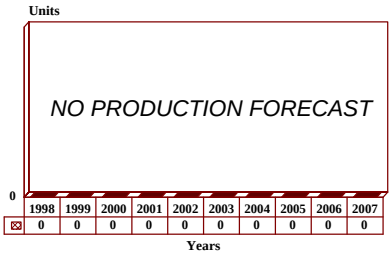
REMBASS - Archived 4/99

Outlook

- Production has apparently ended
- The only confirmed foreign order consisted of 16 IREMBASS systems procured by New Zealand in the mid-1990s
- A potential replacement for IREMBASS is the Lockheed Sanders Trafficking Emplaced Sensor Operational Network (TESON)
- **BARRING CONTRACT ACTIVITY, THIS REPORT WILL BE DROPPED NEXT YEAR**

10 Year Unit Production Forecast
1998-2007



Orientation

Description. REMBASS (Remotely Monitored Battlefield Sensor System) is a passive battlefield sensor system. An improved version has been fielded with the designation of IREMBASS (Improved Remotely Monitored Battlefield Sensor System).

Sponsor

US Army
Communications Electronics Command (CECOM)
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Contractors

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(Prime Contractor Development/Production. GE Aerospace, the original contractor, was acquired by Martin Marietta in December 1992, which subsequently merged with Lockheed in September 1994.)

Status. In production and operational service with US armed forces, primarily the US Army.

Total Produced. An estimated 810 REMBASS sensors and 410 IREMBASS units were produced through 1997. It is believed that all procurement has been completed.

Application. REMBASS is intended to provide divisions, brigades and battalions with information on activities in areas beyond the forward edge of the battle area and for rear area protection within the division zone. System uses include surveillance, early warning, target development and cueing of elevated radar platforms or remotely piloted vehicles.

Price Range. The estimated unit costs (FY94 US dollars) for the REMBASS sensors are: DT-561, US$3,100 each; DT-562, US$8,050 each; and the DT-565, US$4,800 each.

Technical Data

Design Features. REMBASS is a passive combat surveillance, target acquisition and early warning

system based on a family of unattended, all-weather ground sensors, data communications gear and monitoring sets.

The system combines self-contained VHF transmitters with seismic/acoustic, magnetic or infrared sensors. The architecture also includes monitors, radio repeaters to surmount VHF line-of-sight problems, and a code programmer to initiate sensor and test system operation. The monitor programmer sensor set is designated the PSQ-7.

Sensors. While the system comprises three different sensor types, construction is similar. They all consist of a common battery module, a common encoder/transmitter module and a unique sensor module, either magnetic, seismic/acoustic, or infrared. The encode/transmit module weighs 10 pounds and houses a built-in VHF-FM transmitter which includes a precision digital frequency synthesizer and an antenna that can externally load the specific sensor's frequencies and identification. The modules are tamper-proof; should the module be disturbed, the sensor's frequency and identification are erased. The modules consist of:

- The DT-562 seismic/acoustic sensor differentiates between various types of moving objects through the use of large scale integration/complementary metal oxide silicon (LSI/CMOS) microprocessors and memory circuits which compare stored signatures with sensed signals. This sensor type has the longest range.
- The DT-561 magnetic sensor uses a sensitive dual-axis magnetometer to provide directional discrimination. The data output of this device indicates the presence of tracked or wheeled vehicles or personnel and the direction in which they are headed. It can also count the objects that pass through its range of detection.
- The DT-565 infrared sensor combines a dual field of view with a high degree of sensitivity. A 1.5^{o}C temperature difference is sufficient to activate it.

Originally, if sensors were to be emplaced other than by hand, aircraft or artillery had to be procured. However, the air-dropped and artillery-delivered sensors were canceled because of a lack of sufficient funding and the Army's desire to field production hardware as early as possible.

Monitors. There are two types of monitors. The R-2016 is a portable unit approximately the size of a small radio. This unit supplies a visual display of sensor actuation status and intruder classifications. The operator can also use the analog output to listen to audio information gathered by the audio sensor. The other monitoring unit (GSQ-187) is capable of hard copy recording and of operator calculation of factors such as the rate of intruder motion. The GSQ-187 is normally housed in a vehicle or an S-250 shelter along with communications and control equipment and REMBASS related ancillary gear. It is capable of receiving, decoding and recording up to 64 separately identified sensor inputs.

Radio Repeaters. The use of radio repeaters overcomes the terrain masking encountered because of the use of VHF-FM. The ground range of the repeater is 15 kilometers, while airborne it is 150 kilometers. The repeater, designated RT-1175A, uses an internal diplexer for real time, single-antenna re-transmission of analog and digital messages. It will intercept and decode messages from the sensors, verify bit integrity, and re-encode and re-transmit on a different frequency. The repeater has a 768-byte memory and because it uses software-controlled processing, it has the option of adding new message types in the future.

The system's code programmer loads the operating frequency and injects the appropriate ID number and other parameters into a specific sensor. Working in conjunction with the radio repeater unit, it can also conduct system tests.

Operational Characteristics. REMBASS is a very important field asset, since it provides urgently needed all-weather, terrain-independent, forward-area early warning/surveillance, rear area intrusion detection and target development capabilities to forward tactical commanders who are faced with wide frontages. The system is able, under adverse conditions, to detect and classify the personnel, and wheeled and tracked vehicles of armored heavy attack forces and enemy ground air defense systems.

REMBASS uses remotely monitored sensors located along enemy approach paths. These sensors react to seismic/acoustic, infrared, and magnetic field changes created by enemy activities. The raw signals are processed and provide detection and/or classification information such as whether an armored vehicle is tracked or wheeled and whether infantrymen are present. A VHF-FM radio transmitter, internal to the sensor, broadcasts the information in short digital messages. Repeaters can be used to pass along the message to a distantly located receiver. The receiver is capable of providing a time-phased record of sensor activations.

REMBASS can be used in both offensive and defensive roles and is intended to operate in any environment. The system's flexibility and wide application range will allow a battlefield commander to select various combinations of gear for any given mission. It is also meant to supplement the reports of other surveillance systems and would be operated by remote sensor platoons in the

military intelligence units of divisions, separate brigades and armored cavalry regiments. The system has also been proposed to cue aerial and ground surveillance radars and aerial drones, showing them the best places to conduct a search.

REMBASS's burst transmission technique, below-ground sensor emplacement and passivity of operation make REMBASS extremely hard to detect. REMBASS is well suited for contingency force operations faced with wide frontages, extensive depths, and gaps between adjacent forces. With the use of relays/ repeaters for ground applications, REMBASS is designed to supply targeting data at the 100 km range. It thus partially fills the see deep requirement of the AirLand Battle. Various combat scenarios for REMBASS have been proposed, including its use as a cueing device for elevated radar platforms, remotely piloted vehicles, and ground surveillance radar systems.

Variants/Upgrades

Improved REMBASS. The Army has developed a miniaturized Improved REMBASS (IREMBASS), a lightweight version of REMBASS for Special Operations Forces (SOF). IREMBASS uses three types of sensors: IR (DT-565A), magnetic (DT-561A), and seismic-acoustic (DT-562A) with the following characteristics:

- The DT-562A weighs 4 pounds and has minimum detection ranges of 50 meters for personnel, 250 meters for wheeled vehicles and 350 meters for tracked vehicles.
- The DT-561A weighs 3.5 pounds, and has minimum detection ranges of three meters for armed personnel, 15 meters for wheeled vehicles, and 25 meters for tracked vehicles.
- The DT-565A weighs 3.5 pounds, and has minimum detection ranges of 20 feet for personnel and 50 feet for vehicles.

The PSQ-7 monitor/programmer weighs 5 pounds. The RT-1175A radio repeater weighs 6 pounds.

Other system characteristics include sensor data transmission rates of 25 millisecond bursts over any one of 599 programmable radio frequencies (thus providing high jamming or radio homing immunity), a minimum battery life of 30 days based on 1,000 detected events per day, and automatic dumping of the reloadable software if the system is disturbed in the field (thus rendering it useless to unauthorized access). Since all IREMBASS components are fully compatible with previous REMBASS components, there is complete interoperability between generations.

Program Review

Background. Advanced development of REMBASS was supported under Program Element #0603704A, which received its initial funding in FY77. Engineering development was provided under PE#0604704A Unattended Ground Sensors, project DL73. REMBASS preproduction units were used successfully during the Grenada campaign of 1983. Earlier versions were used during the 1980 Winter Olympics to guard the competitors, and functioned successfully even under eight feet of snow.

The Army has spent approximately US$100 million on R&D and procurement for REMBASS. Total production quantities presently called for will be sufficient to equip eight and one half divisions. The first full production units were slated to go to Army units stationed in the Republic of Korea. Other Army entities being equipped with REMBASS include five light divisions, the 101st Airborne Division (Air Assault), the 82nd Airborne Division, Southern Command (SOUTHCOM), and the intelligence school. The regular REMBASS fielding was completed as of late 1990.

Future use includes equipping of all US Army Force XXI digital divisions down to at least battalion level with IREMBASS. The system is undergoing integration, risk, and testing at the Ft. Huachuca, AZ Battle Lab.

REMBASS/IREMBASS has been used extensively in various parts of the world. Probably its most significant use is on the Korean DMZ. The US Army conducts extensive REMBASS patrols along the DMZ as an adjunct to other intelligence assets. Due to North Korea's penchant for digging tunnels, it is possible that DT-562/ 562A sensor could detect the seismic shock of nearby hand digging that would go undetected by other seismic sensors. REMBASS has also been used in Bosnia to provide detection capabilities in blind areas surrounding some US base camps.

In addition to the US military, the US Boarder Patrol has deployed REMBASS units along stretches of the US-Mexican boarder. The civilian sector is also interested in applications such as perimeter security. However, unit cost is likely to be too high for many potential civilian

customers. It may be of interest to those whose security needs transcend potential costs.

Funding

No recent funding for either REMBASS or IREMBASS has been identified.

Recent Contracts

Contractor	Award ($ millions)	Date/Description
Lockheed Martin Overseas	Unknown	1995/1996 – The New Zealand Army contracted for the supply of 16 IREMBASS systems. The procurement of these systems falls under the Project STANO acquisition program.

Timetable

	1971	Army approved REMBASS project
	1977	RCA received US$8.9 million for a REMBASS Engineering Development Model
	1978	Testing of classifying sensor began
	1981	Pre-production development tests began, testing of prototypes
	FY83	Development phase ended
Apr	1984	Initial production contract issued
	FY85	REMBASS entered Full-Scale Production. RDT&E effort began for an Improved REMBASS System incorporating the latest hardware technology to further reduce size and weight, and enhance deployment options
Late	1986	Full production commenced. Mini-REMBASS began testing
Sep	1988	Developmental contract issued for Improved REMBASS
	FY92	Production of Improved REMBASS started for US Special Operations Forces
	1995/1996	Order for 16 IREMBASS placed by New Zealand Ministry of Defence
	1997	Completion of IREMBASS procurement

Worldwide Distribution

REMBASS/IREMBASS is known to be used by the **US Armed Forces** (primarily the US Army) and the **New Zealand Army.**

Forecast Rationale

REMBASS (Remotely Monitored Battlefield Sensor System) is a passive battlefield sensor system consisting of numerous sensor modules (infrared, magnetic and seismic/acoustic), a radio repeater and a handheld/fixed monitoring station. The system is geared to detect both personnel and vehicular between 3 to 350 meters depending on the sensor. An improved version has been fielded with the designation of IREMBASS (Improved Remotely Monitored Battlefield Sensor System). This system is lighter and more compact than the original system.

The last confirmed US contract was for 48 IREMBASS sets in 1994. These sets consisted of several hundred sensors with their attendant repeaters and handheld/ fixed site monitors. Since that time, there has been no further mention of additional production for the US Army. However, as most of these sets are being used by Special Operations Forces, procurement has probably been kept classified.

One foreign sale has been confirmed. The New Zealand Army procured an unspecified number of IREMBASS systems around the 1996 time frame. The totals given would be enough to equip the two battalions of combat

troops that currently make-up the New Zealand Army. Additional sales have been made to unspecified Middle East and Pacific region nations.

A potential replacement for IREMBASS is the Lockheed Sanders Trafficking Emplaced Sensor Operational Network (TESON). The TESON contract was awarded in late 1993. These ground sensors are designed to be emplaced at remote locations, with a communications network linking the sensors and providing data to Army command centers regarding activity at the remote sites. TESON thus would appear to be competing against REMBASS in the protection of fixed sites.

The following forecast is based on a combination of REMBASS and IREMBASS monitor/programmer sales to the US Army. The numbers presented represent sets consisting of a monitor, repeater(s), and an unknown quantity of sensors. The numbers derived for REMBASS is based on the assumption that each infantry battalion would be equipped with four systems representing 108 systems per US division. It was further speculated that only the five light divisions would be equipped with this system. IREMBASS figures assumed procurement from US Special Operations amounting to 54 systems with the rest being replacements for the standard units.

Foreign sales figures equal 270 REMBASS and 135 IREMBASS units sold. Of these 16 IREMBASS systems are confirmed to have been procured by New Zealand for its land forces. The remaining amount should be considered highly speculative as it cannot be confirmed and represents a best estimate. These systems are based on foreign procurement equaling 50 percent of the US Army procurement of both systems.

REMBASS production ended in 1988 with IREMBASS production starting in 1991. It appears that IREMBASS has also reached the end of its production cycle due to the lack of contracting activity, domestic or international.

Ten-Year Outlook

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