By Louis F. Linden, KI5TD

Winlink 2000 in the Jungle

Digital modes come of age in support of volunteers providing health services in a place where few exist.

The Cessna 206 banked steeply left. I surveyed 15 or 20 huts arrayed 500 feet below us next to a meandering river, wondering which one of them would be the new home of HR3/KI5TD, one of 12 International Health Services Amateur Radio stations temporarily in Honduras. What concerned me even more was that I saw no landing strip.

I turned to Lola Johnson, our team pharmacist and yelled in her ear, "I don't see no landing strip!"

"I think it's that foot path leading into the village," she shouted, barely audible over the engine noise as we circled. I shook my head to indicate I thought she was crazy. She held up five fingers indicating the amount of the bet and I nodded in assent. At least if we augured it in, finally making me one with all my radio equipment, I would confront St Peter with an extra five bucks in my jeans! By the time our pact was sealed George Goff, our pilot, had plopped us down on the ground. We were indeed heading right up that foot path toward the village at 50 miles per hour sending chickens and pigs scrambling for safety until the plane stopped 20 yards short of a clump of wooden huts on stilts, turned 180° and George shut the engine down. In the dust and silence Lola simply

LOLA JOHNSON

The author erects antenna mast for experimental 2 meter beam and HF Delta loop.

held out her hand, palm up. It was just another day in the ongoing adventure that is Amateur Radio.

International Health Service,[1] an all-volunteer, non-governmental organization based in Minnesota, provides medical care to underserved populations in Honduras, Central America. For most of IHS's 23

[1]Notes appear on page 45.

year history the organization has used Amateur Radio as its primary means of communication in this rural country. IHS's multi-year experiment using the digital mode PACTOR has proven that all-digital communications networks over ham radio, when interfaced with the Internet using the Winlink system, are powerful and sophisticated tools for use in public service.

STEVE RICE

The author meets the afternoon net in the middle of a thunderstorm while a patient is prepped for minor surgery.

LOUIS LINDEN, KI5TD

A member of the author's team prepares an e-mail for him to send to her family in the US.

Servicios de Salud Internacional— International Health Service

International Health Service was founded in 1982 by a pair of dentists and a pharmacist who saw the need for a completely apolitical and areligious organization to provide medical services to the poor of Honduras. The next year they returned with some donated supplies and medicines and started fixing teeth. Subsequently they persuaded other healthcare professionals to join them in their annual winter forays to Honduras. The effort has grown steadily over the years until 2004 when a record 122 people and tons of supplies, drugs and gear moved to Honduras during the second week of February.

The typical IHS mission starts in mid-March, when the all-volunteer Board of Directors and staff start planning and fundraising for an expedition that will take place the following February. In October several IHS volunteers make a scouting trip to Honduras, meet with officials of the Honduran Health Service and IHS supporters in-country to decide where IHS teams will operate for two weeks the following February. By late summer IHS starts taking applications from volunteers who are ready and willing to pay about $1200 to cover their expenses and roundtrip airfare to Honduras. IHS selects a radio operator for each team from the applicants. Communications Director John Kirckof, KBØUUP, watches over selection and training of the ops.

Donated and purchased supplies and equipment are collected and stored in donated spaces until December when they are loaded into a 40 foot shipping container, driven to New Orleans and loaded on a Standard Fruit Co ship for a donated voyage to La Ceiba, Honduras. As you can imagine, the logistics of moving an organization this size 2000 miles to a foreign country, setting up health clinics and surgical teams in some of the most remote places in the Americas, then returning them

and their gear to the United States is awesome. That this is done entirely by volunteers and that they have never lost a person in over two decades is mind-boggling.

IHS divides itself into 10 to 12 teams for operations in Honduras. Based on the October reconnaissance and the available personnel it locates teams throughout the countryside. Most teams provide basic medical and dental care. Surgical teams are usually located in larger towns so that patients can be moved from the remote medical teams to surgical sites, often by small single engine airplanes, in less than half an hour. Two administrative teams oversee and coordinate the effort, one team at the group's temporary headquarters in the Gran Hotel Paris in La Ceiba and one in Puerto Lempira on the fabled Miskito Coast of Eastern Honduras.

The teams are comprised of 8 to 12 people. Usually there will be a physician and a dentist, a couple of nurses, a pharmacist, sometimes a paramedic or EMT, at least one, often two English-Spanish translators, a general helper or two (often the Team Leader) and, of course, a radio operator/engineer. The engineer is responsible for purifying drinking water, generating electricity as needed, sanitation, security for people and equipment, and any other infrastructure-related tasks. The radio operator (always a ham, reciprocally licensed by Honduras) is responsible for all communications between the team and the administrative headquarters and with other teams. He or she also often provides communications links with family and professional associates in the United States via e-mail or phone patches. The two functions are usually but not always performed by one person.

The Poor Man of Central America

Honduras is about two-thirds the area of Minnesota and bordered by Guatemala, El Salvador and the Pacific Ocean on the West, Nicaragua on the South and the Caribbean Sea on the North and East. It
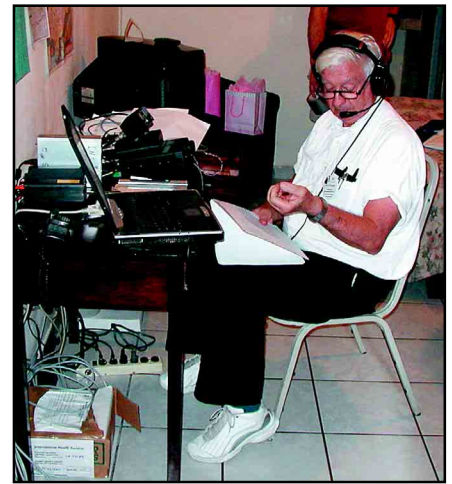

Bob Johnsen, K7TR, IHS net controller, counts down to the noon net in the IHS office, a cramped motel room in La Ceiba.

is home to 6.7 million people, 60% of whom live in rural areas. 28% of Hondurans are unemployed, 60% are illiterate and the population is growing at 2.3% per year. It is reputed to be the poorest country in the Americas after Haiti. In 1998 Hurricane Mitch killed over 5000 people and wiped out most of the bridges and roads in the country.

The northeastern plain of Honduras, La Mosquitia is the most sparsely populated part of the country. About the size of Massachusetts, it is the home of about 70,000 Miskito Indians and Miskito is the dominant language. For a visual, think Jurassic Park: rolling savanna dotted with swamps, old-growth hardwood forests, conifers and palm trees. Also think hot, humid, scorpions, mosquitoes and chiggers in abundance. The area is dotted with grass or gravel airstrips, many built during the Contra War, that enable single-engine aircraft to move people and cargo (read medical teams) into and around the area. People in La Mosquitia often walk an entire day for a chance to see an IHS

LORING KUTCHINS, W3QA
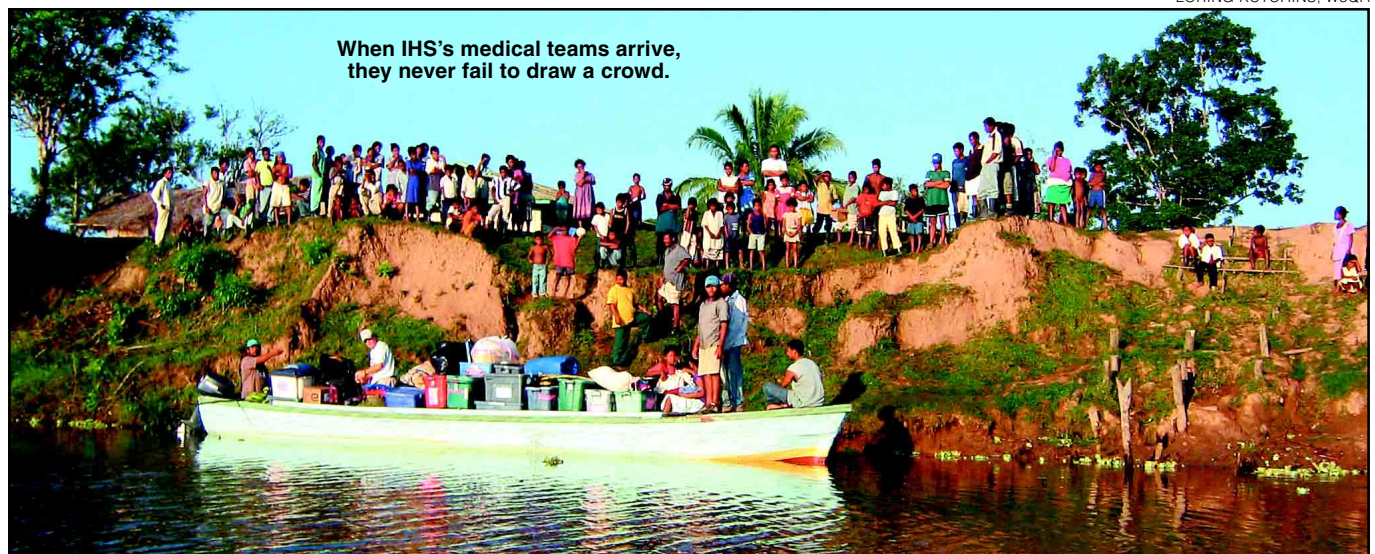
When IHS's medical teams arrive, they never fail to draw a crowd.

doctor. Usually an IHS surgical team, an administrative team and four mobile medical/dental teams deploy to La Mosquitia. One La Mosquitia team travels to its operations area by local dugout canoes. My team was sent to Warunta and Wauplaya, two Miskito villages so remote and obscure that medical teams had never been there before.

The half of the teams that aren't in La Mosquitia are spread around the mountainous western half of the country. The population there speaks Spanish, and roads, such as they are, service the villages. Commercial power is generally available if not reliable and many of the teams sleep in beds, an unimaginable luxury in La Mosquitia. For all that, the poverty is only slightly less onerous and the lack of medical care is substantial. At the same time La Mosquitia is sweltering, this area can be cold and damp.

E-Mail Comes to the Jungle

John Kirckof, KBØUUP, the IHS Communications Director decided in 2002 that the time and technology was right to test the usefulness of data communications in IHS's 2003 mission. In 2001 an IHS ham brought a PACTOR[2] modem with him and used it successfully. The next year four volunteer ops brought PACTOR modems in addition to their HF Voice gear. They all managed to send e-mail over the Winlink 2000[3] (WL2K) system. In August 2002 Kirckof placed a posting on QRZ.com inviting hams interested in operating from remote, primitive locations for two weeks at their own expense to apply. Over 100 radio amateurs expressed interest.

A new selection criterion was added that year: the ability and willingness to operate PACTOR. All of IHS's hams supply their own transceivers and tuners, so this also meant that hams would also have to provide a TNC. The selected ops gladly complied and by December 2002 Loring Kutchins, W3QA, Assistant Communications Director for IHS, instituted a training program for those of us new to digital operations and helped everyone master PACTOR and *AirMail*.[4] The only digital mode I had ever operated before was CW!

The organizing principle of the operation was simply to send e-mail to one another via existing Winlink mailboxes located in the US and the Caribbean. We simulated our in-country net while at home in the States then took our show on the road. Most of the teams were using PACTOR I mode. In spite of the low throughput rate of PACTOR I, the 2003 experiment was a qualified success. Everyone was able to send e-mail to other teams, headquarters and various addresses in the US. The downside was that very few

IHS's Kruta River team including radio op W3QA prepare to move their clinic farther up river.

people actually used the system internally as it might take 24 hours to get an e-mail message across the country depending on propagation and the availability of power. The three-times-a-day SSB net on 40 meters passed almost all the important traffic. Most of the e-mail I sent last year was health and welfare traffic to the US and Europe for other team members and myself. Although H&W traffic was secondary, it proved the feasibility of creating relatively reliable intercontinental links.

Kirckof mulled over the results and decided more speed was necessary. During the summer an anonymous donor provided the organization with five SCS PTC-IIe modems equipped to operate in the PACTOR III mode. PACTOR III has a maximum rate of 3600 bps while PACTOR I maxes out at 200 bps, a huge difference when important documentation needs to be moved quickly to multiple recipients. Barely a week before leaving for Honduras Dave Houser, WA9OTP, suggested to Loring Kutchins that what we really needed was a PMBO (Participating Mail Box Organization in Winlink-speak) of our own to interface with the Internet at our headquarters in La Ceiba. That would give all teams all-day access to the same mailbox. It was a great idea but too late for 2004. Loring also thought it too late but decided to inquire of Steve Waterman, K4CJX, anyway. K4CJX is a member of the Winlink Development Team, and its network administrator,

Waterman responded within two hours by e-mail, "Give me *PCAnywhere 10.5*, a decent computer with XP and some memory, permanent access to the Internet, a decent radio, an SCS modem and cables for the radio, and I'll have it up for you in less than an hour. Deal?" Frantic negotiations immediately began with the Hondu-

ran Internet Service provider. Six days later, Loring and Jim Scott, KG6EFT, arrived in La Ceiba with three complete radio stations between them, one for each of their field teams and one to serve as our new Winlink 2000 PMBO! Along with Bob Johnsen, K7TR, who would be Communications Manager conducting the Net from La Ceiba, and Hector Godoy Bueso, HR3HGB, they spent the entire weekend dodging power failures and parts shortages to get the PMBO up and running. Its new home was a broom closet in the lobby of the Gran Hotel Paris with coax to a G5RV antenna stretched 30 foot above the hotel's swimming pool. They made the PMBO Internet connection with an 802-11b wireless broadband link sharing the hotel's cable modem. It was a technological and organizational triumph that would have been impossible without the continuing support and involvement of the Winlink Development Team and the management of Gran Hotel Paris.

E-mail Comes of Age in the Jungle

IHS Teams fanned out over the country on February 16 and the entire radio network was up and running the following day. Field teams use NVIS antennas,[5] for both voice and data on 40 meters, mostly G5RV dipoles and coax furnished by IHS. These also serve well for making stateside contacts on higher bands. (Ever out of step, I opted for a 40 meter delta loop fed with coax set horizontally at about 10 feet. It worked great as an NVIS antenna on 40 meters and I worked Japan on 15 one afternoon!) ICOM IC-706MKIIG transceivers put the fire to the wire in most cases. Laptop computers, some new and fast and some ancient and donated, all running *AirMail*, worked into the SCS modems.

Within 24 hours it was apparent that having our own PMBO, HR3/K7TR, was the key to a successful digital network. NVIS 40 meter propagation enabled field teams throughout the country to send mail or check their mailboxes anytime throughout the workday as we had hoped. Between 6 PM and 7 AM field team stations could usually hit WL2K PMBO stations in the southern US or ZF1GC in the Cayman Islands. Messages sent through them arrived at HR3/K7TR in a matter of minutes via the Internet ready to be picked up. Usually the messages were available from other PMBOs as well. Initially e-mail was used to track down a (surprisingly small) number of missing and misdirected boxes and containers. Soon teams were requesting supplies from other teams and getting answers in hours if not minutes. The amount of e-mail traffic soared as traffic over the voice net dwindled and the nature of that net changed, probably forever.

Winlink e-mail enabled consultations not only among IHS medicos but also with stateside medical professionals. Pharmacists inquiring about a particular drug were able to get information from the US in less than an hour. Doctors put general inquiries out on the e-mail net and got the benefit of their colleagues' knowledge. This not only improved efficiency but also improved the quality of care rendered to our patients. Aside from logistics and consultation the system's real forte was making arrangements, especially travel arrangements. This might seem mundane, but in a country with few roads or telephones it is crucial. If a patient needs surgery we must arrange with a surgical team to perform the procedure and arrange transportation for the patient, and often a family member, who have no money to the surgical site and back home when the patient is able. Very often we will need to arrange food and shelter for them at the surgical site as well. As most surgical teams are within 2 meter range of the remote teams we used a local 2 meter simplex net to track the patients until they got back home.

More complex referrals to medical facilities in the capital city, Tegucigalpa, called for more complex arrangements. These cases can involve traveling in canoes, trucks, small airplanes, Honduran military aircraft and city buses. Being able to put all of this in writing not only expedites the process but minimizes opportunities for errors during communication. Mistakes could be catastrophic for a sick patient who could find herself hundreds of miles from home with no money, no food, no support system and not even able to speak the language. E-mail also supports tracking of patients in a systematic way so no one gets lost.

The hams of International Health Services will continue to refine the organization's radio network both data and voice. The results of this year's experience can be applied directly to any emergency or public service situation. Given the ease with which a PMBO can be created and operated under less than optimal conditions, and the great benefit of increased accurate information throughput, Emergency Coordinators should be looking into how this mode can be integrated into their communications plans. It's just too good to ignore. The only thing it doesn't do well is ward off chigger bites.

Notes

[1]For more detailed information about IHS and to see photos of IHS in action in Honduras go to **www.ihsofmn.org**. The organization's mailing address is International Health Service, PO Box 16149, St Louis Park, MN 55416; 612-920-0433 (voice or fax).

[2]The de facto standard digital ARQ (linked) mode on high frequency Amateur Radio is called PACTOR. Invented in Germany, it transfers text, files and graphics relatively quickly and without error. See **www.airmail2000.com/pprimer.htm** for a broad overview. See also *ARRL's HF Digital Handbook*, available from your local dealer or from the ARRL Bookstore, order no. 9159, and **www.scs-ptc.com/pactor.html**.

[3]For more information about the Winlink 2000 system, see V. Poor, "Introduction to Winlink 2000," Jun 2002 *QST*, p 31, and *ARRL's HF Digital Handbook*. A good Web resource can be found at **www.winlink.org**.

[4]*AirMail* is the client software used to send e-mail with the Winlink system. It can be downloaded free of charge from **www.airmail2000.com**.

[5]For more on Near Vertical Incident Skywave propagation, see A. Pion, "The NVIS—A Low Antenna for Regional Communications," Jun 2002 *QST*, p 28; **www.qsl.net/k5eph/nvis.htm**.

Louis F. Linden, KI5TD, was first licensed in 1965 as WNØPWQ. After a 20 year hiatus that involved becoming a lawyer, racing motorcycles and running away to sea for several years (not necessarily in that order), he returned to Amateur Radio as N5NJU. You can reach the author at loulinden@toad.net. The following hams participated in the research and/or made suggestions for this article: John Kirkoff, KBØUUP; Loring Kutchins, W3QA; David Houser, WA9OTP; Jim Scott, KG6EFT; Jerry Reimer, KK5CA; Mike Ward, NW5M, and Bill Roussel, K5TAS. The blame rests entirely on KI5TD. QST

STRAYS

ORANGE COUNTY RACES EMERGENCY COMMUNICATIONS VEHICLE PROJECT

By Ray Grimes, N8RG, Chief Radio Officer, Orange County (CA) RACES

◇ The Orange County Sheriff's Department in Southern California administers the County of Orange Radio Amateur Civil Emergency Service program. RACES volunteers are available for callout 24 hours a day and provide communications support to public safety departments countywide.

Over a 14 month period, 10 very talented and committed RACES volunteers assumed additional responsibilities by serving on the Emergency Communications Vehicle Committee. The following committee members have dedicated more than 3600 hours to the project: Jack Barth, AB6VC; Ken Bourne, W6HK; Scott Byington, KC6MMF; Jim Carter, WB6HAG; Ray Grimes, N8RG; Martin LaRocque, N6NTH; Harvey Packard, KM6BV; John Roberts, W6JOR; Joe Selikov, KB6EID, and Tom Stroud, N6FDZ.

This group of volunteers transformed a County surplus truck with an empty shell into a high-tech emergency communications response vehicle. Their efforts involved the design, fabrication and installation of workstations and communications equipment. The vehicle has a telephone switch, computer network with printer, and an onboard generator for emergency power. Three workstations are available, each with radio and telephone equipment.

The emergency communications vehicle will be used for on-site special events and for emergency and disaster incidents. It provides the ability to coordinate communications using

COURTESY RAY GRIMES, N8RG

The new emergency communications van for Orange County (CA) RACES. At the right is a cake with a design appropriate for the occasion.

Amateur Radio, public safety radio, and ground to air systems. It is capable of sending and receiving amateur fast scan and slow scan television, projecting video onto a large exterior flat screen display.

Thanks to the ingenuity and resourcefulness of the Emergency Vehicle Committee, the County of Orange now has a first-class emergency communications response vehicle at a cost to the taxpayers of around 10 cents on the dollar.