

(58) *Landmines, A Deadly Legacy* pp78-79 and company statement to 30 June 1995, lodged with Tribunal of Brescia, Italy.

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APPENDIX 1

The companies and their banks

In the current context of action on the financing of landmine production, stockpiling and trade, it is appropriate to give available information on the bankers of companies mentioned in this report. The following list and comments should be read in conjunction with the full report. The involvement of some of the companies listed is historical; some of the weapons mentioned in the report do not deserve the level of public opprobrium accorded to anti-personnel mines. It should be noted that companies may have several banks - this initial research may not reflect this.

Under no circumstances should it be construed from the following that any banks have financed the production or trade of anti-personnel mines or other landmines, such information is not available.

Barclays Bank plc	British Aerospace Graseby Dynamics Graseby plc Machine Technology Ltd Plalite Ltd
Boston Safe Deposit & Trust	Irvin Aerospace
Citibank	Motorola Ltd UK
Credit Lyonnais London	Matra UK
Hambros Bank Ltd	ML Holdings plc

Lloyds Bank plc	Alvis plc British Aerospace Hunting Engineering Ltd Hunting plc Irvin Great Britain ML Holdings plc
Midland Bank plc (1)	British Aerospace British Aerospace Systems &

Equipment

Fiat UK Ltd
GEC-Marconi (2)
GEC-Marconi Defence Systems Ltd
Thomson (UK) Holdings plc and all
UK subsidiaries (3)

NatWest Group (4)	British Aerospace Daewoo (UK) (5) Fiat UK Ltd Graseby plc Mercedes Benz (UK) Ltd (6) Vickers Shipbuilding - VSEL
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Royal Bank of Scotland	Ferranti Technologies Holdings
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Svenska International plc	Hunting Engineering Irvin Aerospace
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Sources: EIRIS Services Ltd, Key British Enterprises '95, Dun & Bradstreet Europa '96, Kompass 96-97, 'Smaller Companies' EXTEL Financial Times 1996.

Endnotes to Appendix 1

(1) "Midland only finances equipment of a defence nature and does not finance the sale of items of a military nature (eg. bullets and missiles) or landmines" quoted from 'correspondance dated 6.3.96 in *'The Ethical Standing of major British High Street Banks, June-July 1996'* in *'The Lloyds and Midland Boycott Campaign'* resource pack

(2) GEC Marconi Aerospace Ltd and GEC Marconi Avionics Holdings

bank with NatWest.

(3) The French parent company banks with Banque Paribas

(4) "...The issue of a global ban on anti-personnel landmines is not a matter of controversy in Britain...I wish to make it unequivocally plain that our bank and I support and my colleagues personally fully support this objective", statement by Lord Alexander, Chairman of NatWest, to the Co-operative Bank, *Mail on Sunday*, 3 November 1996. "We are totally committed to the ban on anti-personnel landmines both in a corporate capacity and as human beings involved in the running of the bank" from a letter from Lord Alexander to Clare Short MP, 31 October 1996.

(5) *Jane's Military Vehicles and Logistics 1992-93* lists one APM and one anti-tank mine manufactured by Daewoo Corporation, 541 Namdaemoon-Ro- 5-Ga, Chung-Gu, Seoul, Republic of Korea. Daewoo's K440 APM is a copy of the American Claymore, the M19 mine is a copy, made under licence, of the American M19 anti-tank mine. This information is given as a further example of a company that trades in the UK in other products.

(6) The German parent company banks with Baden Wuerttembergische Bank AG, Stuttgart.