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REQUIRED OPERATIONAL CAPABILITY (ROC) NUMBER LOG 159
FOR A MINE CLEARING PLOW SYSTEM(U) MARINE CORPS
WASHINGTON DC 01 APR 83 USMC-ROC-LOG-1.59

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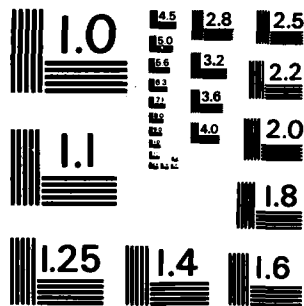
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DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
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RDD24-1-60-m1a

1 APR 1983

From: Commandant of the Marine Corps
To: Distribution List

Subj: Required Operational Capability (ROC) No. LOG 1.59 for a
Mine Clearing Plow System

Ref: (a) MCO 3900.4B

Encl: (1) ROC No. LOG 1.59 for a Mine Clearing Plow System

1. This letter establishes and promulgates ROC No. LOG 1.59 for a Mine Clearing Plow System. The ROC has been developed in accordance with the reference and is contained in the enclosure.

2. The Commanding General, Marine Corps Development and Education Command (Director, Development Center) is the Marine Corps point of contact for the development efforts pertaining to the Mine Clearing Plow System.

Eugene B. Russell

Eugene B. RUSSELL
BRIGADIER GENERAL, U. S. MARINE CORPS
DEPUTY CHIEF OF STAFF FOR RD&S

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REQUIRED OPERATIONAL CAPABILITY (ROC) No. LOG 1.59
FOR A
MINE CLEARING PLOW SYSTEM

1. STATEMENT OF THE REQUIREMENT. A system, device or combination of devices which can be temporarily mounted to the front of a standard armored tracked vehicle (tank) chassis or other tracked vehicle and controlled by an operator inside the vehicle is required to clear land mines and explosive devices from the path of the vehicle. It should be capable of physically extracting or removing any land mine and/or explosive device which is laying on the surface or buried under up to four inches (10.16cm) of soil cover from the area in front of each track. An Initial Operational Capability ~~(IOC)~~ of 1985 is desired.

2. THREAT AND OPERATIONAL DEFICIENCY

a. Threat. Potential enemy threats confronting the United States in the near- to long-range period are fully developed in the United States Marine Corps Long-Range Plan (MLRP) and the United States Marine Corps Midrange Objectives Plan (MMROP).

(1) Land mines have been used successfully against vehicles and personnel by most armies since World War I. Recorded results indicate a marked increase in the effectiveness of mines against armored vehicles. Present indications are that mines will continue to be a threat against both personnel and vehicles.

(2) Current antitank mines are explosive charges of up to 23 lbs (10.34kg) contained in metallic or non-metallic cases, and fuzed to detonate by single or multiple pressure pulses from vehicle tracks or wheels, by command firing, by vibrations or by magnetic influence. Soviet doctrine calls for emplacement of mines with 2-4in (5.08-10.16cm) earth cover. Extensive use is made of mechanical planters which may surface lay or plant mines as the soil or tactical situation dictate. There is no present evidence of a Soviet system of artillery or rocket delivered scatterable mines; however, the capability to develop such systems exists. There is evidence of heliborne delivery systems for conventional mines. In Afghanistan, heliborne and fixed wing delivery systems have been used to dispense antipersonnel mines; therefore, the capability to air deliver antitank mines may also exist.

(3) Many of the mines emplaced by the Soviets in World War II and by the enemy in Vietnam were improvised from bulk explosive charges, dud bombs, shells and any type of container. They were fuzed to detonate on either immediate or repetitive contact or were command fired. They were laid singularly or in small groups and they were frequently used in conjunction with ambushes. The Marine Corps can expect similar mine threats from any enemy in a conventional war.

(4) In a war against the Soviet Bloc armies, mines will be a major threat to ground mobility. Land mines appear to be the basic Soviet artificial obstacle system. While on the offensive, the Soviets lay mines rapidly on the surface for temporary unit protection and to block counterattacks on the flanks. Use of scatterable mine dispensed by aircraft or artillery/rockets is also a possibility. U.S. forces on the offensive should expect to encounter deep, dense minefields laid by both manual and mechanical methods. Surface laid mines should be expected along with buried mines in the same minefield. Controlled charges, mines and boobytraps may be found in buildings, culverts, bridge sites, defiles, road junctions and other areas abandoned by the enemy. Toxic chemical mines are also available to the enemy. The Soviets also have a wire controlled electrical mine arm/disarm device which is used to arm or disarm an entire minefield or section thereof.

b. Operational Deficiency. The only currently available solutions to the safe neutralization of any buried or surface laid mine, regardless of its fuzing, are to detect and identify it as a mine and then:

- (1) destroy it in place with explosives,
- (2) manually neutralize it, or
- (3) pull it out with a long rope or wire from a protected position.

For armored operations, the fastest mine removal technique with an acceptable margin of safety would be to push aside any mine which happens to be in the path of a tank so that if the mine detonates it would do so without danger to personnel and with no or minimal damage to the tank.

3. OPERATIONAL AND ORGANIZATIONAL CONCEPTS

a. Operational Concept

(1) The Mine Clearing Plow System will be employed by units which are equipped with tanks or tank-chassis vehicles and will be used in any geographical area of the world in which such vehicles can operate. It will be used in attacks on enemy positions or forces which are known or suspected to be protected by minefields. It will also be used in armor thrusts or in pursuits deep into enemy areas where minefields are known or expected to exist, and when scatterable mines are a probable threat. In actual mine clearing operations, explosive line charges will be used to blast hasty breach lanes through encountered minefields. These line charges will be trailer-mounted and towed behind plow equipped tanks or mounted on other supporting vehicles. After the line charge has been employed and detonated, the Mine Clearing Plow System will be used to proof the breach lane by pushing aside or neutralizing mines not cleared by the line charge explosion. Spare components will be

carried on the using vehicle for replacement of parts damaged in mine clearing operations. Should the vehicle become immobilized, the system will be capable of removal and attachment to a following armored vehicle that is capable of receiving the system.

(2) In mine clearing operations, mine detection devices should precede the plow-equipped vehicle so that the latter can move rapidly from one suspect spot to another with the components in the travel mode until the suspect spot is reached. It will then employ the plow to extract buried mines.

b. Organizational Concept. The system will be organic to active and reserve tank units. Two track-width mine plows will be organic to each tank company. It is estimated that 180 systems will be required to equip the Active, Reserve, Maritime Prepositioning Stocks, War Reserve, Training and Operational Readiness Floats.

c. Training and Support Requirements. It is intended for all required training to be accomplished through on-the-job training at the unit level. No additional support or manpower requirements are envisioned for this system.

4. ESSENTIAL CHARACTERISTICS. The System will:

a. Be capable of physically extracting or removing a land mine or boobytrap, laying on the surface or buried by up to four inches (10.6cm) of soil cover, from the area in front of each track.

b. Be capable of being operated from inside the vehicle.

c. Consist of sufficient components and interconnecting hardware to accomplish the mission outlined herein by one armored vehicle and shall weigh no more than 6,500 lbs (2948.35kg) including transport pallets. The segmented design will permit some components to be light enough to be handled by the vehicle crew; however, some lifting device will be necessary for complete assembly or disassembly.

d. Be capable of being mounted to the front of an armored vehicle by 4 men within one hour with the assistance of a 6,500 lb (2948.35kg) capacity crane or lifting device (i.e., A-frame, crane, forklift, tank recovery vehicle).

e. Be capable of operating in all tank-trafficable terrain and climatic extremes in which a tank can operate. Some limitations due to frozen ground, rock and other material which would prevent mechanical "plowing" action are acceptable.

f. Neutralize (95%) of mines the system encounters, regardless of fuzing, laid on the surface or buried with up to 4 in (10.16cm) of soil cover, in a patch 3ft (.91m) wide in front of

each track. The system will also be capable of neutralizing 95% of the tiltrod type mines located in the area between the two plows.

g. Be capable of clearing mines while traversing fords as well as cross-country minefields at speeds of 3-10mph (4.82 - 16.09kph), and of turning safely without over-running any mine with a track.

h. Have a Mean-Time-To-Repair (MTTR) of 1 hour. Ninety-five percent of all corrective maintenance tasks will be accomplished in this period.

i. Have a mission reliability of .90 probability of completing a 1 hour mission, exclusive of failure caused by mine detonation. For the purpose of determining reliability, a failure is defined as any malfunction which the operator cannot remedy by adjustment, repair or replacement action within 15 minutes, using the controls, tools, and parts issued with the equipment; and which causes or may cause inability to commence mission, cessation of mission, degradation of performance capability of the plow/components below designated levels, serious damage to the plow/components by continued operation, or serious safety hazards. Simultaneous related malfunctions are considered as one failure.

j. Require lubrication and adjustments no more frequently than once every 4 operating hours. Routine operator maintenance time for the mine clearing plow system shall be less than 30 minutes after each mission and will be performed by the vehicle crew personnel.

k. Be designed for "repair by replacement." Where feasible, such design consideration will decrease active maintenance time and permit ease of maintenance at the organizational level.

l. Not degrade main gun accuracy, or the ability of the tank or tank chassis to perform as an effective fighting vehicle.

5. OTHER WARFARE AREAS CONCERNED. The introduction of this system will primarily affect Mission Area - 214.3 (Mine Countermeasures). It will further impact on Mission Area - 211.2 (Armor).

6. RELATED EFFORTS. The U.S. Army has identified a similar requirement for a track width mine clearing plow system. A requirement document was first staffed in 1973 and a development effort was conducted. However, an acceptable plow system was not fielded. This requirement still exists, but further developmental efforts remain to be determined. The Israeli Defense Force has modified and improved the Army's proposed plow system and has fielded the system.

7. TECHNICAL FEASIBILITY, ENERGY-EFFECTIVENESS IMPACT AND COST FORECAST

a. **Technical Feasibility.** Several mechanical and hydraulic mine extraction/removal systems have been evaluated by the U.S. Army (MERADCOM) in response to a similar requirement. Of the approaches investigated, a track-width mine clearing plow system appears to be the most feasible, practical approach.

(1) The basic design and track-width mine clearing plow system exists in the Israeli plow system; however, the design may be altered as dictated by results of evaluative tests and analysis. The system is designed such that damage from a mine detonation will give a greater probability of damage to individual components than to the entire system so that the entire system can be made operational again with minimal time and effort.

(2) The track-width Mine Clearing Plow System will interface with all M-60 series chassis. Mounting the system on the M-60 tank offers a compatible carrying vehicle capable of cross-country mobility and plowing performance. Adaptation to the standard M-60 tank will preclude a requirement for a unique, dedicated vehicle.

(3) The lift system will be mechanical and will require no major modifications to the tank chassis. A complete add-on system is designed to equip an M-60 tank with the System without the need for hydraulic or electrical systems.

(4) Associated risks to perform the technical evaluation are minimal since technology and hardware exist to accomplish this development effort. The major risks are those related to degradation of the prime mover's mobility, obstacle crossing capability and prime mover Reliability, Availability and Maintainability (RAM). These risks appear to be minimal.

(5) The Israeli tank mounted track-width mine clearing plow is a standard fielded item in the Israeli Defense Force (IDF). Purchase of the IDF track-width plow could be accomplished under the International Materiel Evaluation (IME) Program for evaluation as a candidate to meet requirement. Research and development costs and effort would be minimal. An improved Marine Corps countermine capability could be available in the near term if this candidate proves acceptable.

b. Logistic/Manpower Assessment

(1) Selection on an off-the-shelf plow system will have minimal impact on the Marine Corps logistics system.

(2) Maintenance

(a) Operator and Organization Maintenance. Operator services will be performed by crew personnel of the employing vehicles, including assembly and check-out of all components. Routine maintenance on the System can be performed by the vehicle crew when vehicle maintenance is performed. Organizational maintenance personnel will be trained to perform proper maintenance and repair procedures. Special maintenance equipment should not be required.

(b) Direct Support/General Support. Repairs and mine damage to the plow system that cannot be performed at the organizational level will be performed by a higher echelon of maintenance under the existing maintenance system.

(3) Training Assessments. Training devices and materials will be provided by the Marine Corps and/or material developer to support the Mine Clearing Plow System. Tank crew personnel and unit mechanics will be trained on the assembly, operation and maintenance of the system. A training support package for individual and collective training will be available in final form for system IOC.

(4) Manpower/Force Structure Assessment. The Mine Clearing Plow System will be used by armored tank units. It is anticipated that the system will not require changes to the currently existing tank crew structure. Tank crew personnel will be required to assemble, employ and maintain the System, with minimal additional training. The System will be issued to Marine Corps Reserve units.

c. Energy-Effectiveness Impact. Energy-Effectiveness impact is considered negligible. A slight increase in vehicle fuel consumption may result from plowing operations, but an increase in fuel consumption would be justified based on increased vehicle survivability.

d. Cost Forecast

(1) R&D Cost (FY82)

(a) Investment Cost:

Procurement Costs =	\$37,000 per unit
Number Unit =	2 units purchased IME
Total Procurement Costs =	\$74,000
Engineering, technical and maintenance documentation =	\$50,000
	<u>\$124,000</u>

(b) Recurring Maintenance Cost = \$5,000-\$7,000 per unit

- (2) Estimated procurement cost (180 systems @ \$43,000 each) \$7,740,000.
- (3) Life Cycle Cost: To be determined.

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