Signal Corps training for the 80s and 90s

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Armor officers, in their advanced course, have tanks and maneuver them; field artillery officers, in their advanced course, have guns and shoot them; however, Signal Corps officers, in their advanced course ... have pencils and push them.

We at the Signal School are failing to give our Signal Corps officers the realistic systems training necessary for them to be successful communicators on the dynamic Airland Battlefield. To provide them with the skills they need, we must be able to provide a tactical communications environment within the Airland Battle scenario that will enable them to plan, implement, and manage communications systems. A Signal officer must understand how every single element of an integrated communications system can affect the performance of the total system. This is exceptionally critical as the Signal Corps progresses into the era of automation.

Armor officers, in their advanced course, have tanks and maneuver them; field artillery officers, in their advanced course, have guns and shoot them; however, Signal Corps officers, in their advanced course—for the most part—have pencils and push them. In other words, they primarily receive classroom instruction, which substitutes pictures of equipment for the real thing. There hasn't been any equipment to support officer training at the SOAC level since at least 1973. As it should be, the priority of use for the equipment at the Signal Center is for essential operator and maintainer training; however, if we do not train the leaders to deploy the equipment as a system on the Airland Battlefield, the efforts to train the operators and maintainers are wasted. There have been attempts to develop alternatives, such as using the 67th Signal Battalion, sending students out as Army Training and Evaluation Program (ARTEP) teams, traveling to nearby posts, etc. But these alternatives have all been discontinued because of higher priority missions and/or budgetary constraints. Students are still using stubby pencils for planning and then just talking about implementing the plans. Because the budgetary and fielding constraints of today make it unlikely that we will be able to dedicate the personnel and communications systems required to establish a realistic communications environment, we must be innovative and take advantage of the rapidly changing technology to provide the systems training that is so vital for survival on the Airland Battlefield.

Looking outside of the Signal Corps, we can see examples of technology being used to provide realistic systems training. The British Army developed the Albatross communications simulator (COMSIM) to train their communicators for Ptarmigan, which is the British equivalent of MSE. (See Figures 1 and 2.) The Air Defense Center developed a HAWK training system. The Engineer School is developing a tactical training center which, through the use of distributed computing and interactive video disc technology, will be able to simulate realistic employment of engineer forces in field training exercises. The Combined Arms Center developed ARTBASS, an Airland Battle simulator with communications external to the simulation model. The ARTBASS system is located at Ft. Leavenworth, and a mobile system, currently at Ft. Hood, was fielded in February 1986. The Military Intelligence School is developing an automated G-2 workstation. The Defense Advanced Research Projects Agency (DARPA) is developing the technology base for large scale networks of interactive combat simulators at the Armor School. This simulator networking (SIMNET) will allow force-on-force, man-in-the-loop, free play combat exercises in simulations that require the same troop leading and command and control skills as in field exercises; however, SIMNET can be run on any terrain location in the world modeled in the simulation.[1] These systems also

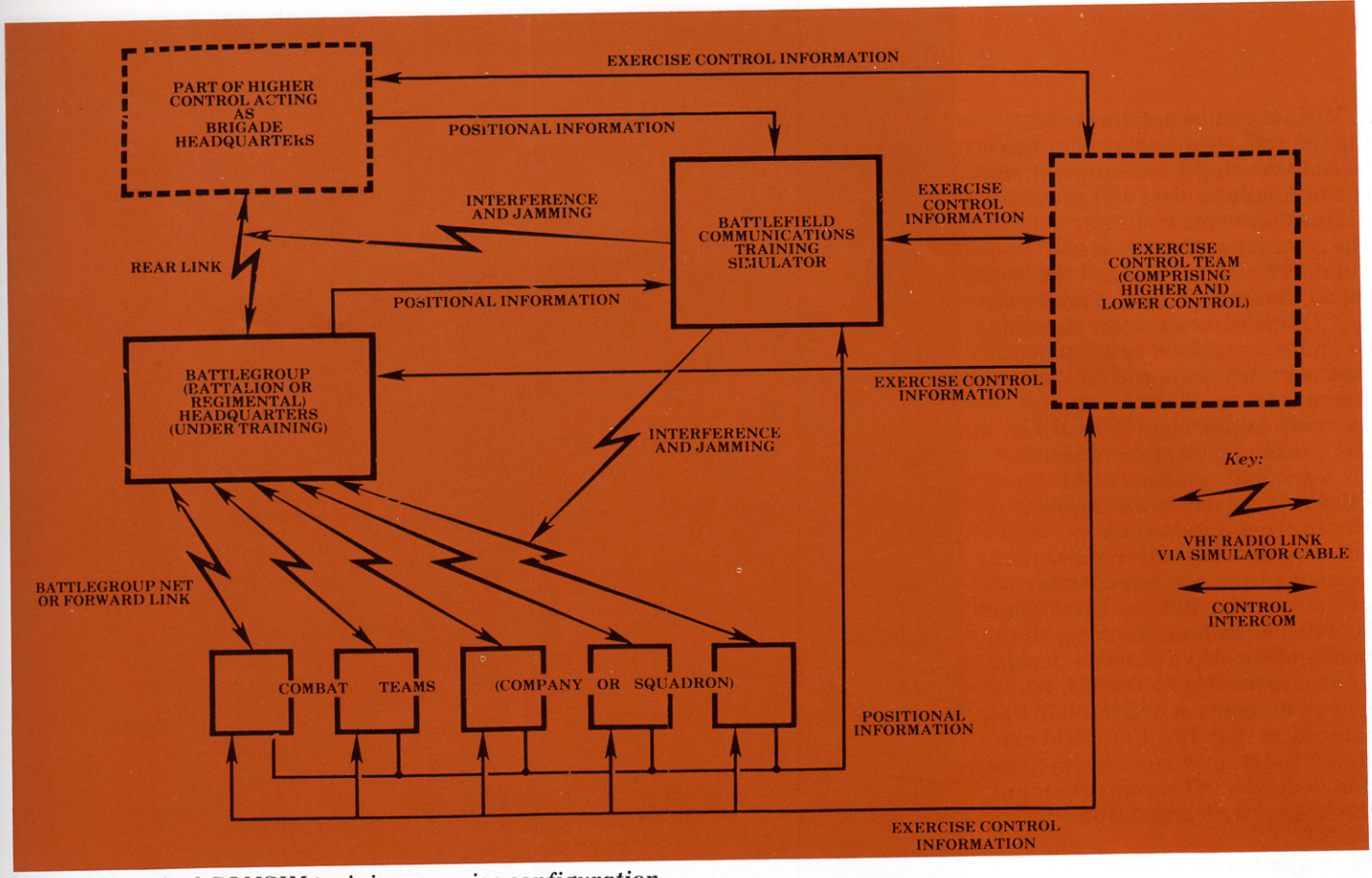
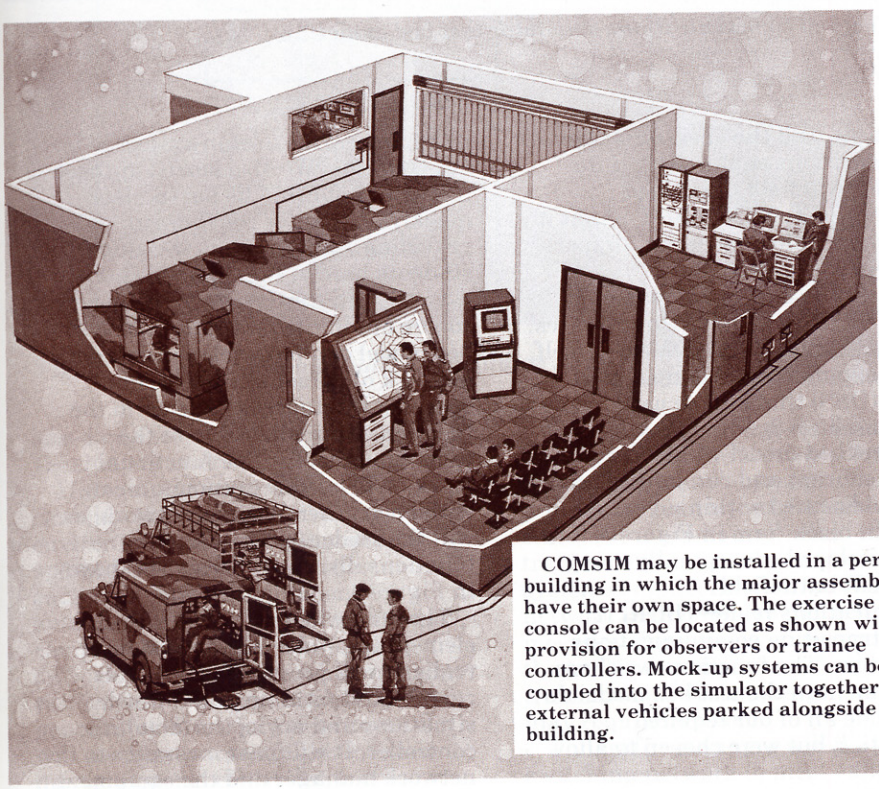


Figure 1. Typical COMSIM training exercise configuration



COMSIM may be installed in a permanent building in which the major assemblies have their own space. The exercise control console can be located as shown with provision for observers or trainee controllers. Mock-up systems can be coupled into the simulator together with external vehicles parked alongside the building.

Figure 2. Typical COMSIM deployment

allow the audio and visual recording of student performances, which can be played back during after-action reviews.

Within the Signal Corps, the Signal Center has the Reactive Electronic Equipment Simulator (REES), which simulates tactical communications assemblages for training operators. Additionally, the Signal Center has an interactive communications training system (ICTS) for training operators and maintainers on fixed station communications equipment. Under development are exportable training packages (which will run on personal computers) for troubleshooting AN/TRC-145 multichannel terminals and AN/VRC-46 radios. But though these packages fill a need, they do not provide realistic systems training in the Airland Battle environment. Noticeably absent is anything for professional development of leaders or anything simulating the challenges posed by automatic switches, transmission systems, or communications systems. The packages being developed for troubleshooting the AN/TRC-145 multichannel terminal and the

AN/VRC-46 radios are, however, using the same technology that can be used to develop a communications systems simulator that will provide the critical systems training.

The communications systems simulator, which we will call the Tactical Communications Simulator (TACCOMSIM), is a project that has been under conceptual development for the past two years within the Communications-Electronics Leadership Department (CELD). A thesis written by Capt. Max Hall while a graduate student at AFIT verified that currently the Signal Corps does not possess any simulators that meet the requirements for systems training. A review of the work done by the Military Intelligence School helped us limit the focus of the project and develop a possible design architecture for TACCOMSIM. A review of the concept of SIMNET has convinced us that TACCOMSIM can be developed from current technology, and in developing it we can use many of the lessons we learned from SIMNET.

Our major requirement for TACCOMSIM is that it must provide a realistic training environment. It should be understood that we do not want to simulate the equipment, but rather the characteristics of the equipment operating in a communications system. Other system capabilities required include:

- An Airland Battle scenario
- Hostile and friendly electronic warfare (EW) environments
- A topographical database
- The ability to profile
- The ability to perform frequency engineering
- A subscriber requirements database
- A tactical communications assemblage characteristics database
- A database of circuit quality standards for different types of traffic
- A database of communications systems testpoints
- The ability to simulate the degradation of a communications system
- The ability to simulate the installation and maintenance of switching systems
- The ability to simulate the installation and maintenance of switching nodes

These integrated capabilities will be used to simulate the interaction between the S-3, the commander, the subscribers, and the operators of the communications equipment on the Airland Battlefield. An added advantage of TACCOMSIM is that it will minimize the instructor/support personnel to student ratio.

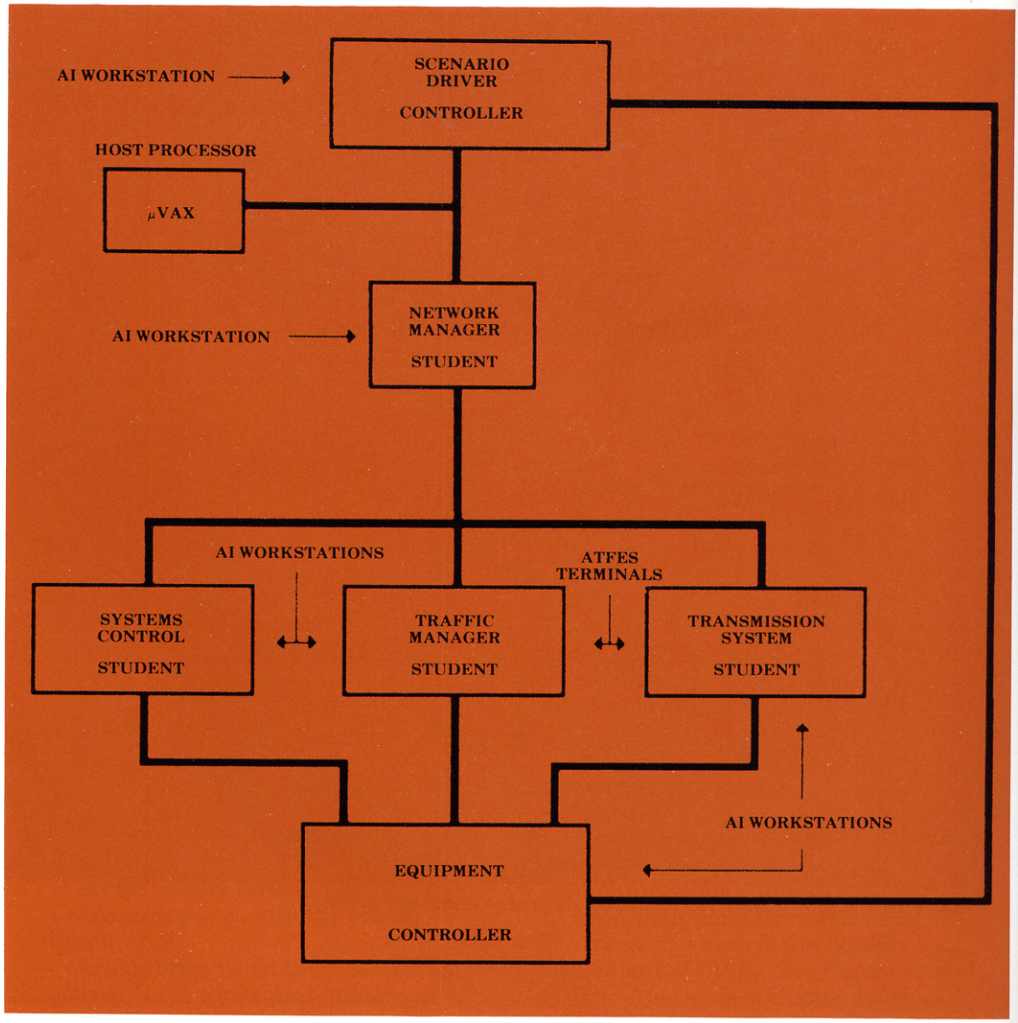


Figure 3. Tactical communications simulator test bed model

We envision that development of TACCOMSIM will have three phases: a test bed model, TACCOMSIM itself, and an expanded decision support system (DSS) that can be used in the field to assist S-3s.

The test bed model will be used to test our concept and can be designed and implemented within a year. Shown in block form in Figure 3, it is being developed conceptually using the current battlefield communications review (BCR) II hybrid/transition communications architecture. The functions we chose to implement in the test bed model do not include all of our required capabilities, but were chosen to allow us to develop a skeleton system to test our concepts. We also looked at those features that could be put in place quickly so that we could begin providing some systems training to students here at the Signal Center even though this training would be somewhat limited initially. The test bed model can be developed using a network of personal computers operated by students to perform the functions desired at each of the functional blocks. The functional blocks will be able to communicate with each other over the network, as will the students. The various functions discussed below are shown in Figure 3.

The scenario driver, the critical element in producing the system's realism, will provide the input for current and future Airland Battle situations and act as the simulator controller. It will pass messages to the network manager and the equipment controller. The scenario driver will be

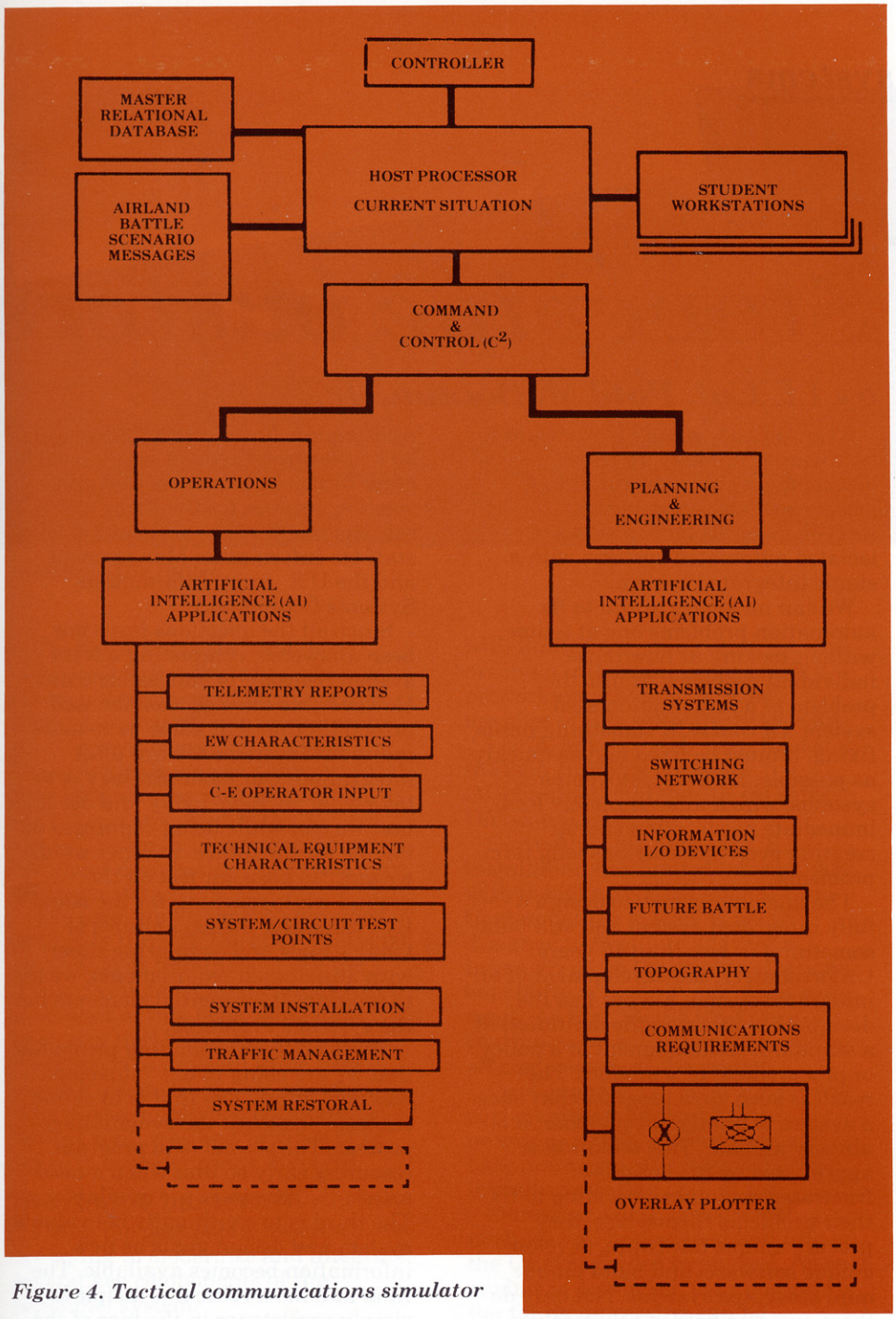


Figure 4. Tactical communications simulator

based on the TRADOC Common Teaching Scenario.

The equipment controller will simulate the communications systems environment, including equipment operator responses, casualties, equipment status, equipment availability, system/circuit testpoints, equipment maintainer responses, difficulty of system installation and restoration, and system fault generation. The equipment controller will communicate with the scenario driver, systems controller, traffic manager, and transmission systems engineer.

The network manager will receive messages from the scenario driver, which then must be assigned a priority for action and passed to either the systems controller, the traffic manager, or the transmission systems engineer for action. The network manager also will receive messages from the systems controller, the traffic manager, and the transmission systems engineer that may require action.

The traffic manager will design the switching network to meet validated user requirements, analyze network performance data, and implement traffic control standards. The Army Tactical Frequency Engineering System (ATFES) will be used by the traffic manager to support network design. The traffic manager will require access to the subscriber requirements database and the circuit quality standards database.

Today's Signal Corps needs a more sophisticated and effective training methodology. And, as we have tried to show, TACCOMSIM will be able to provide that methodology. The techniques used in TACCOMSIM involve the student directly in the Airland Battle/Signal Doctrine and in a dynamic integrated training environment that will reinforce the lessons taught. As always at the Signal Center and within CELD, our goal is to produce high quality Signal soldiers who are prepared to lead, fight, and win the Airland Battle.

ENDNOTE

1. SIMNET overview by Lt. Col. Jack Thorpe, DARPA

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