After Connecting All the Dots, Emcomm Faces a Tougher Task: Connecting All the Agencies

By Bill Sexton, N1IN/AAM1RD/AAR1FP

What a station for contesting! The 20-by-20-foot *shack* boasts four fully-equipped operating positions with networked computers, broadband Internet and emergency power. There's air-conditioning, too, and refrigerator and coffee pot of course. To cut feed-line loss, the station sits directly underneath a high-rise antenna farm.

But when Gary Sessums, KC5QCN/AFA3GS, and his team fire up the rigs for an evening's high-stakes drill, it's not about scoring points and multipliers. It's about defending the homeland. Meet Whisky Alpha Romeo, the MARS station staffed by members of the Pentagon Amateur Radio Club on the top floor of the DOD's vast headquarters outside Washington.

On MARS nets you might have heard their other call signs: AAN3PNT (Army), AGA3DC (Air Force) or NNNØPNT (Navy-Marine Corps). The 60-odd members all have two things in common. Whether military or civilian, government employee or contractor, active-duty or retiree, each is or has been stationed at the Pentagon. And given the security clearances that go with the jobs, their mission statement justifiably struts a bit. WAR, it says, *provide(s) backup communications for the Joint Chiefs of Staff (and) National Military Command Center*. Impressive!

Most recently, four WAR volunteers teamed up to join Defense Department exercises testing real-life contingency communication between commanders on the ground and military assets that are airborne. Details (such as the nature of the "military assets") are classified except to say participants used Automatic Link Establishment (ALE) for handling traffic with planes aloft, and the drills have taken place over a period of months.

At the dedication of the Pentagon's new MARS station last October, two members describe an operating position to John G. Grimes (right). Before his recent retirement Grimes oversaw all MARS operations as Assistant Secretary of Defense. Gary Sessums, left, and Navy Capt. Rick Low are active participants in the station's unique support operations for DOD. *(Courtesy of Sally Sobsey, Department of Defense)*

A Fresh New Life for ALE

ALE may be old news – the utility that continuously scans assigned frequencies testing propagation and automatically connects on the best channel when an operator has traffic. However, there are some new twists of direct concern to EmComm in general and MARS in particular:

- In one of the EmComm community's many responses to Hurricane Katrina, National Guard units are acquiring MARS-ALE capability state by state, under guidance of the Defense Department's National Guard Bureau, which coordinates Guard activity for both the Army and Air Force.

- Under Navy-Marine Corps MARS sponsorship, volunteer developers have expanded the suite of programs providing ALE capability within reach of many – if not most – members' pocketbooks. Forbiddingly expensive military-standard ("MIL-STD") hardware no longer is required; recent-model, plain vanilla transceivers work just fine as long as PC and sound card meet ALE specifications.

All modes are accommodated once the link is made: voice, digital, POP3/SMTP e-mail, photos, maps, SSTV, even Winlink 2000. (As this is written, testing of an ALE-WINMOR RMS hybrid was just getting underway).

- There's been some movement within the federal establishment to loosen its hold on the coveted 60-meter band and allow amateur digital activity – not of direct impact on MARS but an encouraging signal of attitudinal change toward hams' usefulness in emergencies.

The bottom line: A long-sought direct connectivity between MARS and the military is becoming economically as well as technically feasible. The incompatibility of radios will no longer cut it as an excuse for failing to work together. This new com-

The Ham's-Eye View of ALE

It's a fairly exclusive group although anyone may join: they're the hams trained, equipped and ready to roll in an emergency with Automatic Link Establishment on the amateur radio bands.

Around 15 or 20 stations worldwide regularly congregate on eight pre-set data channels (provided the frequencies aren't in use for other modes). Information is available on the Internet. The required software is a close kin to MARS-ALE.

Here's how it works:

"Each ham radio ALE station uses the operator's call sign as an *address* in the ALE controller. When not actively in a QSO with another station, each HF SSB transceiver constantly scans through a list of frequencies (called channels in ALE jargon), listening for its call sign.

To reach a specific station, the caller simply enters the call sign just like dialing a phone number. The ALE controller selects the best available frequency and sends out brief *selective calling signals* containing the call signs.

When the distant scanning station detects the first few characters of its call sign, it stops scanning and stays on that frequency. The two stations' ALE controllers automatically *handshake* to confirm that a link is established and they are ready to communicate.

The receiving station, which was muted up until now, will typically emit an audible alarm and visual alert for the receiving operator of the incoming call. It also indicates the call sign of the linked station. The operators then can talk in a regular QSO." *

– Bonnie Crystal, KQ6XA's, http://HFLINK.net

** Or communicate in any other mode for which the two stations are equipped. ALE only provides the "front end." – ed.*

patibility is being most impressively demonstrated by WAR's operators at the highest level (no pun intended), and the National Guard Bureau is sharing in the economies it facilitates.

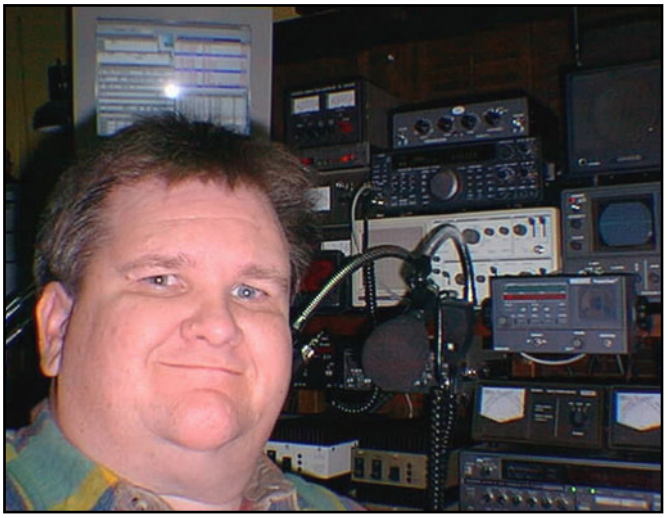
"The prevailing opinion among DOD officials is that MARS should be able to conduct interoperable contingency radio communications with active duty and Reserve/National Guard units using both voice and MIL-STD digital protocols," says WAR's Gary Sessums. "MARS in general needs to evolve beyond using amateur radio digital protocols and embrace MIL-STD to provide the support that we are charged with under the new DODI 4650.02." (That's the revised post-Katrina marching orders issued for the Military Auxiliary Radio System last December).

MIL-STD certification is a complex business, but at the operational level when a MARS-ALE station connects with a MIL-STD station, the latter *sees* the same waveform as its own and proceeds with the communication. The only difference is the software *virtual* modem in MARS-ALE and the hardware modem used by traditional ALE radios. Link Protection, a secure authentication utility to protect military stations from *spoofing* connects, will be added to MARS-ALE in the future, says Steve Hajducek, N2CKH/NNNØWWL, chief author of the program.

Three Branches, One Team

The software that facilitates the new jointness is jointness personified. While *Air Force* MARS member Sessums and three

Ken Heitner, a retired federal employee, is operating an ALE rig at Whisky-Alpha-Romeo (WAR), the Defense Department's MARS station. The equipment is MIL-STD, but MARS members have developed software that enables typical amateur radio transceivers for Automatic Link Establishment. Heitner is deputy national ALE manager for Air Force MARS, which uses HF mode for long-distance air-ground communication. *(Courtesy of Sally Sobsey, Department of Defense)*



Steve Hajducek, shown with some of his many rigs, began development of MARS-ALE after a systems engineering career on projects ranging from electronic countermeasures and weapons systems for the U.S. Air Force to Battlefield sensor systems for the U.S. Army and RFID systems for commercial applications. He continues today as a consultant on hardware, software and firmware development. Hajducek put his collection of amateur, commercial and military HF transceivers to good use testing and tweaking MARS-ALE for application throughout the amateur community – for which he also now maintains the PC-ALE software. See the sidebar, "Ham's-Eye View of ALE." *(Courtesy of KC2KQG)*

colleagues in the Pentagon Amateur Radio Club put the rubber to the road – as the NASCAR saying goes – Steve Hadjucek of *Navy-Marine Corps* MARS has been improving the rubber, that is, developing the software, and you could say Gray Reid, W4NGR/AAA9HT, of *Army* MARS was paving the road. In his post as national high-tech coordinator of Army MARS, Reid, a past Virginia state director from Newport News, Virginia, coordinates issuance of Army MARS-ALE licenses to the Army MARS membership and Army National Guard units.

During his on-duty hours at the Pentagon, Sessums, an Arlington, Virginia, civilian contractor, is manager of command-and-control communications at the National Command Center.

Hajducek, of Hendersonville, North Carolina, has headed the MARS-ALE development team since 2006 and is principal developer of the C++ source code as well as chief trainer. His MARS membership goes back almost a quarter-century.

Of all the embarrassments generated by Hurricane Katrina in 2005, none was more immediately costly than the inability of the many relief agencies and military responders to communicate with each other. Three-and-a-half years later the same disconnect still hobbled forces guarding President Obama's Inauguration. Now at last there's a formidable fix available.

The National Guards of all 50 states are in the process of acquiring the Defense Department's Joint Incident Site Communications Capability system (JISCC). This is a highly-sophisticated *(if unpronounceable)* communications package that can cross-link military and civilian responders using whatever comms the clients have brought along. The plug-it-in menu ranges from UHF handheld transceivers of RACES and Fire Departments to SATCOM and JACCs (joint airborne command centers) – and with e-mail and cell phone connectivity on the side. You need a repeater? The typical JISCC brings half a dozen.

This Rig Can Travel

Capt. Jeremy Downer, who oversees the JISCC unit that went into service at Westover Air Reserve Base, Massachusetts this spring, calls it a command post in a box – "hurricanes, floods, whatever we would be asked to do inside or outside the wire, we can do with this system."

Actually, the JISCC is a whole bunch of boxes, none heavier than two men can carry. A pair of flatbed trucks and a trailer transport from planeside into action. As proof of its universal interoperability, not to mention agility, the North Carolina National Guard dispatched its JISCC and operating crew to unfamiliar Alaska for a statewide exercise in May.

As of this writing, I haven't seen any MARS-wide blueprint for plugging into these huge routers. However, Texas provides a working model fully tested in hurricanes Gustav and Ike two summers ago. There, MARS is fully integrated into the State Military Forces, which for operational purposes embraces National Guard units. An Army MARS station has its own cubicle aboard the Texas Military Forces command trailers. JISCC connectivity, of course, would not require this physical presence, only a dedicated electronic input channel like ALE.

There's no better example of amateur radio's advancing the state of the communications art than ALE. Soon after the U.S. and its NATO allies embraced the concept in the early 1980s, an English ham, Charles Brain, G4GUO, started researching the use of computer- controlled HF transceiver and PC sound card as modem to obviate costly transceivers built specifically for ALE. He eventually posted his very basic PC-ALE proof-of-concept pro-

HF Radio: 'Back to the Future'

In 2001, a retired officer wrote in the U.S. Army Signal Corp's official journal, *Army Communicator*: "After almost 30 years of being the only army in the world and the only service in the Defense Department failing to see the continued military value of HF (high frequency) radio development, the Army has recently done an 'about face' on a large scale."

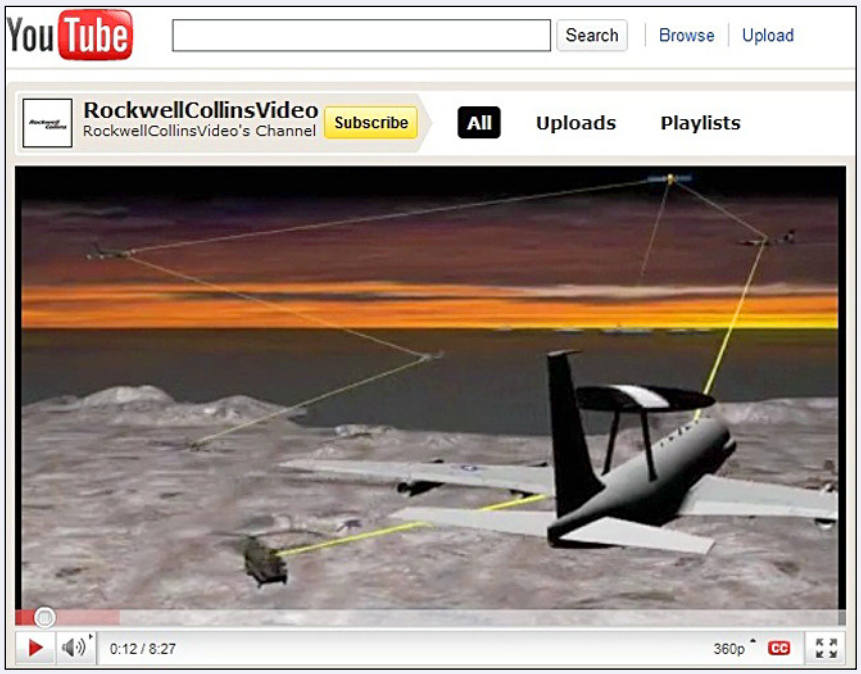
Well, it has taken quite a while but as Lt. Col. (Ret.) David Fiedler put it, the U.S. Army has definitely gone "back to the future."

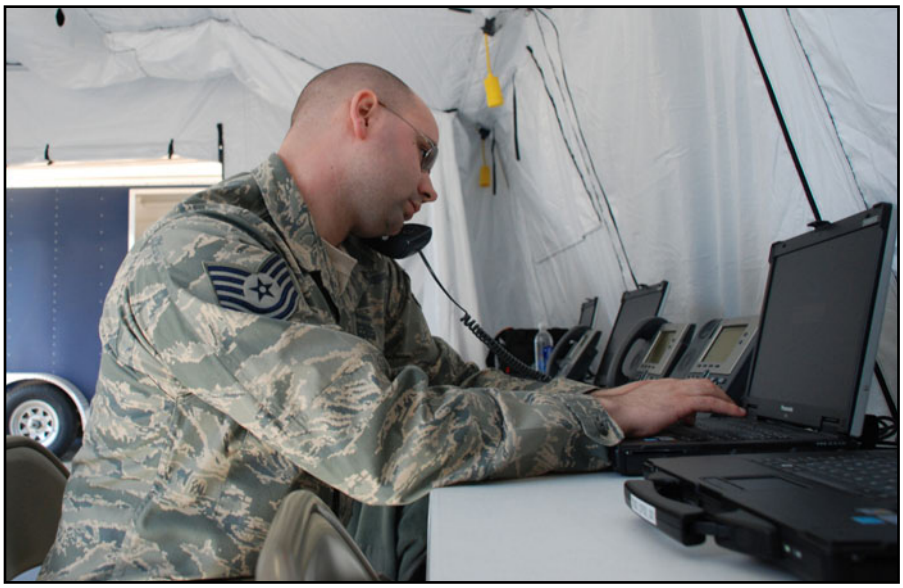
Just how dramatically the future of HF is unfolding can be seen in a video recently posted on YouTube by Rockwell-Collins. <http://www.youtube.com/user/RockwellCollinsVideo#p/a/u/0/mhbFYDsuZI8> Although the purpose is to tout one vendor's products, it's a useful primer on new applications – you might call it science fiction becoming non-fiction in front of your eyes.

Hams will understand the terminology with one possible exception: "SIPRNet" is the acronym for Secret Internet Protocol Router Network, the DOD's secure Internet paralleling the public one.

– Bill Sexton, N1IN/AAR1FP

Screen shot of the Rockwell-Collins video showing how HF's future is unfolding. *(YouTube video)*





View of an operating bench of the new "command post in a box" based at Westover Air Reserve Base, Massachusetts. The Joint Incident Site Communications Capability (JISCC) system serves as a giant router capable of interconnecting multiple civil and military communications channels in a disaster area. Two trucks plus a trailer (visible through the opening in the background) transport the modular installation to the scene. *(Courtesy of 439th Communications Command)*

Members of the 439th Communications Squadron take part in an exercise with the Joint Incident Site Communications Capability system in April. Westover is the first Air Force Reserve Command base to receive the JISCC. *(Courtesy of 439th Communications Command)*

gram on the Internet in 1998. In the interim, he'd been busy pioneering digital voice transmission, the system implemented by AOR's ARD9800 modem.

Hams on the Leading Edge

In 2004, Brain generously provided the proprietary PC-ALE source code to an Army MARS software development team then headed by Carlos Santiago, WB2FOZ/AAM2SB, in upstate New York. Steve Hajducek, at the time a member of New Jersey Army MARS (and eventual successor as ALE team leader) took on the years-long task of expanding Brain's PC-ALE into a full-service program.

Army MARS HQ cancelled its ALE program in early 2007 so that the HF channels could be reassigned to the brand-new MARS-Winlink operation. Bo Lindfors (N9UH/NNNØASA), Chief of Navy-Marine Corps MARS and a pioneer user of ALE , agreed to take the program under his wing. Hajducek transferred over from Army MARS. The joint-service development team continued its work, now using frequencies solely contributed by N-MC and AF MARS. Army members remained active under the new sponsorship.

In the meantime, SHARES had adopted ALE for some of its emergency backup nets. That's the Homeland Security Department's SHAred RESources program interlinking HF emergency backup stations at federal agencies and the major commercial phone and data carriers. The three MARS services participate in its ALE operation.

WAR's Gary Sessums served on the SHARES HQ staff before coming to the Pentagon. He currently is the ARRL ARES Emergency Coordinator for Arlington County, Virginia and was previously the RACES Radio Officer for Hillsborough County FL, leading a commo team to Mississippi during Hurricane Katrina. Besides Sessums, the WAR airborne exercise team included Navy Capt. Rick Low, N6CY/AAT3PG; Van Evans, KB3XC; and Ken Heitner (WB4AKK-AFD3LE).

There's an interesting spin-off of the fresh attention that HF is now getting from government communicators who all too long were convinced SATCOM could do everything. After years of opposing amateur digital operation on the 60-meter band (5060-5450 kHz), the National Telecommunications and Information Administration, which allocates frequencies for federal agencies, has signaled its OK for CW, PSK31 and Pactor III. Ham activity would be under very strict conditions and on only a relatively tiny slice of the spectrum.

The final decision belongs to the FCC, but NTIA's assent was at least enough to spur action on an ARRL petition that had been gathering dust at the Commission since 2006. MARS isn't directly affected – we already have a handful of allocations in that priceless neighborhood – but the augury is a good one.

One of the unambiguously positive events in a history beset with obstacles – both technical and organizational – occurred just a year ago. On Oct. 21, 2009 WAR dedicated its new quarters, part of a top-to-bottom refurbishing at the Pentagon. News releases were widely published showing a recently-retired high government official at one of the all-new operating positions.

The story called leadership's attention to the strategic importance of MARS resources, and the result was WARS getting its invitation to join the recent air-ground exercises . . .

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