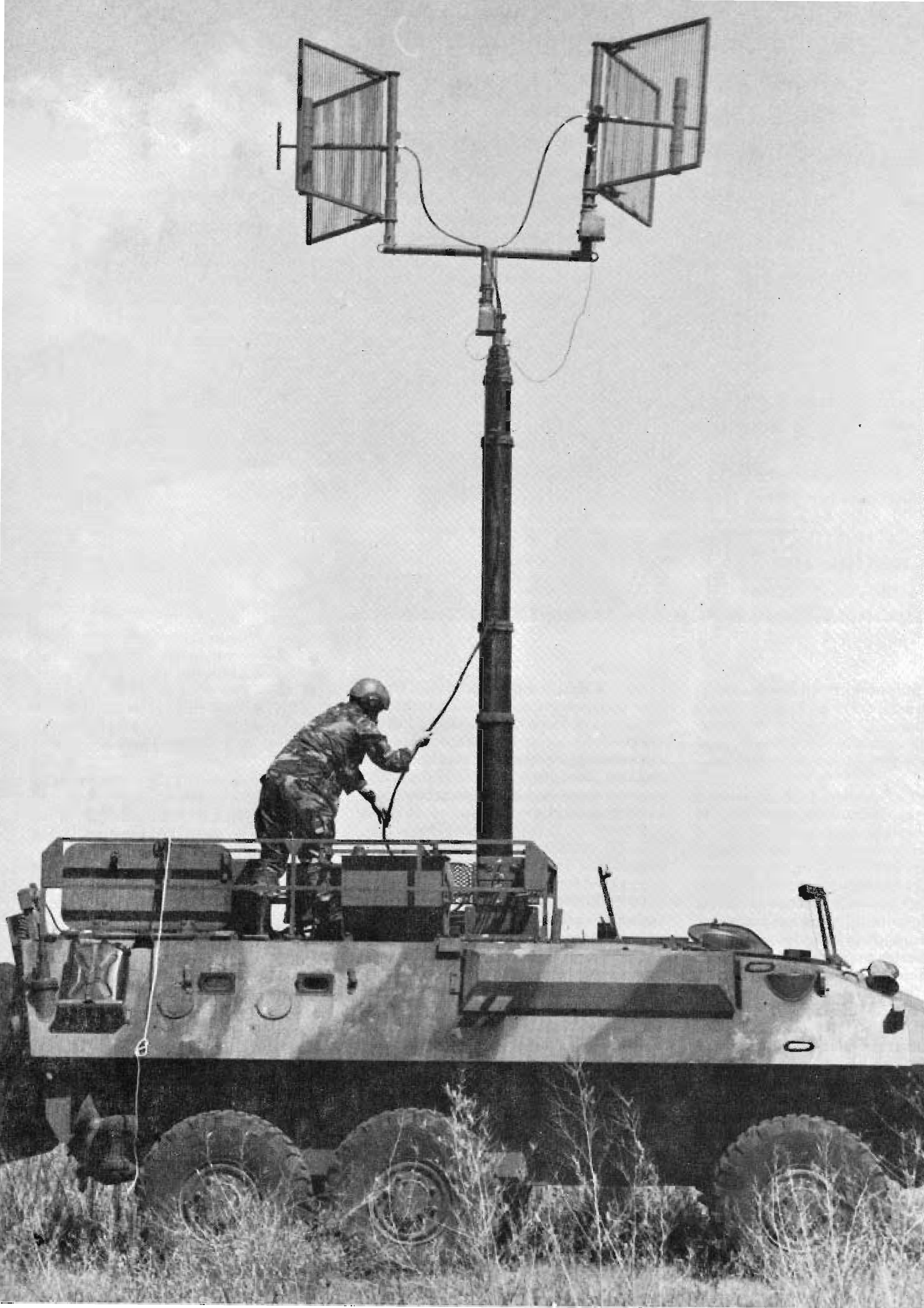



# Improving tactical communications

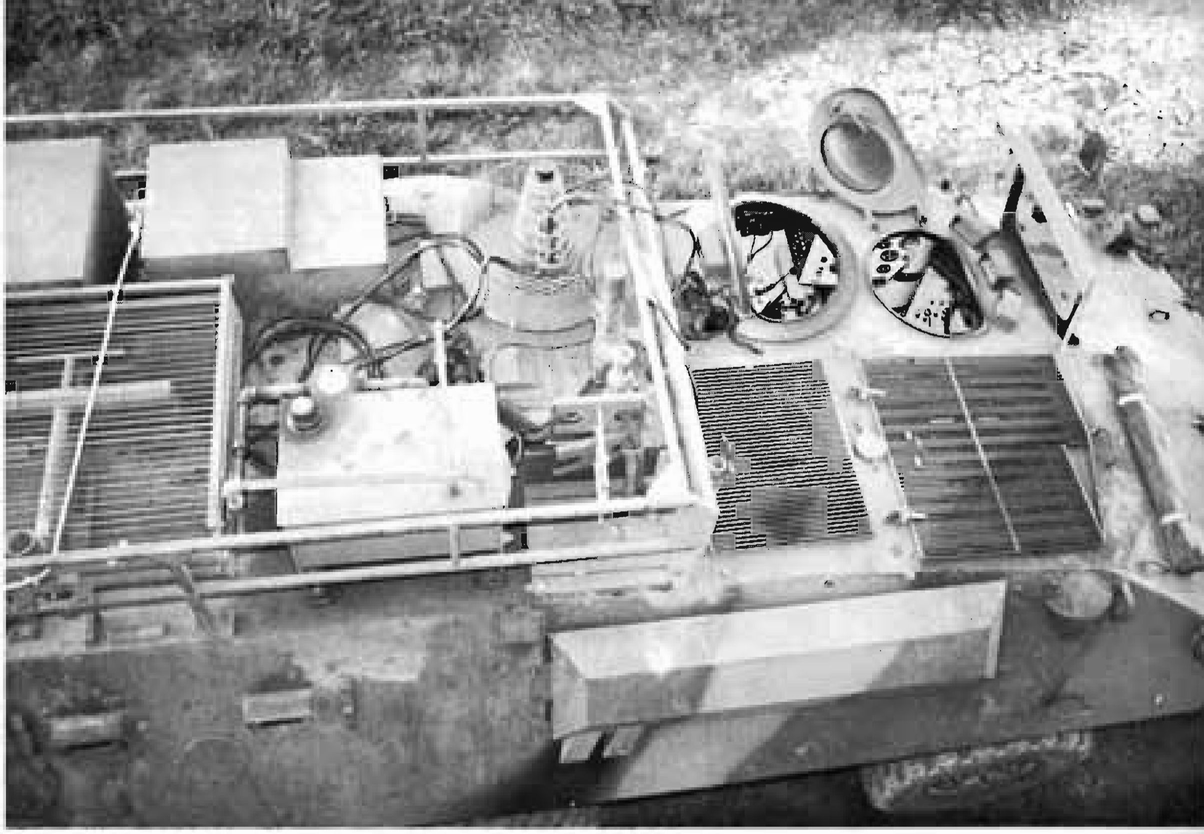
by Capt.
James M. MacMillan

Last fall a unique armored vehicle roared through the mountains of Fort Carson, Colorado. It did not have tracks, nor did it have a gun turret. More important, it was not meant to play the classical roles of weapons platform or personnel carrier. Instead, it was configured as a communications systems carrier.

The concept of using an armored vehicle to house communications systems was first proposed in 1981 by the U.S. Army Combined Arms Combat Development Agency in conjunction with the U.S. Army Signal Center and Fort Gordon and the U.S. Army Communications-Electronics Command (CECOM). These agencies initiated a program to explore the idea of utilizing a light armored vehicle (LAV) as a communications systems carrier. This configuration, dubbed the Light Armored Electronic Systems Carrier (LAESC), was intended to overcome the shortfalls of the current family of signal vehicles and communications shelters. Looking toward the future, these agencies were also concerned with the development of a standard Command, Control, Communications and Intelligence (C3I) carrier that would meet the requirements for survivability and mobility for tactical communications in support of AirLand Battle 2000.

The intent of combining signal communications equipment and an armored vehicle into one package was to create a fast, highly mobile and survivable C-E system. In order to test this concept, a six-wheeled, diesel powered, armored vehicle was obtained on a loan from the Canadian National Defense Forces. This LAV, known as the "Grizzly", can carry 12 soldiers and has a top speed of 100 km/hr (62.5 mph). The Grizzly is amphibious (it has two propellers and rudders on the rear) with a top speed of 10 km/hr (6.2 mph) in the water.

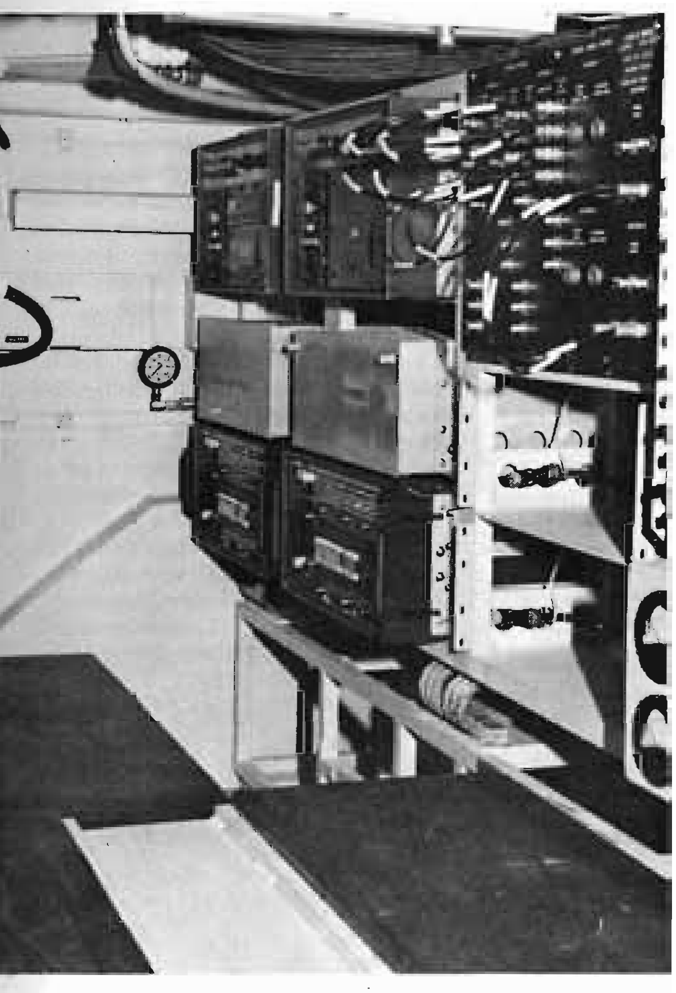
The vehicle was modified by the Keweenaw Research Center of the Michigan Technological University, under contract by the U.S. Army Tank-Automotive Command, so that the signal components of a Radio Terminal Set, AN/TRC-145, could be installed.



The Keneenaw Research Center installed several items not currently found on an AN/TRC-145: a quick erect antenna mast system, a hydrostatic generator and a ground rod driver.

The antenna system mounted on the LAESC was composed of two antennas, AS-1852/GRC-103(V) (also known as "flyswatter" antennas), mounted on a t-bar and oriented by two rotors. The t-bar was mounted on a telescoping mast that consisted of nine tubular sections. The mast was raised and maintained at a height of 40 feet by pressurized air supplied by air compressors and an air storage tank. Two air compressors were provided — a DC compressor to operate off the vehicle batteries and an AC compressor to operate off power supplied by the generator. The purpose of adding an antenna system such as this to the LAV was to improve the set-up and tear-down capability of the communications systems.

A single 120 volt AC, 5 kw hydrostatic generator to power the communications equipment was mounted on the top rear of the LAESC. It was powered by pressurized hydraulic fluid pumped by a power take-off on the LAESC engine. Therefore, the vehicle engine had to be running in order to operate the generator. By adding an on-board generator to the LAV, the system's mobility is not hindered by having to tow a generator trailer.



***Testing showed that the idea of using a light armored vehicle as a communications systems carrier is feasible.***

The ground rod driver was mounted on the rear roadside of the LAESC. In order to drive a ground rod, the operator inserts the rod into the hammer assembly of the driver. When turned on, the ground rod driver hammer hits the top of the ground rod — similar to the operation of a jack hammer. Additional downward force is applied to the ground rod through a winch manually turned by the operator. Again, the intent of adding a ground rod driver was to make system set-up and teardown quicker and easier.

The LAV was then shipped to the Systems Engineering Division of CECOM. There the CECOM engineers installed the equipment racks and the AN/TRC-145 communications equipment into the vehicle. Finally, the first LAWSC prototype was ready for test.

The average time to set up the LAESC was approximately 12 minutes. The average time to set up the AN/TRC-145 was around 35 minutes.

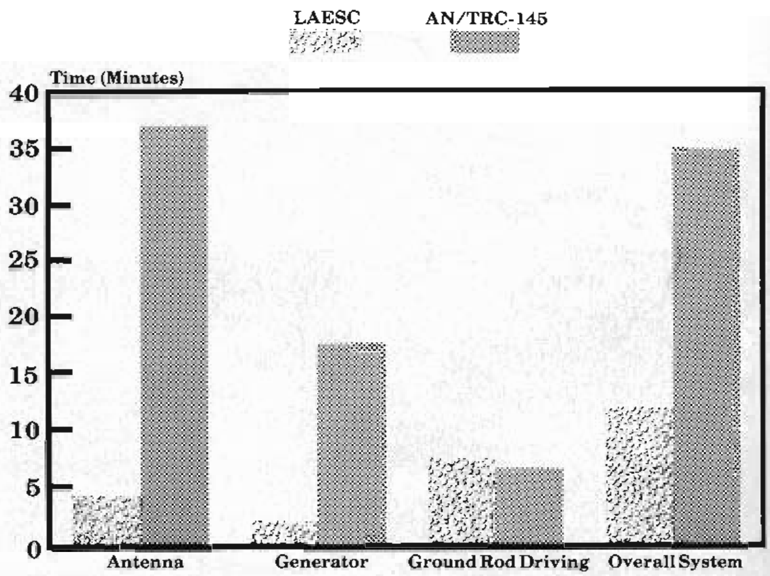



*Figure 1. Set up results*

## Testing

The test used to evaluate the LAESC prototype was a Concept Evaluation Program (CEP). TRADOC Reg 71-9, "Force Development and User Testing," defines CEP as a U.S. Army Training and Doctrine Command directed and funded innovative test. This program provides "... a quick reaction and simplified process for resolving combat and training development issues, firming up requirements document, and determining the operational and training potential of materiel items." In other words, a CEP is a test of an idea or concept to determine its usefulness to the Army.

For this test, the LAESC was delivered to Fort Carson, Colorado. The U.S. Army Communications-Electronics Board (USACEBD) was the operational test agency designated by TRADOC to test the LAESC prototype. In its role as an operational test agency, the USACEBD is responsible for planning and conducting, as well as reporting the results of operational (user) tests of new or developmental communications equipment. Special support, such as multichannel equipment operators, maintenance personnel and logistics were provided by the 124th Signal Battalion, Fort Carson, Colorado.

The test consisted primarily of direct comparisons between the current vehicular configurations of the AN/TRC-145 and the LAESC. For both systems, the time to set-up and tear-down the antennas, generators and overall system were measured. Also, the time to drive a ground rod by using the ground rod driver and by using the current manual method (a sledgehammer and elbow grease) were determined. Additionally, the mobility characteristics of the LAESC were observed throughout the test.

The time for the LAESC and a truck, M885, mounted AN/TRC-145 to travel over specific routes were recorded; however, this data was determined to be unusable because the vehicle operators were required not to exceed posted speed limits for safety reasons.

## Results

The results of the test showed that for most of the timed events, the LAESC was significantly faster than the current configuration of the AN/TRC-145. For example, the average time to set-up the LAESC (from the time the LAESC arrived on site until order wire communications with a control AN/TRC-145 was established) was approximately 12 minutes. The average time to set-up the AN/TRC-145 was around 35 minutes. Although more ground rods were driven successfully (completely into the ground) by the LAESC ground rod driver, the LAESC ground rod driver was not faster than driving a ground rod using manual methods. The

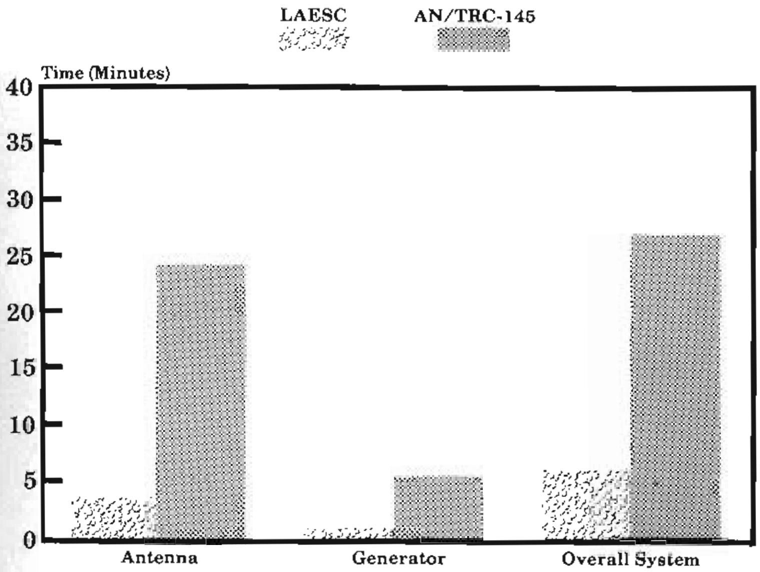



*Figure 2. Tear down results*

***Tests also showed that the installation of the C-E equipment in and on the LAV had no apparent affect on the vehicle's mobility.***

results of the timed events are shown in Figures 1 and 2.

During the test, it was determined that the installation of the C-E equipment in and on the LAV had no apparent effect on the vehicle's mobility characteristics.

The LAESC was not without other problems, however. For example, a back-up system was not provided to power the communications equipment should either the vehicle engine or the hydrostatic generator fail. More ground rods driven by the LAESC ground rod driver could not be removed than those driven manually. The LAESC ground rods lack a ground strap lug; therefore, it is more difficult to get a good grip on the rod to remove it by hand.

## Conclusions

This test showed that the concept of utilizing a light armored vehicle as a communications systems carrier is feasible. Not only did the LAESC, as configured for this test, improve upon current communications capabilities through increased mobility and shorter set-up time, but it will also provide increased survivability for the C-E system and crew.

Even with the shortcomings and deficiencies noted during this test, the LAESC could significantly improve tactical communications on the battlefield. The identified problems appear to be solvable with current technology. Once corrected, the effectiveness of the LAESC will be further enhanced.

The LAESC represents a significant step forward in C3I. This marriage of tactical communications with a vehicle that provides improved mobility/survivability will make command and control in future combat, particularly in the forward areas of the division zone, more effective.

## References

*MacMillan, James M. and Lilly, Robert E., "Concept Evaluation of the Light Armored Electronic Systems Carrier," USACEBD Final Test Report, Nov 1983.*

*Lokey, Hugh A., "Proponent Evaluation of the Light Armored Electronic Systems Carrier (LAESC) (Phase II)," USASC &FG Report, Dec 1983.*

*TRADOC Reg 71-9, Force Development User Test and Evaluation.*

*"CECOM Adapts Radio Terminal to Armored Vehicle," Monmouth Message, 30 Sep 1983.*

*Capt. MacMillan, who was on orders at the time this article was published, holds a B.S. in electrical engineering from the University of Nebraska where he graduated with honors. He was also the honor graduate of the Signal Officer's Basic Course, class 06-80.*