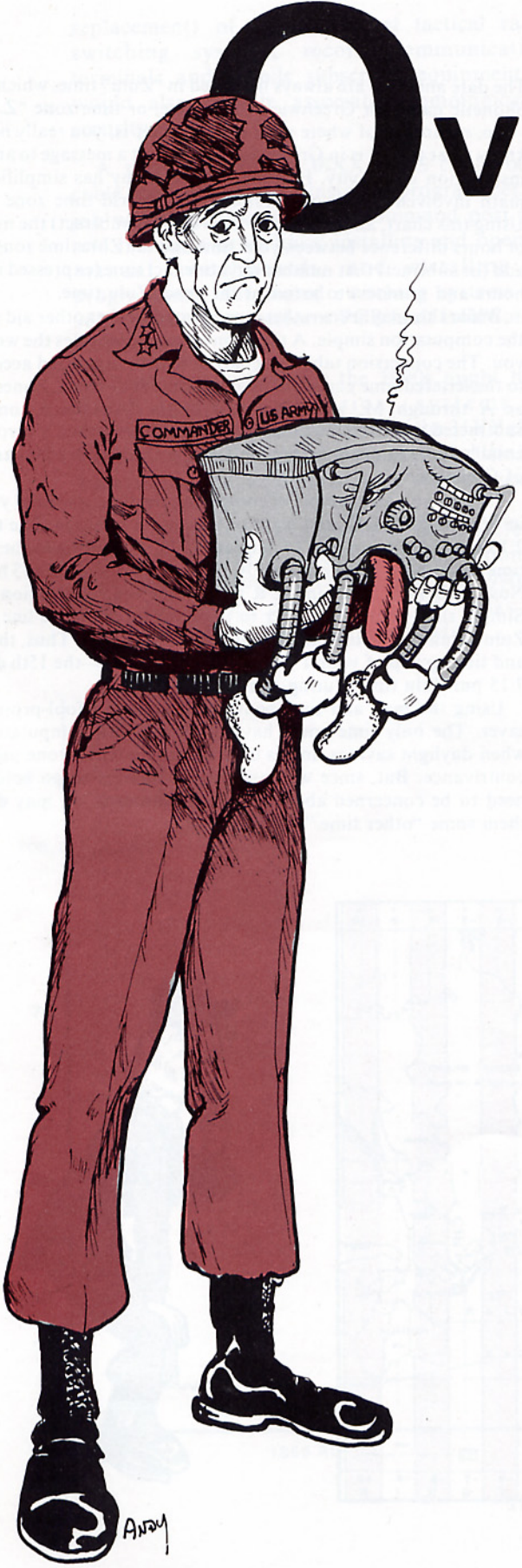
# Overuse of FM Radios




by MAJ Francis A. Long, Jr.

The Army has a problem. It's a distinct problem. It affects everyone in the tactical command and control communications business. Whether you're a commander or a communicator, a user or an operator, you're involved in this problem.

It's known as "the tactical communications problem": the tendency of our tactical ground forces to rely much too heavily on single channel VHF-FM radio while conducting ground combat operations. Current enemy threat literature warns us of what he's up to. Stated simply, in any future conflict, he plans to bring whatever power is necessary to deny us our most crucial instrument of combat direction: our command and control FM voice communications.

Thanks to a recent proliferation in the conventional Intelligence press on threat nations' capabilities and objectives, many of our commanders appear to know more about the enemy's weaknesses than about our own strengths. While our adversary's potential for doing exactly as he intends is convincingly understood by most Army authorities, present trends indicate that our own capabilities are often shockingly unknown to, or ignored by, our combat commanders and communicators. This is especially alarming when consideration is given to the fact that much of the enemy's efforts will be directed at the tactical commander.

It is the purpose of this article to discuss the problem, how it is caused, influenced and solved. It is intended that commanders and communicators will more fully understand the seriousness of the dilemma they face and take immediate action to offset any advantages of threat nations in this field. For the record, something *is* being done to solve the

problem. Unfortunately, like many complex problems faced by modern combat units, there's no one best, quick answer. This article offers two possible solutions, neither of which is presented as a panacea.

## THE PROBLEM

Over-reliance on the use of FM radios as a means of command and control communications did not occur overnight. Actually, the problem has been growing ever since radios were first applied to military use. During World War I, radios were used relatively little, primarily because of the poor reliability associated with the equipment and technology.

During World War II and the Korean War, technological advances caused greater reliabilities in the components and an attendant widespread acceptance of radio as an extension of the commander's voice. As tanks and aircraft carried soldiers farther from the base camp to conduct operations, radio communications became as inextricably a part of the commander's tools as were his weapon systems.

And so it went. Finally, during the Vietnam conflict, the use of radio as an extension of the commander's voice had so saturated our combat operations that a point of diminishing returns was reached. The equipment was so reliable, and commanders had become so dependent on the radio, that the planning process began to suffer.

The importance of military planning had been taught for generations before Vietnam. But in the jungles and rice paddies thousands of miles from the classroom, commanders and operations officers were foregoing the proven wisdom of detailed, well thought-out operations orders and plans. Instead, what was more often the case was "command at 10,000 feet." A tactical commander would simply get on the FM radio (non-secure, same frequency and call signs for weeks at a time) and direct his subordinate commanders to execute a particular operation. As the operation got underway, and as the senior commander obtained more information from his staff, he simply picked up the microphone and directed his commanders to change or alter their actions accordingly. In the hands of a brilliant commander, the instantaneous contact afforded by radio won fire fights and preserved lives; in the hands of a mediocre commander, the same instantaneous contact caused confusion, doubt, oversupervision and loss of friendly lives.

During the post-Vietnam period, radio dependency and bad operating habits became entrenched in the everyday field operations of combat units. Many of the bad operating habits have been compensated for by greatly improved frequency and effective periodic call sign changes and by increased use of secure voice equipment and codes. However, the over-reliance on FM radios remains deeply rooted in our combat operations.

Acting in consonance with the central theme of over-reliance on FM radio as the primary means of command and control communications are three important factors. These factors—electronic warfare, electromagnetic pulse and mutual interference—are best considered by commanders and communicators as real forces to be contended with on any future battlefield.

### *Electronic Warfare*

The first obstacle to successful radio communications that the tactical unit commander should anticipate during the next battle is electronic warfare (EW). Basically, EW is the sum total of the actions taken to prevent or minimize the enemy's use of the electromagnetic spectrum and the actions taken to allow us to use the spectrum effectively ourselves. There are three major areas within EW: electronic warfare support measures (ESM), electronic counter measures (ECM) and electronic counter-counter measures (ECCM).

Electronic warfare support measures involve the actions taken to search for, locate and identify radiated electromagnetic energy, primarily through the use of direction-finding techniques.

Electronic counter measures are in the offensive area of electronic warfare and involve the actions taken to preclude or minimize the enemy's effective use of the electromagnetic spectrum primarily through the use of jamming, disruption and deception techniques.

Electronic counter-counter measures involve the defensive actions taken to counter the enemy's counter-actions and thereby allow our own use of the frequency spectrum. ECCM techniques involve anti-jamming, authentication methods and radio operating procedures.

Although threat nations may define the categories a little differently, there should be no doubt in any commander's or communicator's mind that EW is here to stay. We use it against the enemy and he's guaranteed to use it against us. The key point is that the enemy has the ability to deny us the use of our FM radios virtually whenever he chooses to do so: he can disrupt our communications or destroy them.

### *Electromagnetic Pulse*

The second major obstacle to successful radio communications is electromagnetic pulse (EMP). EMP is a

"burst" of electromagnetic energy resulting from a nuclear explosion, which instantly covers the entire useable portion of the frequency spectrum, with heavy concentrations centering in the high, very high and ultra high frequency range. It effectively destroys the inner circuitry of a radio by delivering a highly intensive flow of energy. Our present day radios with their relatively slow circuit breakers cannot react quickly enough to prevent this damage. As long as a radio set is on and is within the effective range of a nuclear detonation, it can be affected by EMP.

It is by now a well-publicized fact that the Soviets intend to utilize tactical nuclear weapons of various sizes in future conflicts. They are well aware of the effects of EMP. They further realize that it is to their advantage to reduce their reliance on radios and are doing so in their training on a regular basis. Once a nuclear blast occurs, EMP will affect only minimally the side that depends on radio the least.

***Mutual Interference (MI)***

The third and final obstacle to successful radio communications is mutual interference. MI is simply the expected interference on the next battlefield caused not only by ourselves, but by the opposition force as well. With our present family of FM radios, the AN/VRC-12 series of radios, a total of 920 discrete channels is available. When you consider that the average Infantry battalion has well over 100 radio sets, 920 channels begins to look frighteningly small. Add to the number of FM sets all other radios (AM, radioteletype), radars, generators, vehicles (ignition systems), plus like items on the opposite side of the battlefield, and you frankly wonder how anyone is going to be able to communicate during the next war.

When combined with the future battlefield factors of electronic warfare, electromagnetic pulse and mutual interference, FM radio overuse poses a problem that even the most experienced commanders and communicators are going to find difficult to solve. Fortunately, it's not as if they are going to have to solve the problem on their own...there's some help on the way.

## THE SOLUTION

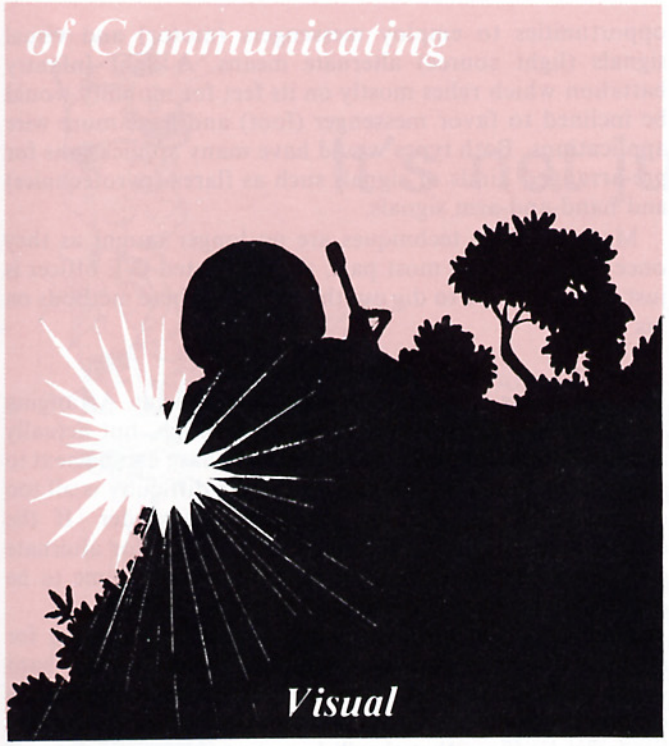
The "eventual" solution is called INTACS, the integrated tactical communications system, with its main sub-systems: the single channel ground-airborne radio sub-system (SINCGARS); the mobile subscriber access sub-system (MSA); and the tactical satellite communications sub-system (TACSAT).

INTACS began as a program in 1971 when the Army commissioned a study to look at future communications. The final study report was approved in February 1976 and covered communications requirements from 1976 to 1991, an unprecedented scope for communications managers. The result was a tremendous step forward and provided many answers to many previously unanswered questions.

The MSA and TACSAT are very important parts of the INTACS program, but will not be discussed here because they are not central to the problem of over-reliance on FM radio. The MSA and TACSAT are intended to supplement the SINCGARS program and provide telephone access to higher headquarters.

***Single Channel Ground-Airborne Radio Sub-system***

The key feature of INTACS is the single channel ground-airborne radio sub-system (SINCGARS). SINCGARS, which is still in the developmental stage, is the official response to the tactical communications-electronics problem. Specifically designed to replace the current family of FM single channel radios, SINCGARS promises 100 per cent secure communications that are jam proof (ECM resistant) and minimizes the electronic signature of the radios.



SINCGARS is primarily intended to be installed in vehicles and aircraft at battalion level and below, but will undoubtedly be used as a command and control radio at higher echelons as well, distances permitting. SINCGARS radios are to be much lighter in weight and smaller in size than current FM radios, with the ability to handle digital data as well as voice transmission. They will have more useable channels than the present family of radios (although that number is still undetermined).

The most important new feature that SINCGARS will employ is "frequency hopping," a technique whereby the net control station, through use of a computer, will change the operational frequency of the radios in the net as many as several thousand times per second, making it extremely difficult for enemy locating equipment.

The biggest disadvantage of SINCGARS, however, is that it's not going to arrive any time soon. As mentioned earlier, INTACS covers requirements from 1976 to 1991. The first SINCGARS equipment isn't expected to be fielded until the mid 1980's. Even then, it will take until 1990 to field it completely.

In the meantime, we can't expect threat nations to wait or world events to stop while we wait for our new radios. But there is something we can do...innovate.

## THE INTERIM SOLUTION

Among the many "catch words" and "buzz words" in vogue today is the phrase, "The next war will be a come as you are war." This implies that action and reaction times have been greatly shortened to the point that when hostilities break out there'll be no time for the lengthy mobilizations we've known in past wars. We're simply going to have to go into combat, on short notice, with what we have. To assure at least a par showing in that next battle, every communicator will have to possess in great abundance a thorough knowledge of the traditional means of alternate communications and an ability to innovate.

### *Traditional Alternate Communications Means*

Traditionally, when discussing the typical alternatives to radio communications on a battlefield, something close to the following list can be compiled: wire, messenger, visual, "other." Keep in mind the idea here is not to teach these methods. Rather, the intent is to discuss how these methods, in combination with one another, can effectively help lessen a unit's reliance on FM radio as the primary means of command and control.

The first alternate means of communicating is by wire. There are normally two types of wire employment: field, used in static or defensive situations; and assault, a lighter wire, used in assault or offensive "on-the-move" operations.

A second alternative is by messenger. Messengers have been around a long time and continue to be of great importance today. There are several kinds employed depending upon the circumstances: foot, vehicle (four-wheel), motorcycle and air (helicopter).

The third option is visual signals, including light source, flags and heliography. Like the messenger, visual signals have been used for centuries, but have fallen into increasing disuse in modern times. This has been caused mostly by the growing dependence on electrical communications. But, like wire and messenger, there's still an application for these techniques on today's battlefield. Of special note in this category is the tremendous present day interest in laser and fiberoptics technologies, both of which can greatly supplement radio.

Finally, the "other" alternate communications techniques, such as panel signals, pyrotechnics, sound signals and hand-and-arm signals, have reduced

applications. Nevertheless, in the right situation, they can still be very effective.

It should be stressed that these alternate methods are not designed to replace present electrical communications systems. Rather, they are recommended solutions to immediate battlefield communications problems. They are intended to supplement the existing family of radios, with the intention of relieving some of the over-reliance on FM radio as the primary means of command and control communications.

Some of these methods require extensive prior training, others very little. The point is not whether the time and effort involved in the training is warranted by the occasional demand for these techniques over the next few years until SINCGARS arrives. Indeed, it's a question of "what else can we do?" And the answer to that question, today, is nothing! Nothing except "innovate."

### *Innovation*

There are three key ingredients normally associated with the kind of environment in which a communicator can best display his innovativeness. They are planning, training and command emphasis.

### *Planning*

Even if he is armed with an expert knowledge of the traditional alternate means to communicate, today's combat communicator must still be prepared to do his homework. Planning an alternate communications scheme for his particular unit requires a detailed analysis of a number of factors. The most important consideration is the determination of precisely which of the alternate means are best suited to the mission of the unit. A highly mobile unit such as a mechanized battalion would have more opportunities to employ messengers (motor) and visual signals (light source) alternate means. A light Infantry battalion which relies mostly on its feet for mobility would be inclined to favor messenger (foot) and have more wire applications. Both types would have many applications for pre-arranged kinds of signals such as flares (pyrotechnics) and hand-and-arm signals.

Many of these techniques are no longer taught as they once were. For the most part, the motivated C-E officer is just going to have to dig out the details of these methods on his own.

### *Training*

The training phase is easily the most difficult. Arranging the time and the resources is tough enough, but actually achieving the goals set in the planning phase can be next to impossible at times. The reason for this difficulty is all too often because of one person: the commander. If the commander doesn't truly believe in the need for alternate communications, he may not allocate enough time to be devoted to it during training.

Assuming the commander is interested in training for alternate communication contingencies, the really hard work still lies ahead. That is, the really important training objective involves convincing the commander and operations officer that they'll have to turn their radios off and use some other means of communications. If they'll do it and stick with it, everything else in the training program will fall into place.

### *Command Emphasis*

Emphasis by the commander, as with anything he emphasizes, precedes success. As mentioned above, it may be difficult at first but, once done, is well worth the effort. It's not that commanders don't want to support their communicators, but just that there's a tendency to "leave things alone when they're going well." If the communicator is doing his job, it's usually just what the commander wants him to be doing...his job. But with certain programs the communicator needs to point out to the commander that this one is just a little bit special and is deserving of his personal support and attention. In using this approach, the communicator is not only doing his job but is also making the commander's job easier.

There's no doubt that our over-reliance on the FM radio is not an easily solved problem. Although the need for SINCGARS especially has been recognized, the system is part of tomorrow's realities, not today's. Thus, a communicator's most important recourse in the meantime is to exploit other means of communications to be prepared for that "come as you are" war where effective use of the FM radio will likely be a futile effort.

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