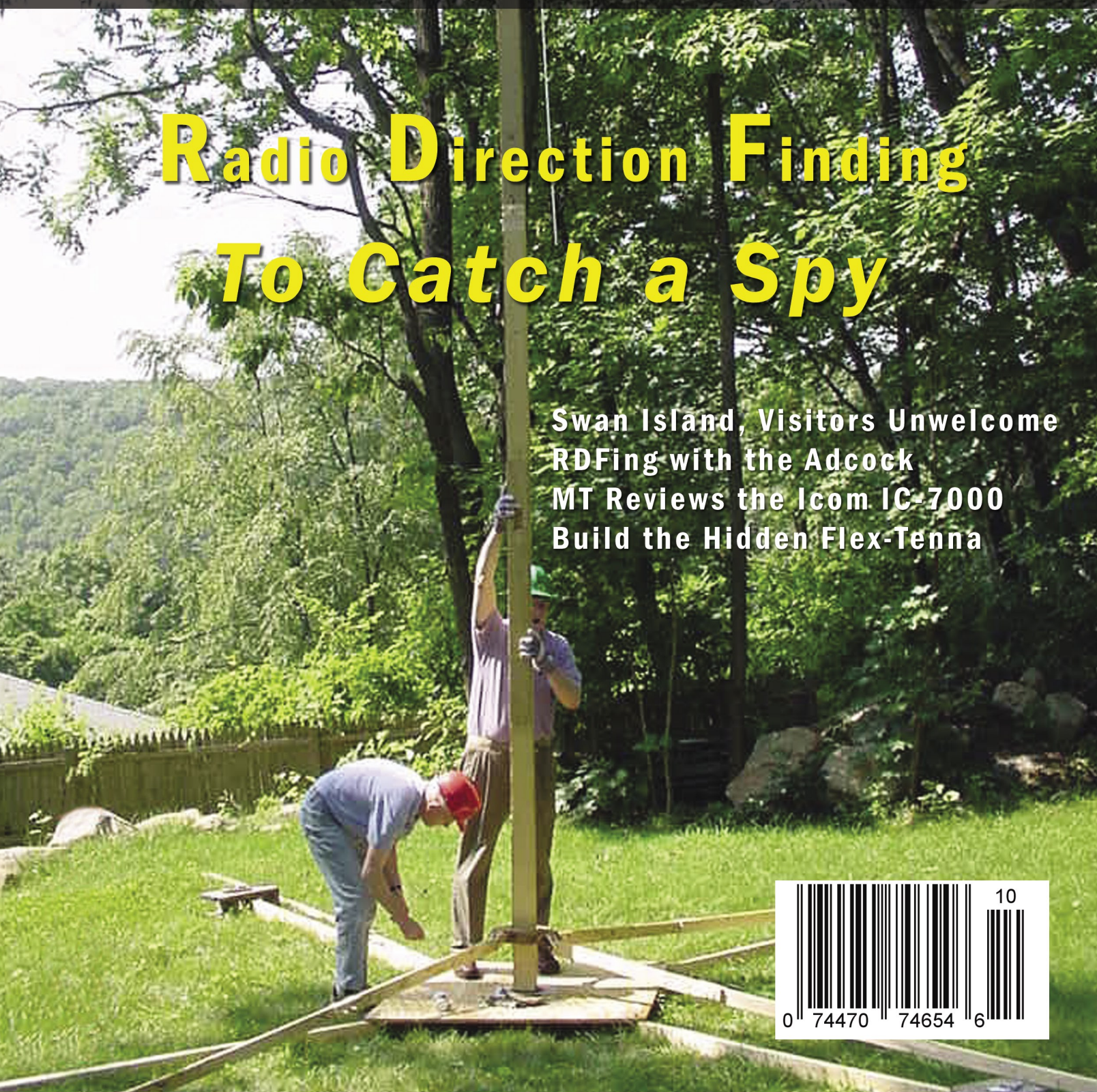
Scanning - Shortwave - Ham Radio
Equipment - Computers - Antique Radio

Monitoring Times

A Publication of Grove Enterprises

Volume 25, No. 10
October 2006

U.S. $5.95
Can. $8.95
Printed in the United States



Radio Direction Finding

To Catch a Spy

Swan Island, Visitors Unwelcome
RDFing with the Adcock
MT Reviews the Icom IC-7000
Build the Hidden Flex-Tenna

10
0 74470 74654 6

NOW AVAILABLE

AR-ONE
Communications Receiver

The AR-ONE gives law enforcement and government professionals total command of frequencies, modes, tuning steps and more. It is possible to tune in increments of *one* Hz.

FOR PROFESSIONAL USE ONLY

Monitor Any Frequency from 10 KHz to 3.3 GHz

Ultra-stable reference frequency oscillator (0.1ppm)

The AR-ONE is a new beginning for wide-range monitors.

The AR-ONE is designed to support computer controlled operation. Link up to 99 receivers for control by a single PC. The AR-ONE can be used for mobile or fixed monitoring operations.

Surveillance operations are enhanced. Monitoring multiple frequencies is easier and faster. Computer control gives you maximum flexibility and unleashes the many features found in this advanced technology receiver.

The AR-ONE is the right choice for the new world we now monitor.

- Super wide coverage: 10 KHz ~ 3.3 GHz
- 1000 memory channels
- 10 VFOs
- Monitor AM, NFM, WFM, USB, LSB, CW, Data
- Ultra-stable reference frequency oscillator
- Two RS-232C ports
- Control up to 99 AR-ONE Units with one PC
- Triple conversion superheterodyne front end
- Antenna input level readout
- Adjustable BFO
- High intercept +2dBm (-1 dBM above 2.5 GHz)
- Multi IF signal output (10.7 MHz or 455 KHz)
- Excellent sensitivity

The AR-ONE is designed for use by the monitoring professional. The AR-ONE is so advanced, you'll be thinking of new applications for its powerful capabilities.

AOR
Authority on Radio Communications

The Serious Choice in Advanced Technology Receivers™

AOR U.S.A., Inc.
20655 S. Western Ave., Suite 112, Torrance, CA 90501, USA
Tel: 310-787-8615 Fax: 310-787-8619
info@aorusa.com • www.aorusa.com

Available only to authorized users in the USA. Documentation required.

EXTERNAL OR INTERNAL?
The choices are yours at WiNRADiO.

The latest WR-G305 software-defined VHF/UHF receivers come in two versions: Internal PCI card and external USB box.

Which will you prefer, the convenience of being able to hide your PCI-based monitoring receiver inside your desktop PC, doing away with all the cables and clutter on your desk; or, on the other hand, the portability of your USB-based receiver, a great companion device for your laptop or notebook while travelling?

WR-G305i receiver: No clutter on your desk

The WR-G305e (USB) and WR-G305i (PCI) are the first commercially available VHF/UHF software-defined scanning receivers. Their all-mode digital demodulator works entirely in software, with easy upgradability and high performance level typical of receivers costing many times more.

These receivers are designed for demanding applications where the ability to locate even the weakest signals in background noise and extract the cleanest possible audio is important. Their excellent hardware parameters and extensive software support define a new standard for communications intercept and monitoring tools.

WR-G305e receiver: Portable and powerful

- *9 kHz-1800 MHz frequency range*
  (except cellular bands where required by law)
- *Optional 3500 MHz downconverter*
- *Tracking front-end filters*
- *Dual-loop AGC and AFC*
- *Software-defined demodulation*
- *Excellent sensitivity*
- *Fast scanning speed*
- *Multiple squelch modes*
- *Real-time spectrum analyzer*
- *Sweeping spectrum analyzer*
- *Hit counter*
- *Accurate S-meter*
- *Adjustable IF bandwidth*
- *Adjustable digital audio filter*
- *Digital communications ready*
- *Digital Bridge™ compatible*
- *Standard PCI card or USB box*
- *Easy "Plug and Play" installation*

www.winradio.com

...the future of radio.™

Monitoring Times

Vol. 25, No. 10 October, 2006

Cover Story

To Catch a Spy

By Greg

Sometimes it takes a newcomer to test our assumptions. Greg, as an extra-class ham, is no newcomer to ham radio, but he'd never paid much attention to the other unidentified, mysterious signals to be found on shortwave. That is, until he heard an encrypted 5-letter Morse code signal that pegged his S-meter in the middle of the ham bands. Experienced utility DXers will find it hard to understand Greg's reaction – everyone knows cut "spy" numbers are communications between Cuba and Ottawa, right? But, not being "in the know," Greg took his report to the FBI.

Rebuffed by the three-letter agencies, Greg took his quest to Bob Grove and a few fellow hams, and they decided to initiate a little direction-finding on their own. The story isn't done (it may never be), but if you're curious about the direction-finding antennas they used, you'll find tips to get started. On our cover is the Adcock array, being erected by Fred and Howard. Our story starts on page 8.

C O N T E N T S

Reviews

Jim Clarke observes that, with the price of amateur radios coming down and no new stand-alone communications receivers expected soon, serious shortwave listeners may be taking a closer look at buying a transceiver for their monitoring. If they are, they couldn't go wrong and considering the new Icom IC-7000, with its outstanding filter and notch options and well-thought-out user interface (page 70).

Readers reported great results with the multibanded Grove Flex-Tenna; the Grove Hidden Flex-Tenna is equally wide-banded but is designed specifically to be erected in an attic or other indoor location. For how to build or buy, see page 68.

John Catalano has been on an ACARS kick lately. This month he's found a freeware program which will help all those other decoder programs log and make sense of the cryptic ACARS messages – ACARS Log Analyser (page 72).

MONITORING TIMES
(ISSN: 0889-5341; Publishers Mail Agreement #1253492) is published monthly by Grove Enterprises, Inc., Brasstown, North Carolina, USA.

Address:	7540 Highway 64 West, Brasstown, NC 28902-0098
Telephone:	(828) 837-9200
Fax:	(828) 837-2216 (24 hours)
Internet Address:	*www.grove-ent.com* or *www.monitoringtimes.com*
Editorial e-mail:	*editor@monitoringtimes.com*
Subscriptions:	*order@grove-ent.com*

Subscription Rates: $28.95 in US; $39.50 Canada; and $58.50 foreign elsewhere, US funds. Label indicates number of issues left. Renewal notice is cover sheet 3 months before expiration. ***See page 76 for subscription information.***

Postmaster:
Send address changes to *Monitoring Times*, 7540 Highway 64 West, Brasstown, NC 28902-0098.

Owners
Bob and Judy Grove
judy@grove-ent.com

Publisher
Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Managing Editor
Rachel Baughn, KE4OPD
editor@monitoringtimes.com

Assistant Editor
Larry Van Horn, N5FPW

Art Director
Bill Grove

Advertising Svcs.
Beth Leinbach
(828) 389-4007
bethleinbach@monitoringtimes.com

Table Of Contents

EDITORIAL STAFF Email firstlast@monitoringtimes.com

TJ "Skip" Arey.....	On the Ham Bands
Rachel Baughn	Communications
.....	Letters to the Editor
.....	What's New?
Kevin Carey	Below 500 kHz
John Catalano	Computers & Radio
Mike Chace.....	Digital Digest
Jim Clarke	First Look
Marc Ellis	Radio Restorations
Bob Grove	Ask Bob
Glenn Hauser	Global Forum
Chris Parris	Fed Files
Ken Reitz.....	Beginners Corner
Lee Reynolds.....	First Look
Iden Rogers.....	Planes
Clem Small	Antenna Topics
Doug Smith.....	American Bandscan
Hugh Stegman.....	Utility World
Ernest Robl.....	Trains
Gayle Van Horn	Frequency Manager
.....	Broadcast Logs
.....	QSL Corner
Larry Van Horn.....	Milcom
.....	First Look
.....	MT Help Desk
Dan Veeneman	Scanning Report
Ron Walsh.....	Boats
Fred Waterer.....	Programming Spotlight
George Zeller.....	Outer Limits

E1XM

World's First and Only

Etón E1XM AM/FM/Shortwave/XM Satellite Ready Radio | $500*

- Reception Modes: AM, FM-stereo, Single Sideband (selectable USB/LSB) and CW
- Programmable Memories: 500 user programmable with alpha labeling plus 1200 user definable country memories, for a total of 1700
- Superior Audio Quality via a bridged type audio amplifier, providing high output power with battery operation
- Direct Shortwave Band Entry, allows instant access to the shortwave band of choice

G5

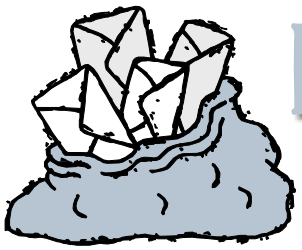
Designed Without Compromise

GRUNDIG G5 AM/FM/Shortwave Radio | $150*

- FM-stereo, AM and Full-Shortwave coverage (1711-29999 KHz)
- 700 programmable memory presets with memory scan and auto tuning storage
- Clock, sleep timer and alarm functions with world zone settings
- Tunes via auto-scan, manual-scan, direct key-in entry and tuning knob
- Internally recharges Ni-MH batteries
- Station name input

ase visit www.etoncorp.com.

eton®
RE_INVENTING RADIO



LETTERS TO THE EDITOR

This page is open to your considered comments. Opinions expressed here are not necessarily those of Monitoring Times. Your letters may be rephrased or shortened for length and clarity. Please mail to Letters to the Editor, 7540 Hwy 64 West, Brasstown, NC 28902, or email editor@monitoringtimes.com

Happy monitoring!

- Rachel Baughn, KE4OPD, Editor

"Spooky" October

Welcome to our October issue, where we talk about spies and spooks – past, present, and future. If you started your monitoring career back in the '60s, you'll remember Radio Americas, a US propaganda station beaming toward Cuba from Swan Island. Of course, no one knew that for sure back then – it was all very hush-hush. Even Johnnie Craig, stationed at the FAA outpost at the other end of the tiny island in the late '60s, had no clue why this post was so cloak-and-dagger compared to his previous assignments.

Now fast-forward to 2006. Five-letter or 5-number groups are a common occurrence on shortwave (see *Utility World*), but not usually in the amateur radio band. When Greg and his friends hear a particularly strong signal in the ham bands, they decide to see if it's "business as usual" or not. Scoff if you like: even if nothing significant turns up, they're doing what hams love to do – build stuff, especially antennas! Radio direction-finding can be a challenge, but it's also addicting. Even Bob Grove got hooked on the antenna design ...

One caveat, though: we don't recommend going to Homeland Security or the FBI for radio interference reports, even if you suspect the message content. Suspicious signals in the ham bands should be reported first to the American Radio Relay League (**www.arrl.org/**) or, more specifically, to the Intruder Watch (**www.iaru-regionii.org/**). Interference or suspicious signals outside the exclusive ham bands should be reported to the Federal Communications Commission.

Both these agencies serve as clearing houses for such reports and can give you best advice. If what you're hearing is potential evidence of criminal activity in your local area, then your local police are the ones to advise, (assuming you aren't listening illegally to someone's phone conversation, of course). Hope this helps!

Radio and TV Museum Thanks MT

"Thanks for the write-up on the Radio and TV Museum of Bowie MD in the August issue of *Monitoring Times*. We certainly can use the exposure to help us build our attendance. Hopefully, this will aid in bringing visitors to our site. We are one of five museums operated by the City of Bowie's Park and Recreation Department and are housed in a 1906 era farm house the city saved from redevelopment in the

mid 1980s.

"Beginning September 15 through March 2007 the Museum will be showing TV programming from the early 1950s (1950-54). Attached please find an ad for the exhibit–based on an old Motorola ad. Also, attached is a current photo of the Museum with our lovely tree that attracts a lot of attention."

Peter D. Eldridge, Board of Directors

For more information on the "Television of the Early 1950s" series, contact: Pam Williams, Assistant Museums Director, 301-809-3089; *museumevents@cityofbowie.org* Many of these shows are long forgotten, and since most were broadcast live, they have not been seen since they originally aired almost 60 years ago. All the shows have the original openings and closings, and many have the original commercials.

Things I Like ...

"Hello, Bob, I just wanted to pass along a 'well done' on the whole *Monitoring Times* magazine. I remember as a kid reading and enjoying *Electronics Illustrated, Popular Electronics, Elementary Electroncs...* You and the rest of the good *MT* folks are keeping that tradition going, and I intend to keep renewing my subscription."

Greg Harris (SWL) WDX9KHY, Park Forest Ill

"Hi Bill, I just received my first issue of *MT* Express and I love it!! I have had some eye trouble recently and it is a lot easier for me to read directly from the computer. Thanks much."

Duke, AI4DR

"Larry, I really enjoyed your article on the 996T – very informative. It helped me decide to buy one. I have had it for about 5 days now and it is a great scanner. I have about 9 or 10 Uniden scanners and it is the best yet. I have a Yaesu 5000 and find the 996 much easier to program. Looking forward to more great articles."

Jerry KG6EBK

A Tip for IC-R20 Owners

"Here is a most interesting program that is supposed to take the Icom *.icw* audio files (made from the internal digital recorder) from a Icom IC-R20 receiver and convert those to a standard *.wav* file.

http://homepage.ntlworld.com/tony.ling/radio/IC-R20/R20um23.htm

"I have not tested this out myself as I no longer have a IC-R20 here, but if this works would be neat indeed."

Dave Zantow N9EWO, Janesville, WI

New MT Blog

Doug Smith W9WI has jumped on the bandwagon and created a blog for the *American Bandscan* column. For late-breaking news and news items that don't make the column, head to **http://americanbandscan.blogspot.com**

Information Please

"I am looking to contact other local monitors in Montgomery and Bucks counties in Pennsylvania. Specifically I am interested in the 800 MHz digital trunking system in Montgomery County as well as the Montgomery County police, fire and ambulances. I also would like information on the Bucks County police system as well as any informal meetings. Write Paul Godshall, 301 Route 152, Perkasie, PA 18944."

One New York resident is discouraged with the lack on scanning information available for central New York. He says "I live right across from Lake Oneida and I have Hancock International Air Port 12 miles to the south of me. The port city of Oswego as well as Lake Ontario are a 45-minute drive. I know that there is a lot around me here, but it seems New York just is not popular enough to get this kind of coverage."

Got radio but no internet? With the demise of *Police Call,* scanner listeners like these two readers without internet connection are increasingly at a loss as to where to find information, especially in this time of transition. So, if you're submitting frequency lists to web pages (which I hope you are), how about shooting us the information for *MT* pages, too? It only takes a few keystrokes to copy it to *mteditor* or *danveeneman@monitoringtimes.com*. Help out our wireless but unwired friends!

Happy Halloween! Enjoy *MT* – all treat, no tricks!

COMMUNICATIONS

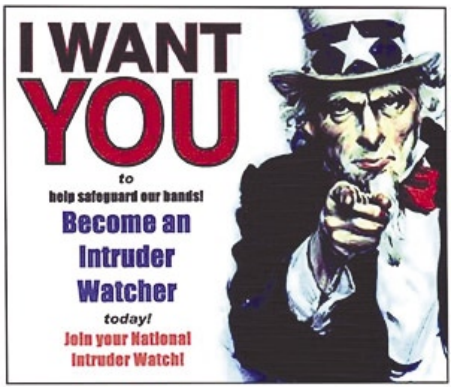
"Communications" is compiled by Editor Rachel Baughn KE4OPD from news submitted by our readers. Many thanks to this month's fine reporters: Anonymous NY, Azizul Alam Al-Amin, Norman Hill, Jerry None, Doug Robertson, Larry Van Horn, Ed Yeary, *ARRL Newsletter*, and *Radio World.*

"Intruders" Spotted in Several Amateur Radio HF Bands

International Amateur Radio Union (IARU) Monitoring System Region 2 Coordinator Bill Zellers, WA4FKI, says Intruder Watch is a lot like the neighborhood watch programs many communities set up with local law enforcement. "The concerned members of the Amateur Radio community organize and form their own neighborhood watch program called Intruder Watch." Zellers stresses that monitors are not "frequency police." They can only report what they hear.

Monitors around the world report "intruding" signals in the amateur bands such as the Chinese music jammer (see *Global Forum* column), and the Russian single-letter beacons.

"To survive, the Amateur Radio community needs clean frequencies that are free of intruders," Zellers says. "Take a few minutes to join the Intruder Watch program and help us take care of our Amateur Radio neighborhood." Contact Zellers (*wa4fki@nc.rr.com*) or visit **www.iaru-regionii.org/** for more information.



This month's feature article reports a "spy numbers" transmission which appeared in the amateur band. According to the US government, the US is probably host to spies from 140 out of 191 countries, most of them looking to snag military or trade secrets. Cuba (the suspected player in this month's feature article) is among the top ten, though it is more interested in "defensive" intelligence of potential invasion plans by the U.S.

National Emergency Communications Upgrade

The 21st Century Emergency Communications Act of 2006 (HR 5852) passed the House and has been referred to the Senate Committee on Homeland Security and Governmental Affairs for action. This legislation will:

- Elevate the Department of Homeland Security's interoperability focus by establishing a new Office of Emergency Communications headed by an Assistant Secretary. It consolidates the SAFECOM Program and other Department of Homeland Security responsibilities relating to interoperability.
- Facilitate the development of standards for interoperable emergency communications and prohibits homeland security funding from being spent on equipment that does not comply with the standards and statewide interoperable communications plans.
- Require the Department to conduct periodic assessments to determine emergency communications needs, current capabilities and recommendations on how the U.S. can accelerate the deployment of interoperable communications nationwide.

Five years after the terrorist attack which proved that communications failures can be fatal, improving interoperable communications doesn't seem to have been a top priority at the Department of Homeland Security. Only $2 billion of the $18 billion it has doled out in grants since 2003 have been for communications. According to a debate in the House of Representatives, the grants have not been tied to any national plan for emergency communications, only seven employees at DHS are assigned to developing such a national plan, and the department's target date for achieving a national emergency communications network is 2023.

Meanwhile, reports accumulate of questionable "homeland security" grants. Congress, which treats DHS grants as a new form of pork, is as much to blame as DHS. HR5852 is an effort to refocus attention on the need to set standards, develop a national plan, and make interoperable communications a priority.

Florida Going it Alone

In Florida, the new statewide M/A-COM system has governor Jeb Bush touting that state as a model of interoperability (see this month's *Scanning Report*). Apparently, they don't expect to need federal or civilian help again, since the state system is not compatible with APCO 25 standards, nor can it be monitored by scanners.

Meanwhile, on the West Coast, police in Alameda County, California, owe one big break in capturing three murderers to a motorist with a scanner. Witnesses gave a description of a van involved in one murder to police, who broadcast it over the radio. A scanner listener saw a van fitting that description a few minutes later and wrote down the plate number as he drove by. That license plate eventually led to discovery of a second murder and the capture of the suspects.

So, what are they going to do in Florida when they want the public's help? Broadcast the description on radio? Television? Use the Amber Alert? No, probably not; the bad guys would hear it, too, by their reasoning. Guess you're on your own, Florida!

Global Ham Radio Emergency Conference

ARRL First Vice President Kay Craigie, N3KN, was chosen to chair the Global Amateur Radio Emergency Communications Conference 2006 (GAREC-2006), held in Tampere, Finland, concurrently with the International Conference on Emergency Communications (ICEC 2006) and the International Telecommunication Union's (ITU) Working Group on Emergency Telecommunications (WGET). Representatives of more than 20 countries were on hand, and Craigie said it was beneficial to have a chance to get to know amateurs from other countries who are involved in emergency communications.

"It is easy for American amateurs to assume that Amateur Radio emergency communications work in other countries is the same as what we are familiar with in the USA; however, for historical, cultural, and regulatory reasons this is not necessarily the case," she said. "We have much to learn from one another."

Craigie stressed that Amateur Radio needs to avoid "being dazzled by our own press clippings into thinking that we are the big dog in emergency telecommunications."

"Given ham radio's dependency on emergency communications as our reason to exist in the US, it would be suicidal to assume that what we have always been able to do – at the speed we have always been able to do it – will be just fine to maintain our relevance into the indefinite future." While Craigie predicted there will always be a role for Amateur Radio in disasters, "The question is whether we will suitably prepare ourselves to play it."

Additional materials, including a presentation by Craigie, are available on the GAREC-2006 Web site **www.rientola.fi/oh3ag/garec/material2006.html**.

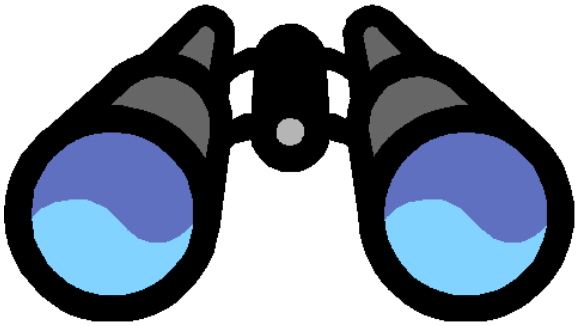
Amateur Radio on Fed's Radar?

FBI: A non-profit FBI program, InfraGard, is dedicated to promoting dialogue between the private sector and the federal investigative agency "concerning critical infrastructure protection issues." ARRL Chief Development Officer Mary Hobart, K1MMH, says InfraGard got to thinking of Amateur Radio as a possible partner, ally and service provider in emergencies. New York Metro InfraGard put together a one-day session entitled "Communications Interoperability and Ham Radios" as a way to get more familiar with Amateur Radio.

FCC: Allan Manuel, an attorney in the FCC Public Safety and Homeland Security Branch, indicated the Commission is willing to be more flexible in accommodating Amateur Radio during emergencies and disasters, such as amending the rules to permit automatic grants of certain types of waivers or special temporary authority (STA) in declared disaster areas.

TSA: Meanwhile, the Military Affiliate Radio System will provide emergency backup communications for the Transportation Security Administration under a formal agreement announced by Army MARS Chief Kathy Harrison. Airport protection during hurricane season is the immediate focus, Chief Harrison said, but the new collaboration with the TSA "is likely to expand to other Department of Homeland Security (DHS) areas" in the future.

The "Memorandum of Understanding" provides for use of MARS networks, manpower and equipment to maintain communications during the initial 72 hours of incidents involving aircraft, mass transit, and pipelines. MARS is also tasked to provide interoperability with other communications systems.



To Catch a Spy

By Greg

Our Story Begins...

My radio hobby consists of both shortwave listening and amateur radio. Over a number of decades of shortwave listening I have heard the infamous numbers spy stations across the shortwave frequency spectrum. These stations have been described over the years in *Monitoring Times* as well as in other periodicals. Numbers stations do not offer much excitement, since "spy biz" is an ordinary fact of life. However, for me this has recently changed.

On a cold January 2005 morning at about 1100 UTC, I powered-up my Ten-Tec Corsair II amateur radio transceiver. The radio was set on 30 meters (10.1 MHz); I proceeded to fast tune across the band. At this hour of the morning radio wave propagation is poor, which on a communications receiver can be heard as a constant hiss.

Then I heard it – a very loud CW (code) signal pinning my S-meter at 30dB over S9, so strong it appeared to be local! As an experienced CW radio operator, Morse code is like a second language. The letters were appearing in my mind but they did not make any word or even any sense. I grabbed a pencil and began copying the text – five letter word groups. I thought to myself, this is a very strange type of transmission to occur on one of the amateur radio bands. I ruled out code practice, since only a certain group of alphabet letters was being sent and numbers were absent in the transmission.

Months went by and so did the memory of this event until I went to Ticonderoga, New York, on a September vacation. I always make a practice of bringing some portable ham radio equipment with me in the event of bad weather. This equipment includes my Ten-Tec Argosy 525D transceiver, power supply, antenna tuner and 100 feet of antenna wire.

Sunday at about 1100 UTC I began listening to some local ham on the single side band portion of 75 meters (3.9 MHz). This portion of the band is solely used for SSB (single side band) and, at times, AM (amplitude modulation). Then I heard a Morse code message being sent. My first thought was that I tuned to a lower area known as 80 meters where radio amateurs use Morse code. Glancing at the digital display, I noticed that I was indeed in the SSB portion of the band. I sprang up from the bed and exclaimed … wow, this is another encrypted message!

This was an eerie coincidence, since the day was September 11, 2005! I began copying the Morse code and, sure enough, it was encrypted 5 letter word groups. After the sender completed his message, he terminated his transmission with the Morse "end of message" code. However, there was no station identification as required by the FCC regulations. I was sure this was a field operative (spy) – certainly up to no good!

Third Time's the Charm

December came before I knew it, and my early morning activity was to get on 75 meters and report local weather conditions to the weather net. This particular Monday the rig was set on 30 meters from the previous day. It was too early to sign into the net, so I decided to tune across the entire band out of curiosity. As I reached the very upper part of the band I heard it again – the clandestine spy station!

The Morse code was being sent in perfect cadence. Being sent so perfectly I knew it must be computer generated. This could be accomplished by coupling a ham transceiver to the computer's RS-232 port. With the appropriate software programs, messages could be sent without any special technical skill. It was kind of scary to think that a field operative could buy a ham transceiver and computer to provide worldwide clandestine communications.

I started to think: these spies know that intelligence agencies of various countries are monitoring their communications, be it by satellite, cell phone or hard-wired telephone. Also, e-mail would not be a good choice, either, since that can be traced to an IP address (internet provider). What a creative way to communicate! No one would ever think of monitoring archaic Morse code!

December had a high amount of activity (also known as chatter to the intelligence community) from this spy station. One evening I decided to be more proactive and try to pass this important information to Homeland Security. So I went on the Internet to find the Homeland Security website. After finding the site, I read all about the responsibilities of this agency with interest. As I navigated around the site, I had difficulty finding any way to contact HS to enter a report on this suspicious activity. After several frustrating minutes, I finally found a web-page on the site to submit my information. To submit a report, you were required to enter your name and address along with your e-mail address.

As I entered all the required information, my heart was racing – I had never done anything like this before. However, I hoped that my report would be helpful to HS. I began to carefully describe the information in a "concise and precise" manner. At the bottom of the web page, Homeland Security stated that a return e-mail would be sent to the submitted e-mail address. I pressed the enter key!

The next morning I checked my e-mail – nothing from Homeland Security. Days followed, with no response. I had no verification that the agency had received my report. Was this a website SNFU (situation normal all fowled up) or did the agency not care? My thoughts were, if this is how Homeland Security responds to a solid lead, this country has not solved the issues that help lead to the unfortunate loss of almost 3000 Americans and foreign citizens on September 11, 2001, in New York City.

Try, Try Again

After a week of receiving no response from Homeland Security, I decided it was time to contact the FBI. I placed a call to the FBI office in Newark, New Jersey. The telephone receptionist connected me to an agent who politely and professionally initiated a report from my information. After completing the report, the agent asked for my business telephone number and stated that the report would be forwarded to the division that handles communications and that they would contact me at a future date.

At work I have a friend, Fred, who is a professional electrical engineer; both of us enjoy the wonderful hobby of radio. Both of us hold FCC Amateur Extra Class Licenses. I discussed the specifics regarding the spy station with Fred. He agreed that a spy station was very unusual in the amateur radio frequency spectrum. He immediately wanted to hear this spy station and make note of its signal level using his mobile station.

Fred is known for his innovative antenna designs, as witnessed by one look at his vehicle which is full of antennas. Rolling down Route 80 in the morning most drivers have to take second and third look at Fred's little Japanese SUV with monster antennas pointing to the heavens. Fred has landed the handle or nickname – "Antenna Fred."

One day, both Fred and I arrived at the company parking lot at the same time. Fred raced over to my parking spot with a big grin on his face stating, "I heard him….30dB over S9!" Fred was very intrigued after verifying my information and wanted to join me in tracking from whence this

clandestine station was transmitting.

My next thought was to record the spy station to document the transmission. After discovering my tape recorders were all inoperative, I used my VCR as a recording device, patching the audio output from the receiver into the audio input on the VCR.

The following day I started the recording process 5 minutes before the typical time of transmission. Sure enough, there was the spy, transmitting his secret message, but this time it was being recorded.

When I got home from work that evening I rewound the VCR tape and began listening to the code – the recording came out perfect. I got my pen and notepad and began decrypting Morse code to alphabet letters. (Morse code is also known as encryption, to my surprise.) The message lasted a total of 25 minutes. The actual message is shown in the accompanying table. Note the use of only a certain group of letters and no numbers.

The code format is shown in rows from left to right.

If you want to try hearing the operative yourself, his schedule (at least until August 7th) was to transmit around 1100 UTC on Mondays, Wednesdays and Fridays on or near 10.1 MHz.. You can try tuning him in from a remote receiver on the following Internet website: **www.chilton.com/scripts/radio/R8-receiver** This receiver, a Drake R8, is located at Reston, Virginia. We have also placed some typical transmissions on the *Monitoring Times* website **www.monitoringtimes.com** under Audio Files in the Reference Library. These are wav files that can be opened with either MS Media Player or Real Player.

Having zero experience in data encryption, I wondered if there were methods of decryption available on the Internet. So I began my Internet search and it was not far into my investigation that I verified that 5 letter word groups were indeed "spy biz" according to several web sites. There was nothing that I could find on the Internet to download that would decrypt the message that I had intercepted. [See this month's *Utility World* column for more background on similar numbers stations - *ed*.]

Fred and I thought that the message would be more useful to the U.S. intelligence agencies if it were placed into an MS Excel database. So we painstakingly entered all the characters into a file and verified its accuracy for use … but what agency might make the best use of it?

A Trying Experience

Now that I had the neatly documented message, I wanted to update the FBI. I placed another telephone call to the Newark, NJ, office. They promptly forwarded my call to the County Agent in the county that I reside in. After the agent identified himself, I gave him an abstract on the activity of this suspicious station. To my surprise, he had absolutely no interest at all in my report! He told me to report the information to the FCC, and if they found an issue, they would forward it to the FBI. I made a second attempt to explain the situation and related my disappointment that the FBI did not contact me for more detail information on my first report. This agent's telephone manner, to be frank, was rude and unprofessional. I guess he sensed my disappointment and frustration and said, "What do you want from the FBI, a pound of flesh?"

Being totally frustrated and hitting a dead end at these two government agencies, I had one more idea: to contact Bob Grove – the owner and guru of *Monitoring Times* magazine. Bob was extremely helpful, forwarding my information to experts in utility broadcasts and also to a federal authority.

Bob and his sources said the most likely source was encrypted communication between Ottawa, Canada, and Cuba. The utility expert identified the encryption as M8a. In this format, each alphabet letter stands for a number from 0 to 9. Bob also contacted the ARRL's complaint bureau. They stated that many complaints had been reported to the ARRL regarding this station.

It seemed an interesting coincidence when, a few days later, two professors from Florida were arrested for spy business using shortwave for the communicating media.

My next thought was if the U.S. Government three-letter organizations were not interested in this spy activity, Fred and I would make a serious effort to DF (locate by direction finding) the covert field operative. We needed to locate this station and ascertain if it was local or else verify the Ottawa to Cuba theory. This task would require a DF antenna designed for the 30 meter band. We proceeded to build one, as you can see in Part Two.

WGUUA	INRTA	AAADD	WGUUA	INRTA	AAADD
WGUUA	INRTA	AAADD	WGUUA	INRTA	AAADD
WGUUA	INRTA	AAADD	WGUUA	INRTA	AAADD
WGUUA	INRTA	AAADD	WGUUA	INRTA	AAADD
WGUUA	INRTA	AAADD	WGUUA	INRTA	AAADD
AAADD	AAADD	AAADD	AAADD	etc.	
GIIRU	NGNRG	MAWUM	RARRD	ITGNT	NRWGN
IDIAG	TTIRE	MIGID	DIURT	ARRUW	GARGG
MDRAN	DAMDU	DNNAI	TUAAT	NRIMM	IDGRG
GIANI	IGWMD	DRAMA	RTDAD	RGUDN	DDATD
DIWRN	RRMUR	URNTI	MRNGD	UUTGT	NRUAU
MRGDN	AITMA	NAIWW	MWNRT	IDNUG	NGIDM
MUMWT	GMMGU	RUMMI	ATRAT	TMIAA	GGGNU
GMIRN	DMARR	IIUAW	MWNAA	TGNTR	INMAA
MGWMT	URANI	GUAAR	MNIAD	DMGUA	WIMAR
UWDAI	RMADW	UMUUW	MTNDA	GGIGM	DTMWD
NWTUW	MWARA	WIGGW	ATMNU	NUTIM	ITDWG
WGWAM	TNDMT	RANWW	GTTRG	NIIGI	MAIDN
DUARG	WUUWD	NDRDD	ATGTA	DRURW	GGNUG
GNUMR	ARMTN	GIRNA	MNAWW	TTTDR	ANAMD
IGDRG	DRIMU	NRIAW	IURMN	RMIAT	GDADR
ATWRN	MRNMR	UDMUW	MRNNG	UNMUG	WTDAR
DIUUI	TMWAN	GDMRN	WDNDM	UNAAM	DGGWI
MDIRN	GIRWW	IGTNT	ARART	UMIGR	ARUTN
MAMNR	DMAMW	MWWUT	TUIND	TMUUU	WRGIU
AAIIR	NTTRM	IDTID	UDAMR	INADT	IDIMU
NTAMG	MWAMU	TADWM	RAAMA	WRDUD	TDRNT
URMRU	AWAWU	NGGDT	TTTAN	GTWWD	MGGNN
MUNUM	DDNWN	GADGM	UNRUI	TRMTM	DAIWM
TANGU	GRIUN	WWUTR	RDDRU	MWIWT	UADWW
MIIAI	MTRUN	NDDRM	MDMWN	GIIRU	NGNRG

Epilogue

After many months of monitoring this station, there are some humorous events to share. It became most evident that the operative had very little skill in radio. This was witnessed by signals that instantaneously went from 30-40dB over S9 to barely above noise level. We speculate that he had a mismatched antenna and blew the utility circuit breaker powering his linear amplifier. On some occasions he used excessive drive for the linear amplifier. This resulted in an output that sounded like "blub…blub…blub," not like a sharp CW tone. Also there were times when he would set something wrong in his software and spaces (pauses) became very long Morse code dashes instead.

In conclusion, having heard so many spy numbers stations during my decades of monitoring shortwave, somehow they don't seem as benign any more. Today, countries around the globe face a constant threat from groups that have one common goal – to take innocent lives and achieve notoriety by the deaths of many. There are silent cells within most countries, including the United States, awaiting their mission. Yes, I know spies aren't necessarily terrorists, but do you want to take that chance? What makes this case different from the usual transmissions for operatives inside the country is (1) it occurs inside the ham bands, and (2) it is of sufficient strength to cast doubt on the assumption that it does not originate from within the U.S..

To improve the safety of our nation, experienced radio amateurs, shortwave listeners, and public service monitors can be a useful source of information for federal government agencies. It is to be hoped that the federal agencies who solicit reports of "unusual activity" from the public will be more receptive to accepting reports from radio hobbyists as well.

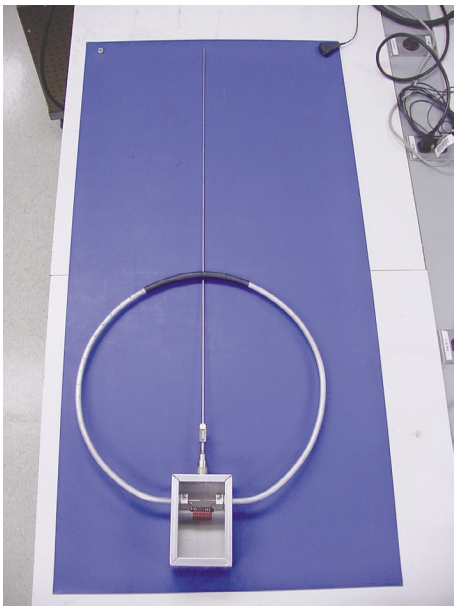
To Catch a Spy – Part II: Direction Finding

Antenna Fred to the Rescue!

When we could get no government agency to listen to our concern over spy transmissions in the ham bands, Fred and I decided to take matters into our own hands and try to at least confirm whether the local-sounding signal was US-based or not. Fred's reference books depicted three basic direction finding (DF) antenna types: a loop with sensing antenna, the Adcock antenna, and a goniometer. Fred was specific with the antenna requirements: Most importantly, it needed to be non-ambiguous, which means unidirectional. The DF loop with integrated sense antenna seemed to be a reasonable choice, since it is a very basic design and easy to construct.

To understand how this antenna works, a typical gain verses polar direction graph is shown in diagram (A). The DF antenna schematic is illustrated in diagram (B).

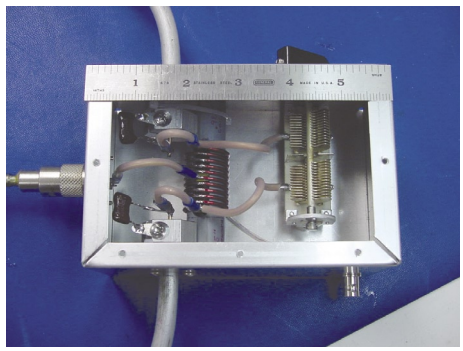
For ease of operation, we wanted to mount the compass to the antenna assembly with Vel-



cro™. For compass accuracy, this meant that the construction materials had to be non-ferrous (non-magnetic), like aluminum, brass or a non-magnetic stainless steel.

The antenna loop was constructed from CTV hard-line. This cable has a single copper center conductor encased in low loss insulation along with a solid aluminum jacket shield. The aluminum jacket provides electrical shielding while allowing magnetic waves to penetrate the jacket to the inner copper conductor. The design required that the aluminum loop be grounded at one point. To achieve this, we used a plumbing pipe cutter to make two circular cuts 1/2" apart at the very top center of the loop maintaining the continuity of the center conductor. After removing the 1/2" section of shielding, we placed several heat shrink tubes over the break to provide mechanical integrity for the loop.

Two custom mounting flanges were turned down on a metal working lathe to secure the loop to the 3x4x6-inch aluminum utility box. A UHF receptacle was placed at the top of the box to accommodate the sense antenna. Fred designed a stainless steel connecting rod from 3/8-inch hex stock that provided an electrical connection to the male UHF plug. The other end had a hole to accept the stainless steel sense antenna along with a brass thumbscrew to secure it in place.



To solder stainless steel, an acid flux was required. The assembly was cleaned thoroughly, since an acid flux is very corrosive.

Two coils were wound on bakelite tubes as specified on the antenna schematic. The coil diameter was selected so that the receiver pick-up coil fit inside the loop coil.

After wiring the assembly, we needed to find the resonant frequency of the loop. To accomplish this, we placed a Millen Grid Dip meter coil perpendicular and 1/2" away from the loop. Turning the dial on the meter, the dip was found at 15 MHz, so additional capacitive padding would be required. Several iterations were required until we had reached a center frequency of 10.1 MHz. We measured the DF loop tuning frequency range and verified that it was below WWV at 10 MHz and above the upper limit of the 30 meter band.

Next, I connected the DF Loop to a communications receiver to verify the directivity using an ARRL reference plot (A) from the *ARRL Antenna Handbook*. The first test would be to tune to the time signal WWV at Fort Collins, Colorado, on 10.000 MHz. The DF tuning capacitor was adjusted for peak signal. The antenna was then rotated 360 degrees while observing the S meter on the receiver. The antenna was again rotated until the signal null was found. I made a mental note of the compass reading and added the correction factor to obtain true north. Referencing a map, the measured direction was close to the location of the Fort Collins facility from my location.

The next scheduled transmission from our infamous operator began at 1100 hours UTC; I slowly rotated the DF antenna while watching my receiver's S meter. I repeated this measurement several times to verify that I came up with the same bearing. I then corrected my average bearing for true north.

Now I needed additional bearings to be able to triangulate my bearing with others to locate the spy. Several amateur friends were contacted and brought up to date with the situation. There were a lot of reservations from other hams to be part of this exercise. Fortunately, I was able to convince some to participate, assuring them of anonymity regarding their names and locations. But consequently, I am sorry to say, I am unable to provide the plot with all intercepting points.

Initial efforts at triangulation using the loop have focused the operative's location as central Pennsylvania. However, given the lesser accuracy of the loop antenna and encountering skepticism from other knowledgeable hams, our team decided to see if we could confirm our results by refining the antennas. For the next stage of this adventure, please turn to the *On the Bench* column on page 66.

The team finally decides to build an Adcock antenna to cinch the results of direction-finding with the loop. (See page 66)

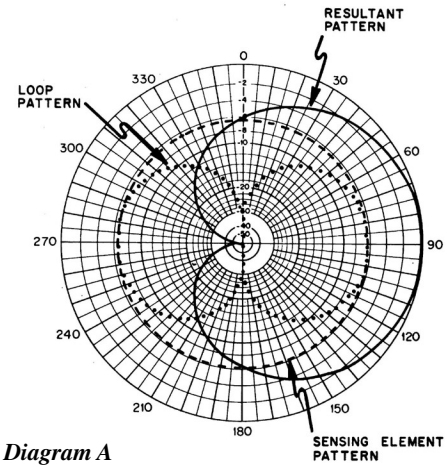


Diagram A

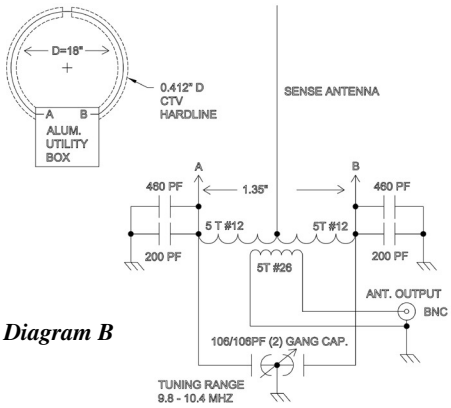


Diagram B

Source material and diagrams courtesy of ***The ARRL Antenna Handbook 20th Edition.***

Motorists will think "Antenna Fred" has really flipped his lid with this goniometer mounted on his car! (See page 66)

Swan Island, Visitors Unwelcome

By Johnnie Craig

A LITTLE BACKGROUND

Longtime monitors will remember Swan Island. The very mention of it hearkens back to the days of intrigue, covert operations, and hints of ... well, we never were sure exactly what ... in Havana Moon's *Uno, Dos, Tres...* column in *MT*.

Not everything at Swan Island was "spooky" ... It was the CIA's propaganda station at one end of the island that gave it that reputation. Though both Radio America and its predecessor, Radio Swan, claimed to be commercial stations, *everybody* knew better. For an entertaining history of the islands and the station by Greg Robins, see **http://www.trsc.com/ref_radio_swan_americas.html**

Readers who remember tuning in to Radio Swan or Radio Americas will enjoy the accompanying story from the point of view of a relief engineer from the FAA who was "in charge" of the island for a brief time in the 1960s.

The map and photos of Swan Island are courtesy of Dr. Donald Keith, professor of biological sciences at Tarleton University, who visited in 1972. His website at **http://www.tarleton.edu/~dekeith/swanislands.html** includes this commentary:

"An aircraft radio-navigation beacon was installed on Great Swan in 1946 for guidance of Caribbean air traffic. It was operated by the FAA until 1971 when the FAA pulled out leaving only the U.S. Weather Service. In 1960, a census was taken of the island by the U.S. Coast and Geodetic Survey. There were 28 people living on the island, 19 Caymanians, three Hondurans, and 6 U.S. citizens attached either to the Weather Bureau or the FAA radio station."

In 1998, Hurricane Mitch destroyed much of what remained of the Weather Service compound. Current efforts by one or two private companies to convert the tiny island to tourism are still in negotiation with Honduras, which has owned Swan Island since 1972.

Rachel Baughn, MT Editor

While in service of the United States government in the 1960s, I had occasion to act as "Island Administrator" for a United States possession called "Swan Island." Swan Island is located 90 miles off Honduras and 1,000 miles south of Miami, Florida. At the time of this story, Swan was staffed with Federal Aviation Agency "Relief Electronic Technicians" on an 8-week rotational schedule.

A Relief was a position designed to fill in for personnel away on annual leave or schooling. At that time Swan was a U.S. possession and required an Island Administrator. Swan Island was an "Oh by the way" job, which could be filled by relief technicians. This is the story of my time on Swan Island – which grew to 6 months instead of the expected two.

My first clue that this assignment was a little out of the ordinary was when I was called into a very large office with very thick carpets, and discovered I was being interviewed by a man at least three Government Service grades higher than me. The only people in this office were me, him, and one other man, obviously trying to look inconspicuous while sitting at least ten feet directly behind me and writing on a clipboard of papers.

Now, I had no idea what I had done wrong, but in my mind I was one step away from a firing squad. The gentleman behind the desk began asking me questions about my past career and my intentions for future career; I was certain that I was in deep trouble.

After about five minutes of this, I mustered enough courage to ask, "Who is the man at the back of the room?" He was introduced as an employee of another government branch.

I am not sure I took a breath until after I finally got out of that office. Although I did not understand the instructions I had been given, at least I did not seem to be in any trouble. I found a restaurant nearby to stop for coffee and gather my thoughts. I looked at my list of things to do prior to going to Swan Island:

- Go to a dress shop in Miami Springs and purchase an airline ticket.
- Go to the Federal building and get a Federal Gun Permit.
- Go to the Tamiami Gun Shop and purchase a gun.
- Go to the Jackson Memorial Hospital for a lecture on child delivery.
- Go to the FAA International Flight Service Station for training.
- And finally, report to local the sector office for a Pre-Swan briefing.

This did not look like an Electronic Technician's "To Do List"! I tried for several minutes to make some sense of it and finally decided to just see it through.

From the Frying Pan...

My first stop was the dress shop in Miami Springs. When located, I was to go to the alley behind the dress shop where I would find a tour guide company. This company was to issue my plane ticket to Swan Island upon receipt of a standard government TR (Transportation Request).

This all seemed very cloak and dagger to me, and I half expected someone to jump out from behind a post and yell, "Gotcha!" or "Smile, you're on Candid Camera." But I had little choice, for the time being, to do anything other than follow instructions.

Finding the dress shop was easy enough. I found the alley okay. But there were obviously no businesses in the alley and only one unmarked door, which could have been behind the dress shop. I was certain now that this must be a joke. But for some reason, I tried the door and it opened. Cautiously, I peered around the door into a room no larger than 8' x 10'. Two men were sitting behind a makeshift counter over which there was a paper sign "Funny Farms Airways."

"All right, what is the joke?" I said. Both men stiffened and told me in no uncertain terms they were offended. They said they were the only airlines that went to and from Swan, and if I wanted to go there I was to cut a Transport Request. The only other means of transportation was a monthly banana boat out of Tampa. I wrote them a TR. They issued me what appeared to be a legitimate charter ticket to Swan Island. I was told to go to Fort Lauderdale, General Aviation Airport at 7:00 am the departure day. I explained that I was familiar with that airport and had never seen their counter. "We don't have one," was the reply. "How do I find my plane?" I asked. "Go to the airport and the pilot will find you," was the reply.

Next on the list was a Federal gun permit. I had been given a signed form and it went right through. I asked the clerk if he had any idea why I was being issued a permit. He pleasantly asked if I was connected to the Air Marshals. I told him no, I am on my way to Swan, but that should not require a gun. He just glared at me and from then on he would not talk unless necessary.

I got my permit and proceeded to the Tamiami Gun Shop. This is an interesting place. You select a handgun, then walk a few steps away and they have an indoor small arms range where you can try your gun before pur-

Courtesy of Greg Robins via www.trsc.com

chase. I selected a 9-shot 22-caliber revolver. Although I was reasonably knowledgeable about handguns from military experience, I did not want a killing weapon, just enough to keep honest persons honest.

As for the lecture at the hospital, I was convinced it was some sort of mix-up, but I went to the hospital like a good little government employee. The doctor I was to see was tied up with an emergency, so I got a cup of coffee and waited. He showed up and introduced himself. We went into a makeshift classroom and he started teaching childbirth. I stopped him to ask if I really was his intended student; yes, I was. The lecture lasted approximately 2 hours and I was his only student. But he admitted he had no idea why I was being trained.

I had driven past the FAA's International Flight Service Transmitter and Receiver Station numerous times and always wanted to see the inside. It was filled with then-current state-of-the-art goodies, alongside timeless radiotelegraph and teletype equipment. It utilized mostly low band frequencies, which were thought to be obsolete but still were in use as long-range communications.

They had some of the most sophisticated equipment I have ever seen. They described Mod-u-plex and its benefits, and how to bring it on line from the Swan Island end. Basically, it allowed simultaneous operation of teletype and voice channels on the same frequency at the same time (in one of the first uses of digital compression). At that time, it was not possible to monitor the voice with any sort of standard receiver and/or manufactured test equipment. The downside was, you had to send a teletype message to Miami telling them you desired Mod-u-plex operation at some preset time. Even an emergency voice message would require a 15-minute delay.

Last on the list was the item I had been waiting for. I reported to the local sector office for my pre-Swan briefing. Hopefully, I was about to get answers for the many questions I had.

Not so. Few of my questions were answered and a lot of new ones surfaced. The only new information I received was what electronic equipment I was to maintain for FAA. The equipment there was a double H (low band beacon transmitter), two channels of radio teletype, and the standard UHF/VHF aircraft emergency frequencies. Both aircraft and ships used the double H as a beacon for azimuth readings.

I did find out there was a six-man US Weather Bureau station and a private radio station on the other end of the island. The trainer made a point of saying, "The radio station is manned by Bendix personnel," but he did not mention that the station was "Radio Americas." They operated an AM band commercial broadcast station. Every time I asked questions about being an Island Administrator, either the subject changed or the response was, "You will be the highest ranking Federal Employee on the Island so you will automatically be the Island Administrator."

... Into the Fire

The next morning at 6:30 am, I was wearing my normal attire of two-piece suit and eating breakfast in the Fort Lauderdale airport, when a touristy dressed man in shorts came over and asked, "Are you Johnnie?" I invited him to join me for breakfast; he declined and said, "When you are finished we will go to Swan. Are you sure you want to wear a suit?"

I took time to change to leisure clothing (at that time I did not own a pair of shorts) and went with him. We approached an old, civilian style Twin Beech that, although it seemed to be in fair condition, obviously had a lot of hours on it. He finished his pre-flight and got in. This was the noisiest airplane engine I have ever heard in a reciprocating engine aircraft. We were the only two persons on board this 12 passenger aircraft.

When he received clearance from the tower and throttled up, I knew this was no ordinary airplane. I found out later that he could nearly hang on the props alone with this aircraft – not normal for a Twin Beech. In addition, the retractable landing gear struts and wheels were approximately twice the size normal. His answer for the large landing gear was that the runway at Swan was a very bumpy grass runway which was listed in the *Airman's Manual* as available for emergency landings only.

After more than 5 hours in the air we finally arrived at Swan. I was not looking forward to that grass runway. When we did touch down, it was immediately evident why the landing gear was so unreasonably oversized. Being knowledgeable about aircraft, I was more worried about the serious wing flex with every bump and wondered if the wings would stay on. We finally slowed to taxi speed and turned around. As we taxied toward a small crowd of people and the pilot shut down the engines, I asked if some of those bumps could be repaired. His answer startled me. "We don't want it smooth enough to land on; everyone would start using it."

The National Weather Service compound in 1972 (Don Keith)

Getting Acclimated

When we opened the door, several people were there to greet us. The first young man to introduce himself was the man I was to replace for eight weeks. After greeting me, he said, "Well, it's all yours," and started boarding the plane. I said, "Wait a minute, you are supposed to give me a briefing!" He never turned around or responded.

I never saw the man again. When he got back he transferred to another job in a different state.

There were seven or eight natives and four other civilians who grabbed the mail bag, jumped into a vehicle with no doors, no roof – in fact, all that could be cut off with a torch was gone. The pilot asked me for a lift to the civilian side of the island and pointed to a nice looking International Scout with FAA emblems on either door. We got into what was now "my" Scout and he directed me to a Quonset hut with no markings

at all. He offered to buy me a drink, which I declined, and he sent me on my way down a dirt road through the jungle.

Within a quarter of a mile the road opened into a fenced-in area, with standard FAA signs all over it. I knew I was home. This area was a standard 10 acres, completely fenced in with 6-foot chain link fence. Missing were the double 12-foot gates. Of course, the fence doesn't do much good without gates, but they had never been installed.

I recognized the equipment building and parked in front of it. I went into the first room, which was the office, and the next room revealed the FAA equipment and systems. I was supposed to have a crew of three persons: a cook, an electro-mechanic, and a mechanics helper. The other end of the building had a separate entrance and was obviously the weather bureau. It also was empty. Where was everyone? Everything seemed to be in order, so I took on my first two tasks: finding people and getting some answers.

Leaving the office and starting toward one of the other buildings in the compound I was met halfway by a young man in his mid 20s. He introduced himself as "Cookie" and asked if I was hungry. I explained that I was more worried about where everyone was. He said they were out working, suggested a cup of coffee, and I agreed. We went into what reminded me of a small military chow hall and he poured two coffees. He explained that the "barracks" was in the building next door, and the double H tower was located about 1/4 mile away. He was a native islander who had live in Miami until he finished high school.

I asked where the electro-mechanic and mechanics helpers and six weather Bureau personnel were. He said, "I think the Weather Chief is in his room and I don't know where the others are." For such a small island a lot of people were missing. After due consideration, I realized that sooner or later all of these people would have to come to me. So I went to the barracks to unpack and settle in.

Although military in style, the barracks were quite comfortable. Everyone had his own private room, approximately 8 by 10 feet in size. Furniture was basic, a hospital style dresser, single metal frame bed, a small table, two chairs, and a closet large enough to hold clothes from one medium sized suitcase. When I opened the closet door I found the closet had a 100-watt lamp in it – turned on with no switch to turn it off – and the room had a 75-watt overhead lamp. Later I learned the humidity was so high you had to keep your clothes heated or they would mildew.

Along one side of the barracks was a screened in porch (probably 12 by 45 feet) with ping-pong table, pool table, several individual tables and chairs. This was obviously the leisure area. I poured myself a VO & Seven in an iced tea glass, propped my feet up on a table, and sat down to watch the island through the screened in porch.

As I had anticipated, after approximately 25 minutes people began to show up. First was Bobbie, the electro-mechanic. "You must be the new Electronic Technician," he said. "I am glad to meet you, too, Bobbie," I responded. Our conversation lasted less than a minute. Most of the time I spent listening to him express his anger at having an outsider in charge of his island. It is always nice to get off to a good start with your crew.

Next were three of the five weathermen, all nice guys. We introduced ourselves, and talked for a few minutes. They said Bobbie did not like any foreigners. They asked if I had been to the "Booby Bar" yet. I said no, it was a little early for me to be seriously drinking. It seems there are two bars on the island, the "Booby Bar" on the private side, and the "Playboy Club" on the FAA side. Since I had nothing else to do, I asked where the "Playboy Club" was located. They pointed to a grass shack next to the fence.

The Playboy Club was virtually a grass shack. I found out later a native built it in two days using local materials, at a cost of $75. Each of the Relief Techs that visited the island tried to add something. One time a tech (who was a tee-totaler) wrote up the Playboy club as a fire hazard (being all dry grass). He went to the trouble of citing all the violations and sent a formal complaint to the Regional Office. After due consideration, they asked him "How close to the fence is this structure?" He responded, only about 5 feet.

Someone up there has a real sense of humor: They agreed with him that it was a fire hazard and solved the problem for him. They cut a formal response in the form of a modification notice requesting that he cut the fence on either side of the club, re-route it around the club (placing the club outside the fence), and install a walk-in gate. He got the idea, and it was not necessary to re-route the fence.

After one night on the island, I got my courage up and decided to go exploring. I got into the Scout and started to drive around the island on the beach. That did not last long; before I got 100 yards the debris, rocks, and rough terrain caused me to turn around. "Cookie" saw me returning and asked if he could help. I said I was looking for a way around the island. He suggested a seldom-used road through the middle of the island.

Driving the Scout, I cautiously entered what used to be a road and had since grown back into jungle, leaving only a small trail which was obviously now used as a footpath. After driving only a few yards, I discovered that as long as I stayed on the path, the overgrowth would easily push out of the way, so I kept going. I was about 100 yards into the jungle when I heard a tremendous roar. Something hit the window, scratched the windshield, and fled off the other side of the vehicle from the hood! I was afraid to stop, so I kept going. Another 100 yards and I broke out in the clear on the other side of the island with a white sand shore just ahead. I stopped to take inventory (after I stopped shaking). I was all right, but the windshield had deep grooves and scratches 1/4" deep, from whatever just tried to get at me. Since the side windows had been down I felt very lucky to be alive.

There was a nice white sand beach on this side of the island. It looked to be about 1/2 mile long and ripe for beachcombing. I looked it over, then returned to "the path" and reluctantly drove back through the jungle to the compound. After talking to several persons, I found out that someone had once brought three house cats to the island, they ran off into the jungle and stayed there. What I encountered was a fourth or fifth generation of housecat. They had evolved to approximately double the normal size and had become extremely savage.

After I recovered from the "cat attack" I resumed my exploration of the island. But this time, I took no chances. The FAA also owned the only boat on the island, a Boston Whaler with twin 30 horse Johnson outboards. Having grown up in Miami, this was something I could handle. I told Cookie to make me a picnic lunch for a boat trip around the island.

Cookie's face went pale., "I would not do that if I were you," he said. He explained that the entire island is in the middle of the Gulf Stream current. This current moves from south to north at about 25 to 30 mph. If you go anywhere, it should be south of the island; otherwise, you may not have enough fuel to return. Everything of interest was south and/or east of the island, but I did the prudent thing and chickened out.

In the Hot Seat

After a few days on the island, I began to feel a little more at ease. By this time I knew a little more about the island. Every Tuesday the mail arrived via the plane. This was a major event.

Every night several of us met at either the "Playboy Club" or the "Booby Bar" for drinks. This was a normal event.

During one of the normal events at the Booby Bar (the civilian end of the island), just after sunset, someone ran in and said, "The transmitter just went down." The transmitter was a very high power broadcast band unit with a 5-element beam antenna, beamed across Cuba. This unit was brought up every evening at 6:00 pm and ran all night. Apparently, it had been successfully brought up, ran for about 30 minutes, and then went off the air.

We all went outside for the vehicles, but were stopped cold when we saw a fire on the horizon. When we got over the shock we quickly drove the 1/4 mile to the transmitter site. To our amazement, there was no fire yet, but the entire transmitter building was engulfed in a dazzling display of jumping electrical arcs. It was like something out of a science fiction movie. Fortunately, an insulated grounding stick was next to the antenna array, away from the transmitter building. One of the guys grabbed the stick, used it to break a window next to the main cutoff switch, and knocked the switch onto the "OFF" position.

It was later determined that although the crew had ordered "non-conductive" paint, supply found they had none and switched the order to an alternate number, which was, of course, quite conductive. The transmitter building was painted using this conductive paint and lit up like a Christmas tree. Fortunately, no one was

Approach to the grass air strip (Courtesy Dr Don Keith)

hurt. The next day the building was cleaned down to the wood and restored to service. It was, of course, re-painted at a later date with the correct paint.

Playboy Bunnies?

It seemed like something happened every few days to keep me on my toes, but finally, I got the better part of a week of peace and quiet.

It did not last long. I was just beginning to like getting full nights of sleep when I was rudely awakened by one of the weather bureau watch standers and told "Hugh Heffner's Bunny girls were en route to Swan Island." I was furious. Not only was I awakened at 4:00 am, but also I just collapsed in bed at 3:00 am after some toasts at the Booby Bar. Now, someone wants to play jokes.

I was reasonably certain that the man who woke me believed what he was saying was true. It was far more likely that someone **created** a false flight plan report. I told him to go back to the station and ask Miami for a repeat of the flight plan, rolled over, and went back to sleep. I just got to sleep and he woke me again. I told him I would get up and check it out, but if it were a set up, heads would roll. We both went across the compound to the FAA station instead of his Weather Bureau station. He wanted to know why we were not returning to his teletype. I asked him to be patient.

I went directly to my test bench teletype, patched it directly into the transmitter/receiver ahead of all other input/outputs, and addressed it to the IFSS (International Flight Service Station) maintenance tech on duty. I requested a confirmation of this flight plan by dispatch number. To my amazement it came back exactly as before. The weatherman went berserk. He ran out the door laughing. I already knew where he was going. He went to wake up everyone else, of course.

Within 30 minutes, almost daylight, everyone on the island was at the runway awaiting Hugh Heffner and 22 Bunny Girls to land in his private plane. Believe it or not, it did make some sense. He had recently opened his San Juan Playboy Club and was touring the Caribbean to advertise the opening.

I continued my background search on the flight plan with the help of the Miami IFSS. I woke up at least three persons in Miami who were no less offended than I was. Each time, they were satisfied the flight seemed to be legitimate. I was the last person to arrive at the runway, and by now it was dawn and the girls were due any moment. Everyone, including me, had a glass in hand, and everyone had refill sources readily available. I can honestly say it was the only "Daybreak Drinking Party" I have ever attended.

I asked if there was any sign of them. Everyone said "No, not yet!" No one thought to ask me the obvious question, "Was the flight plan authentic?" They did not ask and I decided to let them have their moment of glory. About an hour went by, I think I was now the most sober person of the group when someone said, "The plane is overdue, why not call and get a new arrival time."

I was sitting in the Scout; I started the engine to get a head start and said, "The plane sat down in South America an hour ago. The Flight Plan was misfiled at Bimini, in the Bahamas." Then I drove off before anyone could reach me. I made myself scarce the rest of the day.

Invaders from Honduras

A few days later I was playing pool at the Booby Bar, when I was informed that a large group of irate Honduras College students were about to invade, to take Swan Island back for Honduras. The manager of the radio station filled me in: It seems that both the U. S. and Honduras had claims to the island. I do not know the background or who had the strongest claim. I only know that by 1972, Honduras once again owned the island.

My immediate problem was keeping everyone safe, and I did not hold much hope for that with an invasion on my hands. I was about to call Miami for advice, but the manager asked me not to do anything. He explained that every year, on this date, the Honduras college students would get drunk and try to invade the island. The date represented an anniversary of something. Each year, they came over, started a big fire on the solid concrete pier, shot off their guns, and drank until they passed out. Each year, they woke up with hangovers, got back into their boat, and went home. I went back to my office to think without interruption. My options were:

- Call Miami and ask for help. Escalating the problem would probably mean armed persons on both sides and more trouble with people getting hurt.
- Make the docking area off limits for a day, and greet our guests myself, unarmed.
- Make the docking area off limits for a day, and do nothing, hoping the problem would solve itself as it had in the past.

Although I do not think I was supposed to know, I was aware that more arms were available on the other end of the island than anyone could bring in a boat. So applying common sense, I chose the last option. There was a strong chance it would solve itself; if not, there were personnel and weapons available to contain the situation without outside help. Even worst case, this seemed to offer the best chance for minimal problems and/or best chance for minimal injuries.

I put the word out on the island no one was to be in the dock area for the next 24 hours. It worked. I heard the small arms from the barracks, off and on, most of the night. I had to grit my teeth, but I managed to stay put and follow my own orders. No one was hurt, and they went home the next morning.

Fuel, Cows, and Babies!

Next, I had a visit from one of the islanders. This nice lady explained that she was in her 8th month and could go into labor at any time. I had forgotten about having been trained to deliver a baby. She did not seem upset or even concerned about the birth. She simply wanted to know when the "Daydream boat" would arrive. The *Daydream* was approximately 40 feet long and was an inter-island boat in the Caribbean. It had a regular schedule with the larger islands and visited the smaller islands by prearrangement only. This trip was combined with several other Swan Island needs. The islanders maintained several head of cattle for fresh milk. Selling a few head and shipping them out on the *Daydream* thinned the herd once a year.

I had also been assigned the task of signing a contract with the skipper to deliver diesel oil for our full time generators. FAA supplied the entire island with power. In the past, diesel fuel was delivered via oil tanker out of Tampa. We had suffered many problems with this arrangement. On one occasion, the tanker had run out of oil prior to arrival at Swan. After they docked and connected the pump lines, they pulled the lines out of the oil tanker and threw them over the other side of the ship and began pumping seawater instead! They pumped 2,500 gallons of seawater into our main tanks and 2,500 gallons into our reserve tanks. We recovered the money for fuel, but needed all new diesel engines and fuel lines. In addition, the island was without power for

days.

Aside from this one incident, we constantly got large quantities of dirty fuel in the engines, had to shut down, clean, repair, and restart. The *Daydream* delivered clean fuel in 55-gallon drums all over the Caribbean. I was given a contract and told to see if I could get the skipper to deliver diesel to Swan. I called Miami and they gave me the proposed date of the *Daydream* arrival. Now if the pregnant woman co-operated, I would not have to deliver a baby. Just to be sure, I went back to the barracks and read up on childbirth to have everything fresh in my mind.

She had not gone into labor, the *Daydream* arrived on time, and the cattle drive was scheduled for the next day. I had Cookie prepare a special meal for the *Daydream* skipper and myself and invited the skipper for supper. He spoke Caribbean English (broken English with a Portuguese accent) and that made it difficult for us to communicate. But we finally got on the same track and he agreed to our requirements. He also added that he had 50 drums on board that Miami had requested to verify the quality of the fuel. It would be off-loaded just before the cattle drive. My luck was holding.

The cattle drive was spectacular! It took several transfers of a cow to boat before I understood what and how they were doing it. Cattle become disoriented and lose their equilibrium when they are set down on a moving surface, such as a boat. So the islanders would drive them out into the bay close to the boat. Next, the boat's derrick would lower a line attached to a canvas sling. While the cow was still touching bottom in the bay, they would attach the sling around the animal. Finally, the derrick line would be hauled up, bringing the cow safely with it. Now came the problem. When that cow felt the moving deck underfoot it would immediately fold all four feet and not move. The cow had to be properly placed before it hit the deck. Two cows had to be loaded twice, but all in all it went well. The cargo got unloaded, the cattle and the pregnant woman got aboard, and I breathed a sigh of relief.

When I returned to my office I discovered I had forgotten to get the *Daydream* skipper to sign the fuel contract. It would be at least a month until he returned. I was in serious trouble. After due consideration I had a plan. I am ashamed to admit it, but I held a contest. The basis of the contest was who could copy the skipper's signature the best. The winner was to receive a bottle of his choice. My reasoning was simple. Everyone was involved. It could not put me in more trouble than I already was in. This way I could share the guilt. It went over great. One of the weather bureau operators won and all was well.

Personnel Problems

I had now been on the island long enough that people had begun to trust my judgment and hopefully to like me. This irritated "Bobbie," my mechanic, the local native. I did not realize how angry he was, until the beer bottle incident. We consistently purchased an excellent Honduras beer from the *Daydream*. This beer was as smooth as silk, very tasty, and guaranteed to be at least 25% alcohol. The problem was, the deposit for the glass bottles cost more than the beer. The radio station drank the most, so they kept track of ordering beer and no charges were leveled on an individual for how many bottles he drank. It was understood by everyone that if you broke or lost a bottle, you paid for it.

There were two collection points, the Booby Bar and the Playboy Club. At the time in question we had four cases of bottles at the Playboy Club, but when it came time to collect them, they could not be found. Bobby passed the word that I had stolen them. It did not take long to verify who had set me up, but Bobbie was the only diesel mechanic on the island. It would not have been prudent to cause even more friction, and yet I had to do something. After a long talk, he requested two weeks annual leave and I agreed not to take further action.

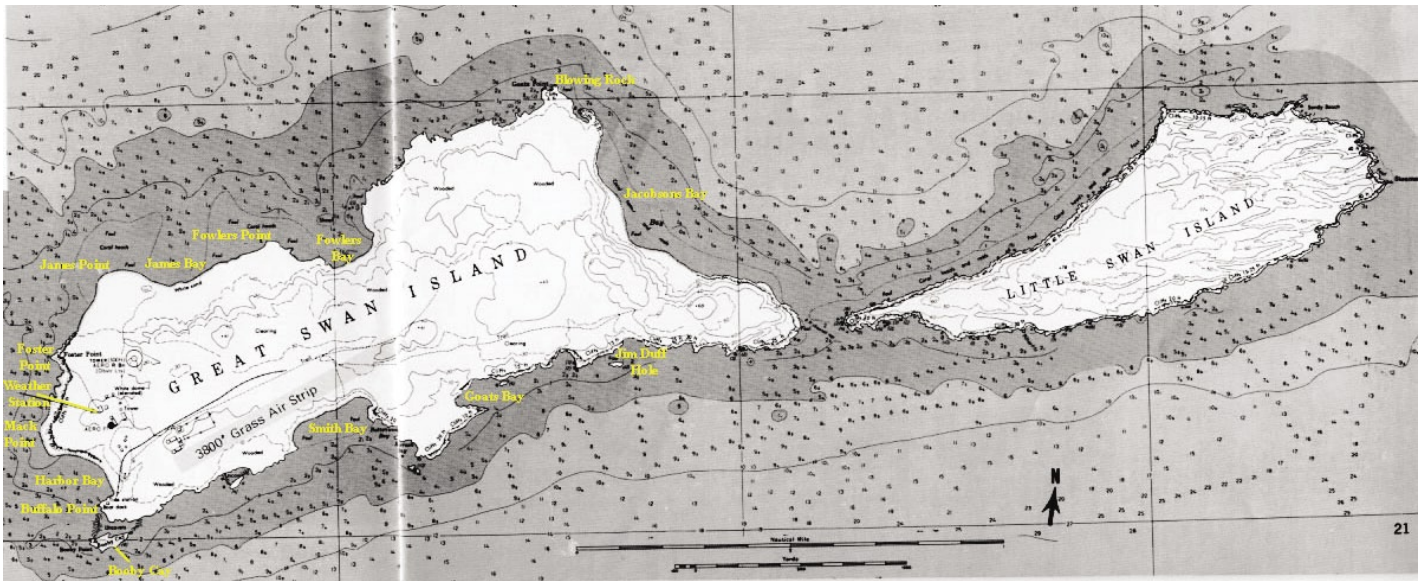
Bobby's relief was on the next incoming plane from Miami. The FAA relief electromechanic that arrived was knowledgeable, hard working ... and, unfortunately, a devout ham radio operator who brought his equipment with him. It seems that Swan Island was at that time one of the most difficult areas to get an amateur radio contact.

I contacted Miami via moduplex radio to give them an update. No one had bothered to tell him that he was not allowed to bring his radios. After a lengthy discussion, it was agreed that I would attempt to control the situation and if it became necessary, the relief would be replaced by another relief.

The next day at breakfast I insisted that Frank, the new replacement, brief me on the status of the generators. Between giving me a status report, accomplishing the recent modifications and upgrades that had been sent with him, and catching up some work that Bobby had not yet completed, he had a full month's work ahead of him and only two weeks to do it in. He was so eager to please, I assumed this would keep him busy. He worked 16 hours a day for 8 straight days and did an excellent job. Then he asked permission to set up his radio and open business for contacts. I agreed he had earned the opportunity to use his radio. Frank agreed to use extreme discretion and that if I got even one call from Miami I would place his radios in a sealed box and hand it back to him when he boarded the plane to leave the island.

I understand he did make a few contacts that evening. Unfortunately, the next day he had an accident. He fell from a wooden antenna pole, which snapped off near the ground, and he landed in a coral rock formation. No one was at fault; the pole had rotted away internally with no visible evidence on the outside of the pole. I called for an immediate plane to evacuate him to Miami. I know they were able to save his leg, which was trapped between the pole and the rock formation. I have no idea how well he recovered.

It is the things we have no control over that always stick our mind the longest and bother us the most. Although the accident could not have been prevented, I will always feel somewhat guilty because it happened "on my watch." Miami offered to send another relief. I told them it was unnecessary. Frank had everything running perfectly and Bobby



would return soon. I wrote a commendation for Frank and sent it to the office.

Monster Iguanas

While on moduplex with the last problem, Miami wanted "my permission" to send a foreign visitor to the island. I was afraid to ask too many questions, but they did volunteer some information. This gentleman from Scotland represented *National Geographic* and he was concerned with our local wildlife. In particular, iguanas on "Little Swan Island" that presumably grew to be 5 feet or more.

I had no idea what to expect when this gentleman got off the plane. He was huge. He was at least 6-1/2 to 7 feet tall, 250 to 300 pounds, and not an ounce of fat. If you were to describe Goliath, this would be him. He had a full beard, bright red hair, and the attitude of "Here I am, what are you going to do about it?" His first statement at the bar was "I can outdrink anyone here." I believe he proved that.

He was genuinely interested in only one thing, iguanas. He openly stated that iguanas do not grow to be 5 foot long and he was here to disprove this claim. I let him know right off that we made no such claim. However, some of guys produced pictures of what looked like large iguanas. He scoffed and passed it off as a joke, accusing them of trick photography. Some of the guys from the radio station had been to Little Swan before and agreed to use my FAA boat and take him over in the morning. I was invited, but I explained it was necessary for me to remain on this island. Something told me to take every precaution, so I insisted that he sign a standard form agreeing to accept responsibility for his own safety while on Little Swan Island.

They returned late the next afternoon. This character had a 16 mm Bolex camera with him and brought back some unbelievable pictures. Some of iguanas were as large as 7 feet or more. And when they grow that large, they do not scurry away when a human approaches. They stand their ground and start hissing as a warning. In consideration of their speed, the length of their tongue, the size and length of their tail, and their agility, this is a dangerous animal. I have always had great respect for *National Geographic*, but after seeing this man in action I am in awe. They had pictures of him running from an iguana, when he fell into one of many coral holes (covered with greenery), and broke his leg in two places. His injury did not seem to bother him. He thought it was funny and a very good reason to stay drunk. He did stay drunk! We poured him onto the plane the next day and I never heard from him again. I often wondered if he wrote an article. I never saw one.

Potshots

A few days later while taking a walk on the beach I met three of the Cuban announcers. Like me, they were beachcombing and enjoying the afternoon. The beach was a good place to target practice with your revolver. I had brought my little 9 shot 22 and they had what appeared to be an army style 45. Since none of us were bi-lingual, we communicated by motions and expressions. They wanted to exchange handguns so I could see theirs and they could see mine. I saw no harm in this, so we did.

They picked out a coconut as a target fired one round and hit it dead center. They seemed impressed with my gun and insisted that I try theirs. I picked a coconut near the one they had hit and pulled the trigger. Obviously, this was not a military 45. The recoil caught me by surprise. I did manage to hit the coconut, but the recoil almost caused the gun to hit me in the head. When we looked more closely at the targets, my 22 had made a clean hole in one side and out the other. Their gun had made a clean hole going in and the back half of the coconut was missing. We each got our own guns back, said goodbye, and I gave up beachcombing as a dangerous pastime.

One of the assigned chores I had while at Swan Island was to inventory the medical supplies. Everyone knew we had supplies, but they had no inventory record. In consideration of Frank's accident, I now placed a higher priority on that. The military had been on the island at one time and they had set up medical supplies for their purposes, then left them. We had several sets of surgical tools and seemed to be set up to do light surgery.

Then I came across this wooden case with four quarts of liquid in it. The outside of the box was unmarked, but the bottles were clearly marked "Opium." Opium had been used in the past for operations. I called Miami and asked them what to do with it. There was a brief pause, then, "Just dispose of it and certify disposal on the inventory form." I asked, "By the way, how much does a quart of pure opium cost?" After a long silence I was told they would get back to me on that. About an hour later Miami called me and said, "Very carefully, pack that box, put it on the next airplane and mark it for delivery directly to Jackson Memorial." They never would tell me how much it was worth!

Finally, it was time to take the next plane to Miami. They threw me a party the night before. (They had parties for everything: It's Tuesday! Let's have a party!) But it was very nice of them and apparently not all FAA/Weather Bureau personnel get parties. The next morning, waiting for the plane, I did have trouble containing my emotions.

The plane landed, my replacement got off and introduced himself. I said, "I'm Johnnie, goodbye folks," and got on the airplane. He followed me onto the plane insisting that I give him whatever information I had on the island. I explained he would find a written update on his desk in the office, much more than I had when I came aboard. "Now get off my airplane!"

Epilogue

One of things I occupied my time with while on Swan was to construct an intercom for the Twin Beech. At least I could talk to the pilot on the way home without screaming. It turned out to be a questionable advantage. He wanted to fly back on a direct heading (over Cuba). To this day I am not certain if he was joking or serious. But I talked him into the normal route around Cuba.

I received three days off when I arrived back in Miami. By the second day I was bored and went back to work. I was called to the office for a debriefing. During the debriefing I was asked to go back to Swan for another tour. I thought they meant after the current Administrator's tour was over, but it turned out they wanted me to replace him immediately. The day after his arrival on the island he had the FAA personnel out picking up cigarette butts! I told them, "You will have to find someone else. I will take my turn, but not someone else's."

Looking back on my time at Swan Island I would have to say I was lucky not to have had any major incidents. Although I was not officially told about it, I was aware on at least two occasions of a US Navy destroyer just off the coast of Swan for more than 24 hours each occurrence. At least three incidents on the island could have developed into real problems. But I would not have been invited back so quickly unless I had done a fair job.

ABOUT THE AUTHOR:

Johnnie Craig says he's the only technician he knows who has worked in five different FAA regions: Southern, Southwest, Alaskan, New England, and finally Northwestern Mountain. While in Alaska he lived and worked on another island called Biorka, offshore from Sitka for two years. The last 10 years he traveled as an Engineer in charge of major installations. "I would walk into bare walls, install all equipment, Air Traffic, office, Weather Bureau, etc., and if required train local techs and ATC personnel on any new or updated installations after completion."

"Normally FAA has four technician career fields: Radar, NavAids, Communication, and Computers. I have full training and experience in the first three and partially in the fourth, which is unusual."

"All my life my peers have told me 'You should write a book.' I am certain I could come up with at least a dozen articles, never tell the same story twice, and not have to exaggerate."

"All information in this article is true to the best of my knowledge except the names, which have been changed."

Johnnie Craig
http://swanisland.home.att.net
swanisland@att.net

Propagation Outlook for October 2006 to March 2007

Winter SW Broadcast Season

By Tomas Hood NW7US

Solar Cycle 23 has all but ended. There is growing evidence that the new solar sunspot cycle has already begun. The most telling evidence is the occurrence of a new type of sunspot that is only seen at the beginning of each approximately eleven-year long solar cycle. These sunspots are magnetically "backwards" when compared to the sunspots of the ending solar cycle.

Sunspots, which can be as large as 50,000 miles in diameter, are regions of cooler temperature on the surface of the Sun. These temporary regions become cooler because they have a concentrated, and often complex, magnetic field structure. This magnetic force inhibits the convective motion of the Sun's plasma that brings hot matter up from the interior of the sun.

Like all magnets, sunspots have north and south magnetic poles. On July 31, 2006, a brief appearance of a sunspot caused scientists to take notice. This sunspot did not have the "normal" magnetic orientation of the sunspots typical of Solar Cycle 23. The magnetic orientation of this small sunspot was opposite. This backward sunspot, only lasting a few hours, signaled the birth of Solar Cycle 24.

"We've been waiting for this," says David Hathaway, a solar physicist at the Marshall Space Flight in Huntsville, Alabama. "A backward sunspot is a sign that the next solar cycle is beginning."

At the end of a solar cycle, there are very few, if any, sunspots. As a new cycle begins, we see more and more of these "backward" sunspots, because the sun's magnetic field does a complete flip! During the course of the typical eleven-year cycle, the sun completes a total reversal of its magnetic poles. This is, in part, what causes coronal mass ejections and solar flares.

Of course, when there are so few sunspots, the strength of the ionosphere is much weaker than during the peak years of a solar cycle. The ionosphere is the reflective group of layers around the earth that enables world-wide propagation of shortwave radio frequencies. When it is weak, only the lower frequencies in the shortwave spectrum are reflected reliably, while the higher frequencies just pass through.

As the new cycle begins, an increase in ionospheric energy begins. It typically takes three to four years from the beginning of a cycle for the cycle to peak. That puts Solar Cycle 24's peak close to 2010. The exciting news is that scientists, armed with more accurate forecasting methods and models of the space weather and solar activity, are predicting that Cycle 24 will be exceptionally stormy, and will perhaps be one of the most active cycles since the 1950s. This is great news for VHF DXers who hope to catch TV or FM signals from around the world on 30 to 120 MHz. It could be possible during the very peak of the new cycle.

Right now, as the weather in the Northern Hemisphere begins to turn, and the summer fades to autumn, we can expect a fair improvement on the higher shortwave frequencies (22 meters up through 11 meters). However, because we're still at the very end of Cycle 23, the solar activity just won't energize the ionosphere strong enough to enable reliable propagation on these higher frequencies.

Winter Season MW and HF Propagation

During the winter months the maximum usable frequencies (MUF) are generally higher during the daylight hours than during the summer daylight hours (for example, see the notes at **http://vesuvius.jsc.nasa.gov/er/seh/sun.html**). This provides short but strong openings on higher shortwave bands during the winter day. Then, at night, the MUF dips down much lower than what would be seen during the summer nights. Summertime MUFs are generally higher during the night hours than during the winter nights, due in part because the ionosphere stays energized through the short nights. Winter nights are longer, so recombination of the ionosphere (which results in a lowering of the MUF) is more complete.

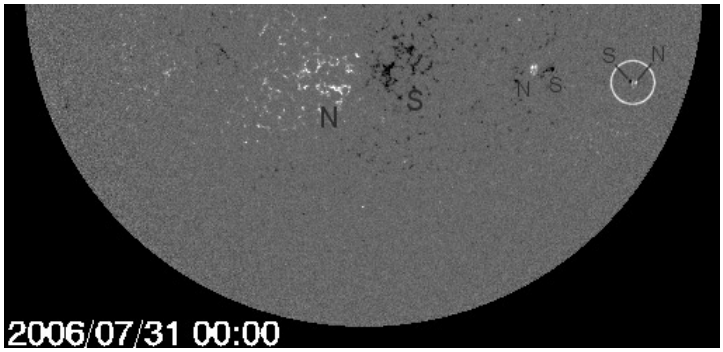
This also means that the D layer of the ionosphere is less ionized during the winter, allowing medium wave and shortwave frequencies to propagate through the D layer and off of the E and F layers. Finally, the seasonal decrease in weather-related noise makes it easier to hear the weaker DX signals on lower frequencies. With thunderstorms few and far between, storm-related static and noise is greatly reduced.

Seasonally, the geomagnetic activity tends to quiet down during the winter months. The most active geomagnetic seasons are centered on the two equinoxes, in the spring and autumn. Combined with the seasonal decrease in geomagnetic activity, the lull in the eleven-year solar cycle geomagnetic activity translates to generally quiet conditions on lower HF and on the MF spectrum.

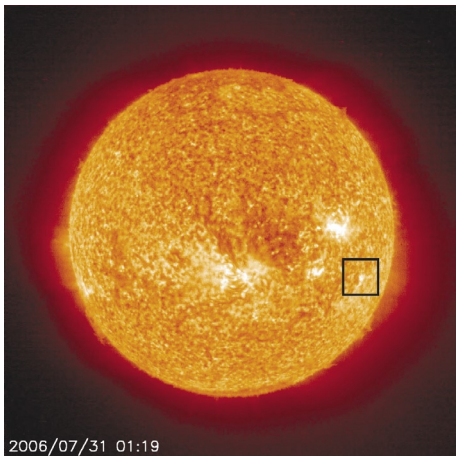
December is well enough past the autumnal equinox and the associated peak auroral activity to support transpolar propagation. With this overall reduction of geomagnetic activity and the decrease of radio signal absorption, comes more stable high-latitude propagation. Medium wave DXers enjoy catching broadcast station transmissions from over the North Pole. Shortwave DXing over high-latitude paths becomes exciting, even if the higher frequency bands might be dead.

During October, signals *below 75 meters* are still hard to hear under the seasonal static. The static then steadily decreases as we move into the longer hours of darkness during the winter months. With the seasonal reduction in thunderstorms and atmospheric static noise in the Northern Hemisphere, it becomes easier to hear the weaker signal DX.

As we get closer to Janu-



A SOHO magnetogram of the sun, July 31, 2006, brings good news to the radio hobby. Courtesy NASA.



An Extreme ultraviolet Imaging Telescope (EIT) image of the solar atmosphere at a wavelength of 304 Angstroms that shows the backward sunspot (boxed).
The bright material is at 60,000 to 80,000 degrees Kelvin.

ary, expect DX openings during the hours of darkness and into the sunrise period. Look for openings from Europe and the south if you are listening in the eastern half of the United States; from the Far East, Australasia, and the South Pacific if you are in the western half of the country.

Expect long-range DX on the low bands, starting nearby right after sunset, and extending farther as the night develops. Signals here should peak from Europe and from a generally easterly direction around midnight. DX paths will move farther west through the night. By morning, openings from Asia should be common. For openings in a generally western direction, expect a peak just after sunrise. The band should remain open from the south throughout of the night.

Propagation in this band is quite similar to that expected on 41 meters, except that signals will be somewhat weaker on the average, noise levels will be a bit higher, and the period for band openings in a particular direction will be a bit shorter.

Forty-one meters should be the hottest DX band during the dark hours, as the seasonal static levels are lower than they were during the summer. The band should be open first for European DX in the eastern United States during the late afternoon. Signals should increase in intensity as darkness approaches. During the hours of darkness, expect good DX openings from most areas of the world. Signals should peak from an easterly direction about midnight, and from a westerly direction just after sunrise. Excellent openings toward the south should be possible throughout most of the nighttime period.

The all-season bands, *31 and 25 meters*, are crowded, and signals are usually very strong and steady. These bands will often remain open into many areas late into the night and will open early in the morning, especially when part of the propagation path moves through sunlit regions.

Twenty five meters is expected to be an excellent band for medium distance (500 to 1500 miles) reception during the daylight hours. Longer distance reception (up to 2000 to 3000 miles) should be possible for an hour or two after local sunrise, and again during the late afternoon and early evening. Heavy congestion will occur here, since many international and domestic broadcasters make use of 25 meters.

Thirty-one meters, the backbone of worldwide shortwave broadcasting, will provide medium-distance daytime reception ranging between 400 and 1200 miles. During November, reception up to 2500 miles is possible during the hours of darkness, and until two to three hours after local sunrise. Thirty-one meters, too, is highly congested, making reception of weak exotic signals a bit more of a challenge.

Nineteen through 25 meters (19 through 22 in October) compete with 16 for the good daytime DX during November and December. They will open for DX just before sunrise and should remain open from all directions throughout the day, with a peak in the afternoon. Nighttime conditions will favor openings from the south and tropical areas. Since the Southern Hemisphere has long daylight hours, DX paths on these bands from stations in the south will be common.

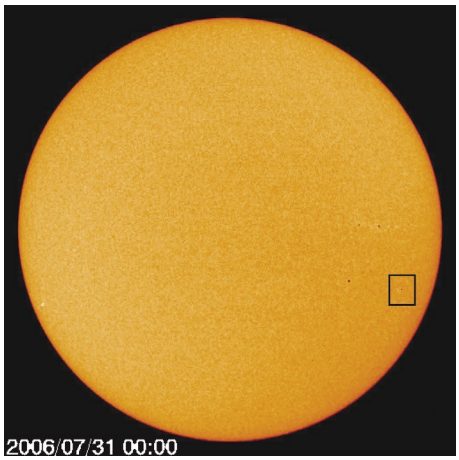
Sixteen through 13 meters will be open occasionally during the first months from October through December when the 10.7-cm flux levels reach above 100 and stay there for a few days. This is not going to happen often, now that we are so close to the current solar cycle ending (predicted to be during 2007). Paths from Europe and the South Pacific, as well as from Asia (at least during days of higher solar flux levels), are possible, especially on 16 meters. Look for best conditions from Europe and the northeast before noon and from the rest of the world during the afternoon hours. Reception from the South Pacific, Australia, New Zealand, and the Far East should be possible well into the early evening. When flux levels remain lower, these openings may be short-lived.

The best propagation aid is a set of sunrise and sunset curves, since DX signals tend to peak when it is local sunrise at the easterly end of the path in question. A good Internet web site featuring a grayline map display is found at **www.fourmilab.to/earthview/** Follow the link, "map of the Earth" showing the day and night regions.

Skipping around

For short-skip openings during December, try 90 through 41 meters during the day for paths less than 250 miles, and 90 down to 120 meters at night for these distances. For openings between 250 and 750 miles, try 41 meters during the day, and both 90 and 120 at night. For distances between 750 and 1300 miles, 22 through 31 should provide daytime openings, while 41 down to 90 will be open for these distances from sunset to midnight.

After midnight, 90 meters will remain open out to 1300 miles until sunrise. Try 31 and 41 meters again for about an hour or so after sunrise. For openings between 1300



This view of the sun shows the small sunspot, indicated by the box, that had a backward magnetic polarity. It did not last long enough to be numbered in the official record, but it did alert solar scientists that a new solar cycle may have begun (see text).

and 2300 miles, openings will occur on 22 through 16 meters, with fewer on higher bands, during the daylight hours. During sundown to midnight, check 22 through 41 meters for these long-distance openings, and then check 41down to 90 meters after midnight until sunrise. Try 41 and 31 meters again for an hour or so after sunrise.

The Spring Scene

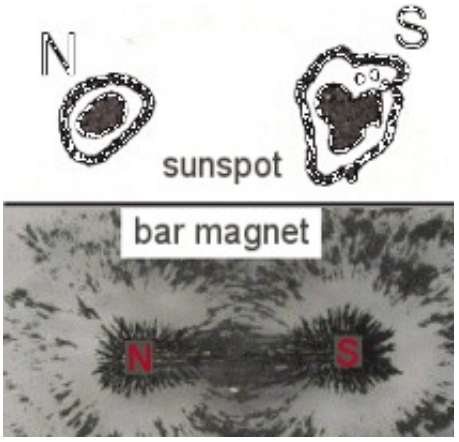
Propagation changes again after January, as the hours of daylight increase. March is one of the optimal DX months. As the Spring Equinox approaches, the gray-line begins to run straight North and South. The return of sunlight to the polar north creates north-south openings on 11 through 25 meters. However, since we are near the end of the solar cycle, and the ionosphere is not as energized as during the peak years, east-west path openings on higher frequencies will be less frequent and shorter than the last few years.

By March, 16 meters will still stay open long into the evenings. You will occasionally find 16 meters open all night long. Daytime paths will not degrade much until midsummer. You will see more early closures if you live closer to the North Pole.

Twenty-two and 19 meters will remain in excellent shape. Both short and long path circuits are reliable and solid. All nighttime paths are wide open during March. Prime time evening hours in the United States are sunrise hours across Russia, Africa, and both the Near and Far East. Expect a lot of short and long path DX from these areas of the world.

Between sunset and midnight, expect occasional DX openings on all bands between 15 and 41 meters. Conditions should favor openings from the east and south. These bands should peak for openings from Europe and Africa near midnight.

From midnight to sunrise, expect optimum DX conditions on 31 through 90 meters, and occasionally, 120 meters. Conditions should favor openings from the west and



A comparison of a bar magnet and a sample sunspot configuration. Sunspots always appear in a group, with regions that have a north magnetic polarity, and regions that have a south magnetic polarity. Source: NASA

south. Some rather good openings on 19 and 22 meters should also be possible from the south and west during this time.

Noise levels are slowly increasing as we move toward the spring season. Geomagnetic storms will increase, disrupting the mid- and high-latitude ionosphere. During the Spring Equinox, Earth's magnetic field is sufficiently perturbed by solar wind particles flowing into the auroral zone (between 50 and 70 degrees north geographic latitude) to cause the ionosphere to be depleted.

Propagation on VHF and Above

It is still possible to catch some *trans-equatorial propagation* (TE) during October. TE favors regions located in a region that lies about 1800 miles on both sides of the magnetic equator. It is necessary, however, to keep in mind that the magnetic equator is not the same as the geographic equator.

Moderate levels of trans-equatorial propagation (TE) are expected; stations in the southern states and parts of the Caribbean will be able to work into the northern areas of South America during the late afternoon. During peak years of a solar cycle, October is one of the best months for TE activity, especially later in the month. Since we are in the tail end of the current solar cycle, these openings will be rarer than previous years, but some exciting openings might occur.

Look for TE openings after sunset, between 8pm and 11pm, local time. TE is caused by a wrinkling in the ionosphere above the magnetic equator that causes a double hop on the ionosphere from one side of the equator to the other, over the magnetic equator. Signals from 14 MHz up to 430 MHz can be propagated in this way.

Sporadic-E activity is sparse during October in the northern Temperate Zone (where much of the U.S. is located). If a sporadic-E opening should occur and link with a TE opening toward the south, expect a possible opening into Argentina, or even possibly into Australia and the South Pacific. A slight increase in Sporadic-E (Es) starts late in November and peaks in December, so keep your ears open for low-VHF (FM, TV carrier, and six-meter amateur) signals via this mode.

Quite a bit of *meteor shower* activity is expected in November and December, providing conditions for meteor-scatter openings on the VHF bands for distances up to about 1000 miles. When a meteor burns up in the atmosphere, its intense heat creates an ionized trail, making it possible for radio signals to propagate off of the ionized trail much like they would off of the ionosphere. Look for the November **Leonids** starting around mid-November. After the Leonids, check out the **Geminid** meteor shower in mid-December. Both of these showers provide great opportunity to experience VHF DX via the plasma vapor trails left by the intense heat caused by the meteor as it burns up in the atmosphere.

Meteor scatter propagation is a mode where radio signals are refracted off of these trains of ionized plasma. Because the height of these plasma trains is in the E layer of the ionosphere, the range of a meteor scatter contact is between 500 and 1300 miles. The frequencies that are best refracted are between 30 and 100 MHz. However, with the development of new software and techniques, frequencies up to 440 MHz have been used to make successful radio contacts off of these meteor trains.

Lower VHF frequencies are more stable, and last longer, off of these ionized trails. A six-meter contact may last from a second to well over a minute. The lower the frequency, the longer the specific "opening" made by a single meteor train. Conversely, a meteor's ionized train that supports a sixty-second refraction on six meters might only support one-second refraction of a two-meter signal. Special high-speed digital modulation modes are used on these higher frequencies to take advantage of the limited available time, like high-speed CW, in the neighborhood of hundreds of words per minute.

Write Me

Do you have questions about space weather and radio propagation? Do you have observations about MW DXing, or Meteor Shower propagation that you would like to share? Please write me an e-mail message or a letter.

I also invite you to check out my propagation resource center (including discussion forums) on the Internet at **http://prop.hfradio.org**. If you have a cellphone or other handheld device capable of reading WML, I have a WAP version of this resource center at **http://wap.hfradio.org** You can even sign up for my propagation eAlert service for free. These propagation eAlerts keep you informed of the various index numbers, in real-time. I wish you a happy radio-monitoring season!

73 de NW7US, Tomas Hood
prop-man@hfradio.org
(P.O. Box 213, Brinnon, WA 98320-0213)

Ken Reitz, KS4ZR
kenreitz@monitoringtimes.com

Stalking Those Elusive Project Parts

Once upon a time (in the 1960s to be exact), there were several national electronics stores with catalogs the size of phone books packed with all kinds of hard to find electronics goodies. The most famous were Allied Radio and Lafayette Radio, though there were others. Then came Tandy Leather Company, which had franchised leather hobby shops across the U.S. and had acquired a promising company called Radio Shack in its corporate portfolio. In an amazingly short period of time, the rest of the catalog companies became bits of nostalgia crushed under the Radio Shack steamroller.

However, in the last few years Radio Shack has slowly reduced the "radio" part of its company, forcing hobbyists to search elsewhere for parts and hard-to-find electronic items. Over the years I've gotten a lot of my project components from a variety of mail order companies which are listed below. I've found that, with each item, the products are the same or better than those sold at the Shack or other electronics stores but, the prices are 10-90% less. I have experienced excellent service from each of these companies and recommend them all.

It's true that buying on-line or via mail order isn't as convenient as running down to the local Radio Shack, but since they're closing some 700 of their stores, that, too, is becoming a thing of the past. One big advantage with buying from the companies listed below is that the discount prices more than compensate for having to pay the shipping. In some cases, as you'll see, it's possible to have items shipped next day air and still beat the local prices!

All Electronics Corp.

Here's a treasure trove of electronics-related items for the beginner or expert experimenter. Browse the unending list of items from A.C. line cords to wiring nuts. I found huge savings on things such as components, cables, connectors, telephone accessories, and much more. Many of the products listed are reviewed by customers and are given ratings. Some, like the monaural headset (see photo) have tips from other experimenters on what they've done with the products. This turns the All Electronics web site into a how-to reference site as well. Be sure to check out their "web only" listing of limited quantity items at even deeper discounts.

Their web site is **www.allelectronics.com** and if your computer is as slow as mine you'll want the 96 page print edition of their catalog

Check out this monaural headset with boom mike from All Electronics Corp. Manufactured by Audiotronics for language lab use this item sells for just $4! (Courtesy: All Electronics)

delivered free to your home by calling, writing, FAXing, or E-mailing All Electronics Corp. 14928 Oxnard Street, Van Nuys, CA 91411 Phone 800-826-5432 or FAX 818-781-2653 or E-mail *allcorp@allcorp.com*.

Cable Wholesale.com

Anyone involved with the electronics hobby needs a great source for huge quantities of cable. The best place to go is **www.cablewholesale.com**. Lots of companies talk about "discount" cable and wire, but here's where you really get cable at wholesale prices. Here's an example: I needed at least 25 feet of toslink fiber optic cable to get digital audio out of an MPEGII FTA receiver which was across the room from the stereo. A well-known audio/video mail order store had only a 20-ft cable and the price was $74.99 plus shipping. I got the 25-ft cable I needed from Cable Wholesale.com for $16.32 plus shipping.

I needed an extra long "S" video cable for the same receiver to get to the VCR. Again, at the famous name store their 19.8 foot "S" video cable was $44.99. At Cable Wholesale.com it was $9.99 for 25-ft.

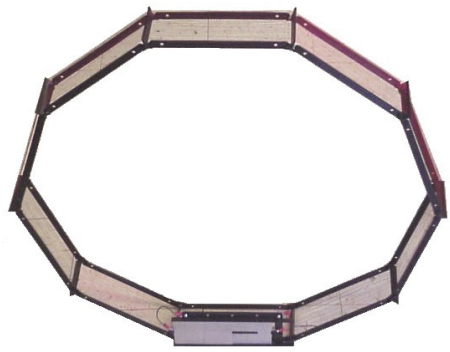
But wait, there's more! I needed a component cable set to bring HDTV signals from my 4DTV satellite receiver to the HDTV set. The distance was 35 feet. At the big name company the best they could do was get me 26 feet at a whopping $149.99. Cable Wholesale.com had the whole 35-ft for $34.83. Now that's a discount! You can get 100 feet of RG/6 coax (with connectors) for $14.67. Need extra long computer cables for printers, keyboards or mice? Check out the line-up at Cable Wholesale.com.

Browse the dozens of pages of audio, video, coax, fiber optic, component video, HDMI, and DVI cables at their well designed web site. You can place your order or get price quotes on-line or call 888-212-8295. Their mailing address is P.O. Box 11775 Pleasanton, CA 94588 and the FAX number is 925-227-1119.

Fair Radio Sales

Since 1947 this company has specialized in military surplus electronics, but they also have many items of interest to all builders, experimenters, and collectors. They sell everything from working military surplus radio transceivers to individual electronic components. Check out their complete list at **www.fairradio.com**.

Over the years I've gotten many items from Fair Radio Sales, including a vintage 1942 all-steel Western Electric telephone which I bought in 1982 and is still in service today. Back then I paid $11 for it.



Build a complete crystal radio set from a kit by Fair Radio Sales which includes this cool decagonal loop antenna, a three-plate sliding capacitor, germanium detector diode and high impedance earphone for just $27.95. (Courtesy: Fair Radio Sales)

You'll find an amazing assortment of goodies, like a box kite antenna ($24), 306-ft spool of #22 wire for the kite ($12.95), WWII vintage lip microphones ($20), and vintage Morse code hand keys which can be strapped to your knee ($45). They have a complete AM crystal radio kit made up of vintage pieces

This military issue R-392 HF receiver from Fair Radio Sales sports no fewer than 25 tubes and tunes .5 to 32 MHz in AM and CW modes in 32 one MHz bands. It's not cheap: $550 in "checked" condition. Don't forget the power supply ($45) and manual ($17) and, of course, you'll have to pick up the shipping on this 58 pound monster. (Courtesy: Fair Radio Sales)

they've put together, including a great ten sided AM loop receiving antenna (see photo above). They have a huge assortment of tubes for those vintage radio projects.

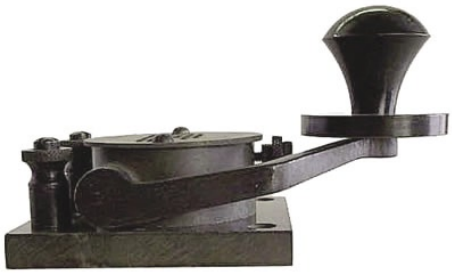
They also have a print catalog which is sent out periodically; you can join the mailing list by writing them at Fair Radio Sales 2395 St. Johns Road Lima, OH 45804 or calling 419-227-6573 or FAX 419-227-1313 or e-mail: *fairradio@fairradio.com*

Mouser Electronics

This company is all about new components. It's where you want to go when you need any particular component for a project. They stock an insane number of items from optoelectronics to semiconductors, wire & cable, to tools & supplies. Check out the Mouser web site at **www.mouser.com**. To order their catalog write, call, FAX or e-mail as follows: 1000 North Main Street Mansfield, TX 76063 800-346-6873 (7:00 am to 8:00 pm CT) FAX 817-804-3899 or *catalog@mouser.com* They have no minimum order, offer same day shipping, and you can sign up for an e-newsletter.

Surplus Sales of Nebraska

Their motto is "Where the hard to find parts are found and on hand!" Go to the product index on the home page of **www.surplussales.com** and check out the available items by alphabetical order. Remember, these are surplus items, so you take them as is and when the quantity runs out they may no longer be available. Most items are unused; some are salvaged, but, being surplus means that the prices are right.



Collect code keys? Check out this J5A key from Surplus Sales of Nebraska it's "flame proof" and never used. At press time there were only 11 left at $95 each. (Courtesy: Surplus Sales of Nebraska)

They also have a substantial number of vintage shortwave and amateur radio transmitters and receivers for sale. I saw a Hallicrafters SX-62 shortwave receiver in "excellent condition" for $395, a Drake TR3 transceiver and power supply in "very good condition" for $325. There were items from Collins, Heathkit, and Johnson, and microphones from Astatic, Turner, as well as CB replacement mics. There are just too many categories and items to even begin to mention. Plan to browse Surplus Sales for a couple of hours.

These heavy duty component video connectors are as good as the name brand ones and $100 less expensive in a 35' run. (Courtesy: Cable Wholesale.com)

Check out Surplus Sales of Nebraska at **www.surplussales.com**. They're located at 1218 Nicholas Street, Omaha, NE 68102. Their phone number is 800-244-4567 FAX: 402-346-2939 and you can E-mail them at *grinnell@surplussales.com*.

OK, Now It's Your Turn

These are just a few of the discount places you'll save up to 90% on similar products found at what's left of Radio Shack. If you have a favorite place for electronic parts, supplies and electronic curiositie,s let me know and I'll pass it on via the *Beginner's Corner*.

ASK BOB

GENERAL QUESTIONS RELATED TO RADIO

Bob Grove, W8JHD
bobgrove@monitoringtimes.com

Q. *A frequency change for a local FM station puts it right on top of another, closer station, so all I get is interference on the one I want to hear. I've tried twisting and turning the whip on my Yamaha receiver, but to no avail. I can't put up an outside antenna; do you have any other suggestions? (David Tager, email)*

A. If the two stations are not in the same direction, you might be able to use an external directional antenna, or an omnidirectional (non-directional) antenna placed alongside a metal mast or other large metal surface to take advantage of reflections, making it directional.

Try making a directional antenna out of a pair of TV "rabbit ears" fully extended; this would allow you to rotate the antenna and mount it in various positions and locations, especially on or alongside the metal surface of a refrigerator, filing cabinet or washer or dryer.

Since rabbit ears are equipped with twin lead, you may need a small TV-type balun transformer to convert it to coax cable with the appropriate plug to fit the external antenna jack on your FM receiver. If your receiver has screw terminals for twinlead, you're OK as is.

Q. *I have two antennas in the attic and two in the backyard, and would like all four hooked up to my SAT 800 for shortwave listening. I am considering purchasing several DC-2 GHz antenna switches. Is that the way to go? Matt Stanley, email).*

A. At shortwave frequencies and lower, nearly any kind of switch is adequate, including AC toggle and even wall switches! You don't need the low-loss coax switches that work to 2 GHz; just keep the exposed center wire short and commonly ground (interconnect) all the coax shields.

That said, high-quality coax switches look nice and work well, and you may want to extend your frequency ranges in the future, so you can't lose with those.

Q. *I am trying to improve my shortwave reception with an accessory between my receiver and antenna. What is the difference between a balun, preselector and tuner? (Mike Kieffer)*

A. A balun ("balanced-to-unbalanced") transformer is simply a broadband coupling device that allows a balanced antenna like a dipole to be fed to an unbalanced line (coaxial cable) without distorting the uniform radiation pattern of the antenna.

A tuner is a combination of adjustable inductors and capacitors that allow an impedance-mismatched antenna system to match the 50 ohm antenna connection on a radio. Impedance matching is very important for transmitting, but not nearly as important for receiving.

A preselector is simply a tuned circuit that favors a particular, narrow frequency range to avoid strong-signal overload from off-frequency signals which could cause the receiver to become desensitized, or produce "distortion products" like images and intermodulation.

None of these devices is necessary when a good receiver is connected to a good antenna.

Q. *If a clothing manufacturer has embedded an RF ID chip in a product, how would the customer find it? What frequencies are used by these chips? (James Rubin, Queens, NY)*

A. Common frequency ranges are on or around 125-148 kHz, 13.56 MHz, 433 MHz, 902-928 MHz and 2.45 GHz.

Moisture and metal take their toll on read ranges, which are from a few inches up to about 30 feet, with some custom (non-commercial) units claiming a mile, depending upon the unit, frequency and power.

Passive tags are "illuminated" by the reader to radiate their code; active tags contain a battery and remain powered as long as five years. Their presence can be detected by a receiver, RF detector or spectrum analyzer.

An excellent web site on RF ID tags is found at: **http://en.wikipedia.org/wiki/RFID#Human_implants**

Q. *Are Slinky antennas any better than a conventional, single-wire antenna? (Bill Fusfield)*

A. No, a Slinky antenna doesn't perform better than a dipole. Their convenient portability and shorter length for resonance are their only benefits. But both antennas require tuning for different bands.

A wire wound on a spool would be as conveniently carried, just as easily adjusted to appropriate length, would have larger aperture because of its longer dimension (thus providing slightly-higher signal capture), would be less vulnerable to erratic tuning in the wind or other movement (the Slinky's tuning would constantly change with movement), and have wider bandwidth at a low SWR due to lower Q.

Q. *Is the U.S. Air Force Tactical Air Command (TAC) still active on shortwave frequencies? (Roger Henderson, Memphis, TN)*

A. No, they've been reorganized as explained by Larry Van Horn in the Grove *Military Frequency List* CD:

"The former TAC, MAC, and SAC are history. In their places are the new Air Combat Command (ACC) and the Air Mobility Command (AMC)."

But the Air Force still populates the shortwave frequencies with clear-voice SSB communications on an on-going basis.

Q. *There is a popular legend that soldiers marching across a bridge can cause the bridge to collapse unless they break the rhythm. Is there any truth to this story? (Mark Burns, Terre Haute, IN)*

A. The "breakstep bridge" myth began many decades ago when a rank of soldiers supposedly marched in cadence over an old bridge and it collapsed. Have you ever watched "Mythbusters" on TV? They did a thorough test of the legend, including robotic feet beating on a suspension bridge, and failed to find any evidence of harmonic resonance. A long line of men marching in step, each pounding a different part of the bridge, would not establish a resonant impetus to the bridge. It remains a myth; it's busted!

Q. *I have noticed that two-meter transceivers (144-148 MHz) seem to outperform 70 cm transceivers (420-450 MHz) at the same power levels. Is this a valid observation? (Judy May, W1ORO, Union, Kentucky)*

A. Yes, indeed it is. The higher the frequency, the more attenuation the signal will experience in propagation due to moisture, foliage, smog, terrain, etc. Another factor is the length of the antennas. The longer antenna at two meters captures more signal voltage than the shorter 70 cm, assuming the same ratio fractional-wavelength antennas are used (quarter wavelength, 5/8 wavelength, etc.).

Questions or tips sent to Ask Bob, c/o MT are printed in this column as space permits. Mail your questions along with a self-addressed stamped envelope in care of MT, or e-mail to bobgrove@monitoringtimes.com. (Please include your name and address.)

MT HELP DESK

SPECIFIC FREQUENCY AND EQUIPMENT QUESTIONS

Larry Van Horn, N5FPW
larryvanhorn@monitoringtimes.com

Q. *I was trying to listen to HF and most of the transmissions were drowned out by some sort of noise. I was intrigued to know what it was. The next obvious question would be how to stop this interference. I have made a recording. (John Barnett via email)*

A. The noise you are hearing is not "noise," but it is a station transmitting in the STANAG 4285 digital mode. You won't be getting rid of this interference. I have placed your audio recording on the *MT* Audio Library page to help others identify this utility band transmission.

Q. *Do you have a lead on where I might be able to get the manual electronically and the final run of EPROMS for an Universal M-8000 decoder? Picked up a unit on eBay without these and would like to find a manual and update the system. (Dino Papas via email)*

A. I have good and bad news. The good news is while manuals may not be available for the M-8000 series decoders, you can still get a printed version from Universal Radio for $20.00. They will need to know which version of the M-8000 you have. Universal has an Adobe PDF file that gives a handy summary of differences between the firmware revisions at **www.universal-radio.com/catalog/decoders/rttymods.pdf.** On the rare occasion that an M-8000 needs service, Universal can handle any of those needs as well.

The bad news is EPROM updates are no longer available, according to Fred Osterman, owner of Universal. For more information you can contact Universal Radio at 614-866-4267 or via their website at **www.universal-radio.com/index.html**.

Q. *I have heard that Beacon DGPS is being replaced by WAAS DGPS. It this true? (Anonymous via email)*

A. First let's translate the alphabet soup. DGPS stands for Differential Global Positioning System and WAAS stands for Wide Area Augmentation System.

Beacon DGPS and WAAS DGPS operate on the same theory. Basically, a position correction is provided the user's navigation unit when a monitoring station calculates the difference between where it *knows* it is and the place the GPS indicates it is.

The beacon DGPS correction is broadcast on low frequencies from the Coast Guard beacon station. The WAAS DGPS correction is sent from the master stations to INMARSAT satellites for broadcast on the same frequency as the GPS signal. The low frequency signals broadcast from the ground-based beacon DGPS stations are more susceptible to radio frequency and atmospheric static interference, and they have a limited range. The WAAS DGPS signals, since they are higher in frequency and satellite-based, are less susceptible to interference and will provide three meters of latitude/longitude position accuracy over a large contiguous geographic area.

You can learn more about WAAS GPS on the Northstar Technologies Inc website at **www.concordelectronics.com/faq16.html**

Q. *Caught an EAM from Andrews AFB directed to "Cigar Smoke" on 5700 kHz USB. No joy from Cigar Smoke. Any ideas on a possible ID for Cigar Smoke? (Rick Fenlon via email)*

A. We have covered this type of military station before in the *Help Desk*. Station Cigar Smoke is one of the U.S. military National Command Authority stations, which change tactical callsigns *daily* in order to make it difficult to pin down the specific aircraft platform, mission or ground station receiving the message. You can learn more about EAM (emergency action message) transmissions and these callsigns on the *Monitoring Times* website at **www.monitoringtimes.com**.

Q. *Do you have any information about McMinn and /or Monroe counties in Tennessee? I will be moving there and would like to monitor what I can. I have an Icom PCR 1000, and various hand held scanners. (Ace Richards via email)*

A. As far as HF communications are concerned, not sure where you live now, but if it is on the east coast, your HF listening will probably be no different than what you are used to now.

For the VHF/UHF spectrum, the definitive scanner source for all things in and around the Chattanooga, Tennessee, area (including McMinn and Monroe Counties) is the Scan Chattanooga website. You can reach this site at **www.scanchattanooga.com/**.

I also have a list on the *Monitoring Times* website for the three-state area of northern Georgia, western North Carolina, and southeast Tennessee (plus northern Alabama) that I update on a semi regular basis. It is compiled from actual on-the-air monitoring. You can see that list at **www.monitoringtimes.com/html/Quad.pdf**. If you are going to monitor the trunk system down in Chattanooga, your PCR1000 will be useless. You will have to look for a digital capable scanner. Otherwise your radio will work fine in your new listening area.

Q. *Monitored DUASPR and D5ASPR on 15091 kHz in USB/ALE. Do you know who they are? These stations would be US military, but who? (Ross in Sydney, Australia)*

A. I have never seen either a DUASPR or D5ASPR sound on any of the SIPRnet (Secret Internet Protocol Router Network) frequencies. I would guess that, given your location, frequency, and time, you have found GUASPR sounding from Andersen AFB, Guam. It comes the closest to matching DUASPR, in all but one character. Another outside possibility might be PLASPR from Lajes, in the Azores.

Q. *Who uses the AEDSPR ALE address on 5702 kHz? (Jon in Florida)*

A. That is also part of the SIPRnet, and the station is Elmendorf AFB in Alaska.

Q. *I'm curious, are there current call signs for the shortwave relay stations in Delano CA and Greenville NC? You can find the history of these stations and the old calls when they were built or when they changed hands, but nothing current. Also, what about the transmitting stations in Key West and Pearl Harbor for the AFN, do these have "standard" call signs? (Tom in Overland Park, Kansas)*

A. There are no callsigns for the two Voice of America (VOA) relay stations. They are government stations and as such are not required to have a callsign.

Regarding the Armed Forces Network stations, the answer is a bit different. These broadcasts are relayed via U.S. Navy communications facilities which do have callsigns, but unrelated to the broadcasts. So, no, there are no callsigns associated with the AFN fleet broadcasts.

Since both of these are government operations, the Federal Communications Commission does not control the operation, frequencies or callsigns of such stations. That comes under the umbrella of the National Telecommunications and Information Agency as do all government communications.

Dan Veeneman
danveeneman@monitoringtimes.com

Halloween Trick and Treat

October is the traditional time for trick-or-treating. This month we have a trick from Florida that is not so kind to our hobby and a treat from the National Weather Service about real-time weather data via radio.

❖ Florida

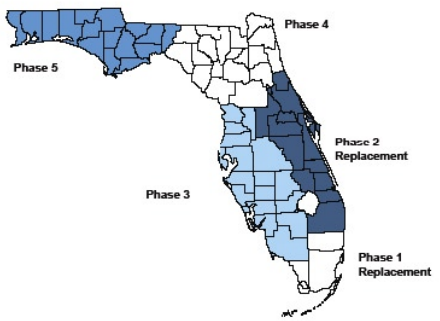
In July of this year, the State of Florida announced that the Statewide Law Enforcement Radio System (SLERS) is complete and fully operational. While perhaps good news for the state, it's bad news for scanner listeners.

Rather than choosing a standard APCO Project 25 system, as many other states and municipalities have done and as the Federal government recommends, Florida has implemented an EDACS (Enhanced Digital Access Communications System) using a proprietary digital voice format called ProVoice. This means that there is no consumer-level scanner on the market today that can monitor the system.

In addition, SLERS uses a system feature called *ESK*, or EDACS Security Key. This feature uses a secret security code to scramble the inbound and outbound control channels, preventing trunk-tracking scanners from understanding talkgroup activity. The manufacturer, M/A-COM, originally touted ESK as a way to prevent unauthorized two-way radios from accessing the system. The concern was that a radio originally from outside the system could come in and begin using system resources without the knowledge or consent of the system owner. However, ESK is advertised as also preventing trunking scanners from monitoring EDACS radio traffic.

SLERS serves more than 6,500 officials from 17 state agencies across the state and as far as 25 miles offshore. Broward and Hillsborough county sheriff's offices have also joined the system, as have the U.S. Fish and Wildlife Service and investigators from the Social Security Administration. According to state officials, more than 200 local public safety agencies have access to SLERS. Across the state at least 14,000 new radios have been purchased.

SLERS Phased Installation



As with most other new systems, interoperability was a selling point. Officials cited multiple incompatible systems as a major factor in preventing effective interagency communications. Florida's idea of interoperability appears to be having everyone operate on the same system. How Federal agencies and mutual aid organizations will be able to enter the state to assist after the next hurricane without getting their own EDACS/ESK radios is not clear.

A second selling point of the system was the capability to make much better use of assigned frequencies. Florida had struggled for years with a lack of radio frequencies. Even as the state population grew, law enforcement personnel had to share a limited number of radio channels, often delaying and confusing critical communications.

Radio over Internet Protocol

SLERS is essentially a digital network based on Internet Protocol that just happens to be moving voice instead of web sites or electronic mail. The 300 or so repeater sites across the state are linked via Cisco routers, allowing the use of standard Internet hardware and software. Of course, that also makes it vulnerable to intrusion and other security weaknesses common to IP-based networks, although one hopes that the State of Florida and M/A-COM have taken the proper precautions to mitigate such attacks.

The system has been a long time in coming. In 1988 the Florida Legislature passed a bill authorizing the creation of a statewide radio communications system for law enforcement use. They also passed a $1 surcharge on motor vehicle registrations to pay for the new system.

After years of analysis and planning, the State awarded a contract to Motorola to build the new system. The state was divided up into five areas and installation was to proceed one area at a time. Motorola began work, but under much controversy, and for a number of reasons failed show sufficient progress to satisfy its critics. By 2000, only two areas had been installed and the delays and cost overruns motivated the State to oust Motorola and bring in rival M/A-COM.

The contract with M/A-COM is worth somewhere in the neighborhood of $290 million. The State claims it will have saved more than $620 million over the 20-year life of the contract compared to what it would have spent with Motorola.

By February of 2004, SLERS began operation in 17 of the 67 counties in Florida. At the same time Regional Communications Centers were being established in Fort Myers, Jacksonville, Tallahassee and Tampa. Later that year hurricanes Charley, Frances, Ivan and Jean proved the system was adequate to withstand severe weather. Despite minor damage and logistical problems, SLERS performed relatively well, considering cellular and terrestrial telephones were either overloaded or nonfunctional in many parts of the affected areas. Additional counties came on-line after hurricane season, at which point the work began to replace the old Motorola system in the central and southern parts of the state.

Revenue Partnership

Funding the new system is an interesting partnership between the State and M/A-COM. There are a lot of details, but here are the highlights. M/A-COM received $40 million up front and currently receives between $13 million and $17 million annually from the motor vehicle registration surcharge. For all this money, M/A-COM provides the permanent equipment (called *infrastructure*), such as repeater sites and dispatch consoles, as well as performing installation and maintenance work.

Also, in exchange for about $25 million worth of radios and related hardware, the State turned over a number of repeater sites and associated equipment. This allows M/A-COM to rent out space on repeater towers to private and commercial radio operators, garnering additional revenue. Some of that money is to be shared with the State.

If counties wish to use SLERS, they are required to pay a monthly fee to M/A-COM, in addition to the cost of the EDACS radio equipment they may need (which would also be purchased from M/A-COM).

An additional $7 million to $9 million worth of enhancements were identified by a state task force; however, the bill to pay for it – by adding another $1 to the motor vehicle surcharge – did not pass the Legislature. The enhancements, which include additional repeater sites and dispatch consoles as well as a backup network, may be funded through other means.

❖ NATSAR Frequency

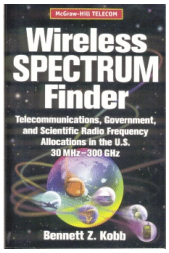
Dan,

I'd imagine that you're aware of it by now, but it appears that there was a typo in your August 2006 Monitoring Times "Scanning Report" column. On page 25, you list 150.160 as the proposed National Search and Rescue (NATSAR) frequency. Seeing that 150.160 would be in a military land mobile band, I did a little online digging for more information. At least a couple of sources I found say that the NATSAR frequency is (or will be?) 155.160. One of the sources I came across, the State of Wisconsin Statewide Mutual Aid Frequency Plan (written by Carl Guse, who is also an active scanning hobbyist) can be viewed at ***http://siec.wi.gov/docview.asp?docid=6715*** *. This might be interesting reading for readers of your column as well!*

I enjoy your column, please keep up the fine work!

Kevin, member, Chicago Area Radio Monitoring Association (CARMA)

Thanks for the catch, Kevin. According to my copy of *Wireless Spectrum Finder*, 150.160 MHz falls in a block between 150.05 MHz and 150.8 MHz which is primarily used by the military. Parts of the block are also allocated to the Emergency Medical Radio Service (EMRS). The Federal Communications Commission (FCC) created EMRS in 1993 to "enhance the reliability of emergency medical radio communications by dedicating specific frequencies solely to life support related transmissions." There are 39 channels in VHF and UHF with more than 1,000 license holders.



By the way, *Wireless Spectrum Finder* is a terrific resource if you're hunting around in unfamiliar frequency bands. The book is just shy of 500 pages and contains descriptions of frequency allocations and the actual use made of those frequencies from 30 MHz up to 300 GHz. Although it's now five years old, it continues to be a handy guide for making sense of activity you might hear. It's also useful to give you new ideas on where in the frequency spectrum to try new scans. Used copies are available on-line for less than $20, should you wish to get a copy for your listening shack.

Emergency Weather

Some of the frequencies in and near to the 150.05 MHz to 150.8 MHz block are used to broadcast weather information known as *EMWIN*. Emergency Managers Weather Information Network (EMWIN) is a data stream from the National Weather Service (NWS) containing digital weather information intended for the public. It contains current weather watches and warnings, advisories and forecasts issued by the NWS, surface and upper air observations, satellite images, some radar graphics, and other related products.

Information from local weather service offices is sent to NWS Headquarters in Silver Spring, Maryland, just north of Washington, D.C. There it is collated and assembled for transmission over the GOES (Geostationary Operational Environmental Satellite) weather satellite network by the Satellite & Information Services division (NESDIS) of the National Oceanic and Atmospheric Administration (NOAA). GOES satellites provide weather imagery and other meteorological data for the NWS. These satellites also carry equipment designed to receive Emergency Locator Transmitter (ELT) and Emergency Position-Indicating Radio Beacon (EPIRB) signals for use in search and rescue operations.

According to the NWS, EMWIN began in 1994 as an outreach project and is now evolving into a fully operational and supported NWS service. There are three primary ways of accessing the EMWIN data stream. The first is to use a satellite receiver and small dish to gather the data stream from a GOES satellite. Over the continental United States, GOES-East (over the Amazon River at 75 degrees West) and GOES-West (over the eastern Pacific Ocean at 135 degrees West) broadcast EMWIN data on 1690.725 MHz.

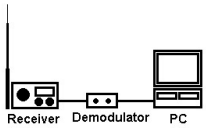
The current data stream, denoted EMWIN-I, uses a modulation technique called Dual Frequency Shift Keying (DFSK) at 9,600 bits per second (bps). Custom satellite receiver equipment converts the signal from the satellite into a stream of data bits. Software on a personal computer separates those data bits into the various NWS images and messages, making them visible to the user.

EMWIN Upgrades

Due to the popularity of EMWIN data and an exception granted to the NWS, the data

stream is scheduled for an upgrade. The new format, called *EMWIN-N*, will operate at twice the data rate (19,200 bps) of the existing stream and will use a more complex modulation scheme called offset quadrature phase shift keying (OQPSK). EMWIN-N will also use a technique called forward error correction, which will allow the receiver to identify and correct most errors that may occur during transmission.

On May 24th, 2006, the next GOES satellite, designated GOES-13, was successfully launched from Cape Canaveral in Florida and is now on station near 90 degrees West. This satellite will eventually carry the new EMWIN-N data stream. EMWIN-I is scheduled for discontinuation by 2011, although it may disappear earlier than that if testing is successful and users can be upgraded to EMWIN-N equipment and software.



EMWIN MONITOR STATION

If satellite reception is not to your liking, there are two other ways of accessing the EMWIN data stream.

EMWIN Rebroadcast

The National Weather Service, along with other agencies, transmits part of the EMWIN data stream on VHF and UHF frequencies. These radio signals can typically be heard from anywhere within 40 or 50 miles of the transmitter. By using a radio receiver, an interface device called a *demodulator*, and software on a personal computer, anyone can receive this information. It includes forecasts and observations, severe weather watches and warnings, Severe and Special Weather Statements, as well as Civil Emergency Messages and National Attack Warnings. In coastal states, Hurricane-related bulletins would also be rebroadcast.

The data stream does have a couple of advantages over the standard NOAA Weather Radio that you might already listen to. First, the information often arrives on the data stream earlier than on the radio. Second, the data stream can be printed, stored and processed as text and images, rather than a voice announcement. Third, you don't have to wait for the message to be repeated on the radio – once you've captured it from the data stream, you have all the details in front of you.

Here is a list of broadcast locations, frequencies, and the data rate of the stream. If anyone has updates to this list, please send them to me at *danveeneman@monitoringtimes.com*

STATE	CITY OR AREA	FREQ	DATA RATE
Alabama	Dadeville	163.325 MHz	1200
	Mobile	148.050 MHz	1200
	Opelika	453.275 MHz	1200
Arkansas	Fayetteville	148.050 MHz	
	Harrison	148.025 MHz	1200
District of Columbia			
	Washington	400.175 MHz	1200
Florida			
	Gainesville	163.325 MHz	1200
	Rockledge	158.805 MHz	1200
	Sanford	156.105 MHz	
	Saint Petersburg	139.2125 MHz	1200
Illinois			
	Germantown Hills	148.6375 MHz	1200
	Wheaton	148.6375 MHz	1200
Indiana	Goshen	147.480 MHz	1200
Kansas	Wichita	155.775 MHz	1200
Louisiana	Monroe	139.390 MHz	9600
Maryland	Brunswick	142.925 MHz	1200
	Laurel	142.925 MHz	2400
	Silver Spring	400.175 MHz	1200
Michigan	Battle Creek	150.500 MHz	1200
	Fremont	163.300 MHz	1200
	Whitehall	163.325 MHz	1200
Mississippi	Pascagoula	148.375 MHz	1200
Missouri	Buffalo	139.2125 MHz	1200
	Chesterfield	460.425 MHz	1200
	Kansas City	139.2125 MHz	9600
	Nevada	139.2125 MHz	1200
Nebraska	Wilber	156.105 MHz	1200
North Dakota	Bismark	143.150 MHz	1200
	Fargo	143.150 MHz	1200
	Grand Forks	143.150 MHz	1200
	Great Falls	143.150 MHz	1200
Oklahoma	Atoka	153.950 MHz	1200
	Broken Arrow	142.950 MHz	9600
	Clinton	148.775 MHz	1200
	Durant	150.750 MHz	1200
	Enid	142.950 MHz	9600
	Kiamichi Mountain	142.950 MHz	1200
	McAlester	148.775 MHz	1200
	Norman	169.025 MHz	1200
	Oklahoma City	150.750 MHz	9600
	Poteau	150.750 MHz	1200
	Stillwater	148.775 MHz	1200
	Woodward	150.750 MHz	1200
South Carolina			
	Moncks Corner	141.500 MHz	1200
Tennessee	Oak Ridge	164.325 MHz	9600
	Memphis	150.890 MHz	9600
Texas	Austin	150.435 MHz	1200
	Burkburnett	150.435 MHz	1200
	College Station	89.1 / 67 KHz Subcarrier	1200
	Crockett	150.435 MHz	9600
	Denton	168.7125 MHz	1200
	Gainesville	163.350 MHz	1200
	Fort Worth	163.325 MHz	1200
	Houston (Downtown)	150.435 MHz	1200
	Houston (Downtown)	163.325 MHz	9600
	Houston (Northwest)	168.7125 MHz	9600
	Longview	150.435 MHz	1200
	McAllen	150.435 MHz	1200
	Mesquite	163.8125 MHz	1200
	Nursery	150.435 MHz	1200
	Paris	168.7125 MHz	1200
	Port Lavaca	150.435 MHz	9600
Virginia	Mappsville	163.350 MHz	1200
	Roanoke	148.775 MHz	1200
Wyoming	Cheyenne	453.4875 MHz	1200
	Laramie/Albany	141.300 MHz	1200

Transmissions may occur at 1200, 2400 or 9600 bits per second. Be sure to check if your demodulator is capable of working at the specified speed.

EMWIN via Internet

It is also possible to retrieve EMWIN data over the Internet by using File Transfer Protocol (FTP). NWS compiles EMWIN data into electronic archives, which can then be "pulled" via FTP into your computer. After unpacking the archive, individual EMWIN products would be available for use.

NOAA also operates the Interactive Weather Information Network (IWIN), which provides text and graphical versions of EMWIN products. For instance, you can retrieve text-only warnings for the entire country by checking the web page at **http://iwin.nws.noaa.gov/iwin/us/allwarnings.html**

Decoding Data

If you'd like a relatively easy and very practical introduction to receiving and decoding digital data, EMWIN may be the right way to go. Commercial vendors offer hardware and software to decode and display the data stream. The NWS has identified a number of vendors, which you can see listed on the web at **www.nws.noaa.gov/emwin/winven.htm**

There are electronic mailing lists for EMWIN users as well as separate groups for programmers who would like to write their own software. The National Weather Service has a number of web pages with EMWIN information, starting at the official home page **www.nws.noaa.gov/emwin/index.htm**

❖ Scanner Manuals

Sometimes the manual that comes with the scanner isn't always easy to understand. You may also want to see the instructions presented in a different manner, especially if you're working with a new, more complicated scanner.

One example can be found at **http://myweb.cableone.net/marksscanners/330/330test.html**

That page contains an "Easier to Read BR330T/BCD396T Trunking Scanner Manual." If you're having difficulty with the Uniden BR330T or the BCD396T, it might be worthwhile to check this page.

Often Internet newsgroups and mailing lists have participants with "cheat sheets" or streamlined instructions for your particular model. As we've discussed in previous columns, entering your scanner model into the search window on **http://groups.yahoo.com** or **http://groups.google.com** may turn up a friendly group of folks that can help you out when the factory-provided manual isn't enough help.

Of course, you are welcome to continue sending e-mail to me at *danveeneman@monitortimes.com* and check my website at **www.signalharbor.com** for more information on scanners, data decoders and frequencies. Until next month, happy trick-or-treating and happy scanning!

Big Savings on Radio Scanners

Uniden® SCANNERS

Bearcat® 796DGV Trunk Tracker IV with free scanner headset

Manufacturers suggested list price $799.95

CEI Special Price $519.95

1,000 Channels • 10 banks • CTCSS/DCS • S Meter

Size: 6 15/16" Wide x 6 9/16" Deep x 2 3/8" High

Frequency Coverage: 25.000-512.000 MHz., 806.000-956.000 MHz. (excluding the cellular & UHF TV band), 1,240.000-1,300.000 MHz.

When you buy your Bearcat 796DGV Trunktracker package deal from Communications Electronics, you get more. The GV means "Great Value." With your BC796DGV scanner purchase, you also get a **free deluxe scanner headphone** designed for home or race track use. Headset features independent volume controls and 3.5 mm gold right angle plug. The 1,000 channel Bearcat 796DGV is packed with features to track Motorola Type I/II/IIi Hybrid, EDACS, LTR Analog Trunk Systems and Motorola APCO 25 Phase I digital scanner including 9,600 Baud C4FM and CQPSK. Also features control channel only mode to allow you to automatically trunk many systems by simply programming the control channel, S.A.M.E. weather alert, full-frequency display and backlit controls, built-in CTCSS/DCS to assign analog and digital subaudible tone codes to a specific frequency in memory, PC Control and programming with RS232C 9 pin port (cable not supplied), Beep Alert, Record function, VFO control, menu-driven design, total channel control and much more. Our CEI package deal includes telescopic antenna, AC adapter, cigarette lighter cord, DC cord, mobile mounting bracket with screws, owner's manual, trunking frequency guide and one-year limited Uniden factory warranty. For maximum scanning enjoyment, order magnetic mount antenna part number ANTMMBNC for $29.95. For complete details, download the owners manual from the **www.usascan.com** web site. For fastest delivery, order on-line at www.usascan.com.

Bearcat® BCT8 Trunk Tracker III

Manufacturer suggested list price $299.95

CEI Special Price $169.95

250 Channels • 5 banks • PC Programmable

Size: 7.06" Wide x 6.10" Deep x 2.44" High

Frequency Coverage: 25.0000-54.0000 MHz., 108.0000-174,.0000 MHz., 400.0000-512.000. MHz., 806.0000-823.9950 MHz., 849.0125-868.9950 MHz., 894.0125-956.0000 MHz.

The Bearcat BCT8 scanner, licensed by NASCAR, is a superb preprogrammed 800 MHz trunked highway patrol system scanner. Featuring TrunkTracker III, PC Programming, 250 Channels with unique BearTracker warning system to alert you to activity on highway patrol link frequencies. Preprogrammed service searches makes finding interesting active frequencies even easier and include preprogrammed police, fire and emergency medical, news agency, weather, CB band, air band, railroad, marine band and department of transportation service searches. The BCT8 also has preprogrammed highway patrol alert frequencies by state to help you quickly find frequencies likely to be active when you are driving. The BCT8 includes AC adapter, DC power cable, cigarette lighter adapter plug, telescopic antenna, window mount antenna, owner's manual, one year limited Uniden warranty, frequency guide and free mobile mounting bracket. For maximum scanning enjoyment, also order the following optional accessories: External speaker **ESP20** with mounting bracket & 10 feet of cable with plug attached $19.95. Magnetic Mount mobile antenna **ANTMMBNC** for $29.95.

Bearcat® BCD396T Trunk Tracker IV

Suggested list price $799.95/**CEI price $519.95**

APCO 25 9,600 baud compact digital ready handheld TrunkTracker IV scanner featuring Fire Tone Out Paging, Close Call and Dynamically Allocated Channel Memory (up to 6,000 channels), SAME Weather Alert, CTCSS/DCS, Alpha Tagging. Size: 2.40" Wide x 1.22" Deep x 5.35" High

Frequency Coverage:

25.0000-512.0000 MHz., 764.0000-775.9875 MHz., 794.0000-823.9875 MHz., 849.0125-868.8765 MHz., 894.0125-956.000 MHz., 1240.0000 MHz.-1300.0000 MHz.

The handheld BCD396T scanner was designed for National Security/Emergency Preparedness (NS/EP) and homeland security use with new features such as **Fire Tone Out Decoder**. This feature lets you set the BCD396T to alert if your selected two-tone sequential paging tones are received. Ideal for on-call firefighters, emergency response staff and for activating individual scanners used for incident management and population attack warning. **Close Call Radio Frequency Capture** – Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. Useful for intelligence agencies for use at events where you don't have advance notice or knowledge of the radio communications systems and assets you need to intercept. The BCD396T scanner is designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS, LTR and EDACS® analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. **Dynamically Allocated Channel Memory** - The BCD396T scanner's memory is organized so that it more closely matches how radio systems actually work. Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 3,000 channels are typical but **over 6,000 channels are possible** depending on the scanner features used. You can also easily determine how much memory you have used and how much memory you have left. **Preprogrammed Systems** - The BCD396T is preprogrammed with over 400 channels covering police, fire and ambulance operations in the 25 most populated counties in the United States, plus the most popular digital systems. **3 AA NiMH or Alkaline battery operation and Charger** – 3 AA battery operation - The BCD396T includes 3 premium 2,300 mAH Nickel Metal Hydride AA batteries to give you the most economical power option available. You may also operate the BCD396D using 3 AA alkaline batteries. Unique Data Skip - Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. Memory Backup - If the battery completely discharges or if power is disconnected, the frequencies programmed in the BCD396T scanner are retained in memory. Manual Channel Access - Go directly to any channel. LCD Back Light - A blue LCD light remains on when the back light key is pressed. Autolight - Automatically turns the blue LCD backlight on when your scanner stops on a transmission. Battery Save - In manual mode, the BCD396T automatically reduces its power requirements to extend the battery's charge. Attenuator - Reduces the signal strength to help prevent signal overload. The BCD396T also works as a conventional scanner to continuously monitor many radio conversations even though the message is switching frequencies. The BCD396T comes with AC adapter, 3 AA nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, SMA/BNC adapter, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO or ESAS systems. Order on-line at www.usascan.com or call 1-800-USA-SCAN.

More Radio Products

Save even more on radio scanners when purchased directly from CEI. Price includes delivery in the continental USA excluding Alaska.

Bearcat 898T 500 channel Trunktracker III base/mobile	$209.95
Bearcat 796DGV 1,000 channel Trunktracker III base/mobile	$519.95
Bearcat BCD396T APCO 25 Digital scanner with Fire Tone Out	$519.95
Bearcat 246T up to 2,500 ch. Trunktracker III handheld scanner	$214.95
Bearcat Sportcat 230 alpha display handheld sports scanner	$184.95
Bearcat 278CLT 100 channel AM/FM/SAME WX alert scanner	$129.95
Bearcat 248CLT 50 channel base AM/FM/weather alert scanner	$104.95
Bearcat 92XLT 200 channel handheld scanner	$109.95
Bearcat 72XLT 100 channel handheld scanner	$99.95
Bearcat BR330T up to 2,500 ch. Trunktracker III with Tone out	$274.95
Bearcat BCT8 250 channel information mobile scanner	$169.95
Bearcat 350C 50 channel desktop/mobile scanner	$104.95
AOR AR16BQ Wide Band scanner with quick charger	$199.95
AOR AR3000AB Wide Band base/mobile receiver	$1,079.95
AOR AR5000A+3B Wide Band 10 KHz to 3 GHz receiver	$2,599.95
AOR AR8200 Mark IIIB Wide Band handheld scanner	$594.95
AOR AR8600 Mark II Wide Band receiver	$899.95
AOR AR-ONE Goverment/Export sales only 10 KHz-3 GHz	$4,489.95
Scancat Gold For Windows Software	$99.95
Scancat Gold for Windows Surveillance Edition	$159.95

Bearcat® BC246T Trunk Tracker III

Suggested list price $399.95/**CEI price $214.95**

Compact professional handheld TrunkTracker III scanner featuring Close Call and Dynamically Allocated Channel Memory (up to 2,500 channels), SAME Weather Alert, CTCSS/DCS, Alpha Tagging. Size: 2.72" Wide x 1.26" Deep x 4.6" High

Frequency Coverage:

25.0000-54.0000 MHz., 108.0000-174.0000 MHz., 216.0000-224.9800 MHz., 400.0000-512.0000 MHz., 806.0000-823.9875 MHz., 849.0125-868.9875 MHz., 894.0125-956.000 MHz., 1240.0000 MHz.-1300.0000 MHz.

The handheld BC246T TrunkTracker scanner has so many features, we recommend you visit our web site at www.usascan.com and download the free owner's manual. Popular features include **Close Call Radio Frequency Capture** – Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. **Dynamically Allocated Channel Memory** - Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 1,600 channels are typical but **over 2,500 channels are possible** depending on the scanner features used. You can also easily determine how much memory is used. **Preprogrammed Service Search (10)** - Makes it easy to find interesting frequencies used by public safety, news media TV broadcast audio, Amateur (ham) radio, CB radio, Family Radio Service, special low power, railroad, aircraft, marine, racing and weather frequencies. **Quick Keys** - allow you to select systems and groups by pressing a single key. **Text Tagging** - Name each system, group, channel, talk group ID, custom search range, and S.A.M.E. group using 16 characters per name. **Memory Backup** - When power is lost or disconnected, your BC246T retains the frequencies that were programmed in memory. **Unique Data Skip** - Allows the BC246T to skip over unwanted data transmissions and birdies. **Attenuator** - You can set the BC246T attenuator to reduce the input strength of strong signals by about 18 dB. **Duplicate Frequency Alert** - Alerts you if you try to enter a duplicate name or frequency already stored in the scanner. **22 Bands** - with aircraft and 800 MHz. The BC246T comes with AC adapter, 2 AA 1,800 mAH nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. For more fun, order our optional deluxe racing headset part **#HF24RS** for $29.95. Order now at www.usascan.com or call 1-800-USA-SCAN.

Buy with Confidence

Order on-line and get big savings

For over 36 years, millions of communications specialists and enthusiasts worldwide have trusted Communications Electronics for their mission critical communications needs. It's easy to order. For fastest delivery, order on-line at www.usascan.com. Mail orders to: Communications Electronics Inc., P.O. Box 1045, Ann Arbor, Michigan 48106 USA. Price includes $30.00 UPS Ground shipping/handling/insurance per scanner to a street address in the continental USA excluding Alaska. Add $20.00 shipping for all accessories. For shipments to Canada, Puerto Rico, Hawaii, Alaska, Guam, P.O. Box, APO/FPO, USPS Priority Mail or UPS 2 business day delivery, add $30.00. Michigan residents add sales tax. No COD's. For Bearcat scanners your satisfaction is guaranteed or return item in unused condition in original packaging within 61 days for refund, less shipping charges. 10% surcharge for net 10 billing to qualified accounts. All sales are subject to availability, acceptance and verification. Prices, terms and specifications are subject to change without notice. We welcome your Discover, Visa, American Express, MasterCard, IMPAC or Eurocard. Order toll free, call 1-800-USA-SCAN or 1-734-996-8888 if outside Canada or the USA. FAX anytime, dial 1-734-663-8888. Dealer and international inquiries invited. Order your radio scanners from Communications Electronics today.

For credit card orders call 1-800-USA-SCAN

e-mail: cei@usascan.com

www.usascan.com

PO Box 1045, Ann Arbor, Michigan 48106-1045 USA

For information call 734-996-8888 or FAX 734-663-8888

COMMUNICATIONS ELECTRONICS INC.™

Emergency Operations Center

Visit WWW.USASCAN.COM • 1-800-USA-SCAN

Hugh Stegman, NV6H
hughstegman@monitoringtimes.com
www.ominous-valve.com/uteworld.html

The Spooks of October: Numbers and the News

Halloween's always a good time to talk about the "spooks" (spies and transmissions to spies). This year, as we go to press, interesting events are unfolding in Cuba and the Middle East. Possibly by no coincidence, these two places also account for most US loggings of "numbers," as we call the deeply encrypted broadcasts presumably sent by intelligence agencies to deep-cover spies recruited from the target population.

❖ Cuba

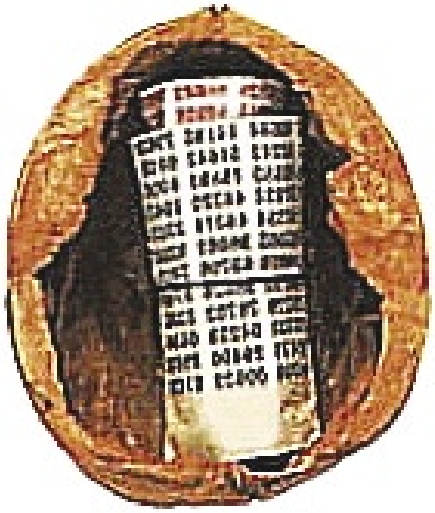
On July 26, 2006, the 79-year old Fidel Castro gave a physically-taxing, 2-hour speech for the yearly anniversary of the revolution's start. Only days later, Cuban press gave a terse announcement that Castro needed abdominal surgery, and had temporarily turned over power to his brother Raul. Needless to say, a lot of people went looking for any changes in Cuban numbers broadcasts, some of which undoubtedly came from the same powerful transmitters which carried the speech.

Cuba's traffic volume is huge, beginning at the top of most hours of the day, sometimes with different messages on multiple frequencies. They use overlapping daily and weekly schedules. These can often be puzzled out by tracking the initial callups with three groups of five numbers each, which often increment their last digits each day.

The daily schedule is by far the easiest to snag. 1600 hours Coordinated Universal Time (UTC) is 7975 kilohertz (kHz), AM (amplitude modulation). 1700 is 8010, 1800 and 1900 are 8097, 2000 is 7887, and 2100 is 6855. Like all Cuban frequencies, the actual transmission may vary plus or minus a few hertz up to a kilohertz.

On July 17th, two weeks before Castro's operation, a new transmitter and format appeared. The transmitter, still occasionally being used at press time, is easily recognizable by its bad audio (even by Cuban numbers standards) and worse modulation. On the Morse code, which is supposed to be straight CW (continuous wave) keying, it has a poorly suppressed AM carrier, with attendant hum and whine. On the AM voice, this noise pulses weirdly as the computer "woman" intones the numbers. The lower sideband is usually pure grunge.

For the first five days this transmitter used a new Morse format. The usual one is assigned the designator M8a by the European Numbers Intelligence Gathering and Monitoring Association 2000 (ENIGMA 2000 or E2K), and it has exactly the same structure as the voice broadcasts (designated V2a). The new one, quickly named M8d, slightly resembled a voice format (V2c) used for about a month last year. Instead of the three 5-figure groups, its callup went like this: V 252 97 V 252 97 V 252 125 V 252 97 V 252 97. Note how the third pair was always different.



Tiny decoding pad discovered in a walnut shell.

By July 26, the transmitter had reverted to the M8a format, but it surprised everyone with a new schedule on 10119 kHz CW, to go with the usual 10125 in the middle of the 30-meter amateur band (See this month's feature article - ed.). It switched to a voice V2a in progress after the Morse ended early.

Is this format a special one used rarely for one group of agents, or for important traffic? Was the new transmitter brought up in preparation for R. Havana's expanded simulcast of the speech, or was it with the knowledge that Castro was in poor health? Was the lack of change because all traffic had already been passed? We'll probably never know.

❖ Israel

Considerable time and expertise have been expended by "numbers" fans trying to make sense of the rather bizarre transmissions coming from Israel (ENIGMA designator E10). These are nearly as prolific as the Cuban ones, but technically superior. They're the ones that begin, often on the quarter-hour, with a 3-letter callup in phonetic, machine-spliced, English with a bit of a French accent. The haunting "Yankee Hotel Foxtrot" on the Wilco rock CD with the same name is typical.

Again, these can occur any time of the day and nearly always with parallel frequencies, making a lot to keep track of. Many different schedules exist, most daily, with new time slots coming and going from time to time. The message in a slot can be repeated for very long periods, even years. This message is in 5-letter groups, similarly said phonetically, unless there is a 2 at the end of the initial callup/ identifier/ whatever, it which case it then has no message at all.

When the US invaded Iraq, certain slots opened up, or went from obvious dummies to new messages which changed frequently. When Israel went to war in July, much the same thing happened.

One of several changed slots was at 2200 Coordinated Universal Time (UTC), and it appeared to be "important" traffic. Calls and frequencies at press time: ART, 3415 and 5435; EZI, 6842 and 9130; FTJ2, 2626 and 4461; JSR2, 2270 and 5091; PCD2, 3150 and 4270 kHz; ULX2, 4880 and 6270; and the famous YHF2, 3840 and 5820.

Numbers hobbyists also track a different Israeli format, designated E10a, in which either a number greater than two or a long alphanumeric string appears in the null-message callup. The long strings appear in swarms. They will suddenly fill the airwaves, then practically vanish just as quickly, for weeks or even months.

One popular theory used to be that they were urgent traffic when something big was about to happen in the Middle East. Unfortunately, they were notable by their near-total absence in June and July.

Another possibility is that, since there's always something happening in the Middle East, the timing is sheer coincidence. Another, less likely, is that orders were given out in May, before the dropoff. A third is that they are merely tests, dummies, or quality control messages, now replaced by important stuff.

A couple of useful Internet mailing lists that help one keep up with the hundred or so frequencies used by these two countries, are the Spooks (*spooks@qth.net*) and E2K's own list at Yahoo! Groups (**groups.yahoo.com**). Also, MT's *Utility World* column now has its own blog, **mt-utility.blogspot.com**.

I wish everyone a DX season with more spooks than a haunted house!

UTILITY WORLD

UTILITY LOGS

Hugh Stegman

ABBREVIATIONS USED IN THIS COLUMN

AFB.....Air Force Base
ALE.....Automatic Link Establishment
AM.....Amplitude Modulation
ARQ.....Automatic Repeat Request
AWACS.....Airborne Warning and Control System
CAMSLANT.....Communication Area Master Station, Atlantic
CAMSPAC.....Communication Area Master Station, Pacific
CW.....“Continuous Wave” Morse telegraphy
DSC.....Digital Selective Calling
E3.....Lincolnshire Poacher, Cyprus, with musical tune
E10.....Israeli phonetic station (xxx2=null message)
E25.....Unknown, sometimes Arabic music, 3/2 callup
EAM.....Emergency Action Message
FAX.....Radiofacsimile
FEC.....Forward Error Correction
JSTARS.....Joint Surveillance Target Attack Radar System
HFDL.....High-Frequency Data Link
HF-GCS.....High-Frequency Global Communication System
M8a.....Cuban 3-message CW, ANDUWRIGMT = 1-0
MARS.....Military Affiliate Radio System
Meteo.....Meteorological
MX.....All Russian single-letter beacons and markers
RSA.....Republic of South Africa
RTTY.....Radio Teletype
S10d.....“Czech Woman,” “Pozor nn nn konec” variant
Selcal.....Selective Calling
SITOR-A.....Simplex Telex Over Radio, ARQ mode
SITOR-B.....Simplex Telex Over Radio, FEC mode
US.....United States
USCG.....United States Coast Guard
UK.....United Kingdom
V2a.....“Atencion” Spanish numbers 3-msg format
Volmet.....From French, loosely “Flying Weather”
XM.....“Whales,” “Backward Music Station,” etc

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time). “Numbers” stations have their ENIGMA (European Numbers Information Gathering and Monitoring Association) designators in ( ).

375.0 DW-Nondirectional aero beacon, Tulsa International Airport, OK, CW with AM carrier, at 0340. (Tom Sevart-KS)

426.0 KSM-New commercial CW maritime coastal station, Pt. Reyes, CA, special event transmission for “Night of Nights VII” at 0500. KPH-Maritime Radio Historical Society, Pt. Reyes, with CW maritime union news at 0523. (Hugh Stegman-CA)

2656.0 “Romeo”-US military, passing numbered tracks in possible exercise with “Sierra,” “Mike,” and others, at 0815. (Bill Riches-NJ)

2743.0 Unknown-Israeli Intelligence phonetic station (E10), message in progress, also on 5091, at 2140. (Ary Boender-Netherlands)

3150.0 PCD-Israeli Intelligence, callup and message (E10), also on 4270, at 2200. (Boender-Netherlands)

3161.0 XJV-Unknown “XSS Net,” calling XSS in ALE, at 1955. (Patrice Privat-France)

3270.0 MIW2-Israeli Intelligence, AM callup only (E10), also on 5230, at 2119. (Boender-Netherlands)

3360.0 VLB2-Israeli Intelligence, callup only (E10), also on 5170, at 2145. (Boender-Netherlands)

3485.0 New York Radio-Volmet with aviation weather for various Midwestern cities, at 0701. (Matt Stanley-NY)

4036.0 AAM7ENE-US Army MARS, NE, net control at 0228. (Sevart-KS)

4156.5 ZSC-Globe Wireless, Capetown, South Africa, Globedata idler, also on 8017.5, at 0810. (Bob Hall-RSA)

4271.0 CFH-Canadian Forces, Halifax, RTTY weather at 0140. (Hall-RSA)

4274.0 ZSC-Globe Wireless, Capetown, South Africa, Globedata idler at 1655. (Hall-RSA)

4316.0 NMG-USCG, New Orleans, LA, Gulf weather from National Hurricane Center, at 1005. (Stanley-NY)

4325.9 “R”-Russian Air Force, Ustinov, CW single-letter marker (MX), simulcasting on 5465.9, at 2110. (Boender-Netherlands)

4343.0 WLO-Mobile Radio, AL, with special CW “Night of Nights” participation, markers also on 8514 and 12660, at 0116. (Eric Christensen-NC)

4442.0 FP4FEM001-US Federal Emergency Management Agency, ALE sounding, also on 4757, at 1828. (Jack Metcalfe-KY)

4461.0 FTJ2-Israeli Intelligence, callup only (E10), at 2200. (Boender-Netherlands)

4681.0 ZS-SNF-South African Airways flight 220, an A340-642, working Johannesburg in HFDL, at 0500. D-ALCA-Lufthansa Cargo 6296, an MD-11F freighter, working Johannesburg in HFDL, at 1947. (Hall-RSA)

4721.0 Unknown-US military, with EAM, on a Mystic Star frequency not known for same, at 0130. (Jeff Haverlah-TX)

4780.0 CIO2-Israeli Intelligence, callup only (E10), at 2145. (Boender-Netherlands)

4880.0 ULX2-Israeli Intelligence, callup only (E10), also on 6270, at 2200. (Boender-Netherlands)

5091.0 JSR2-Israeli Intelligence, callup only (E10), at 2200. (Boender-Netherlands)

5153.8 “P”-Russian Navy, Kaliningrad, CW cluster beacon (MX), simulcasting on 7038.8, 8494.8, and 10871.8, at 2115. (Boender-Netherlands)

5153.9 “S”-Russian Navy, Arkhangelsk, CW cluster beacon (MX), simulcasting on 7038.9 and 10871.9, at 2115. (Boender-Netherlands)

5435.0 FTJ2-Israeli Intelligence, callup only (E10), at 0258. (Sevart-KS)

5711.0 King 22-NY Air National Guard HC-130 tanker, radio check with King 16 (an HC-130), at 0119. (Mark Cleary-SC)

5717.0 Halifax Military-Canadian Forces, telling Rescue 313 not to launch jumpers due to weather, at 0027. (Cleary-SC)

5732.0 LNT-USCG, raised J19 in ALE, then voice as CAMSLANT working Juliet 19, at 0115. (Sevart-KS) Omaha 2MR-US Customs Bombardier Q400, working Hammer, March Air Reserve Base, CA, at 0531. (Cleary-SC)

5778.5 R26609-US Army helicopter, calling B1Z171 (1-171st Aviation), ALE at 1303. (Cleary-SC)

5820.0 YHF2-Israeli Intelligence, callup only (E10), at 2200. (Boender-Netherlands)

6340.5 NMF-USCG, Boston MA, FAX weather chart at 0322. (Sevart-KS)

6411.0 KLB-Shipcom, Seattle, WA, special CW “Night of Nights” participation, also on 12917, at 0116. (Christensen-NC)

6474.0 KSM-Coastal station at Pt. Reyes, CA, with annual “Night of Nights” special event messages, also on 16914, at 0116. (Christensen-NC)

6477.5 KPH-Maritime Radio Historical Society, Pt. Reyes, CA, with annual CW “Night of Nights” special event messages, also on 8642.0, 12808.5, 17016.8, and 22477.5, at 0116. (Christensen-NC)

6506.7 VTP13/14-Indian Navy, Vishakhapatnam, RTTY weather forecast at 1550. (Hall-RSA)

6694.0 Halifax Military-Canadian Forces, relaying info to Rescue Coordination Centre from Whiskey 915, at 0057. (Sevart-KS) Bravo Whiskey-US Navy, tracking net with other units at 0101. (Cleary-SC)

6697.0 Roll Back (possibly Roll Pack)-US military Nightwatch net, EAM at 0056. (Cleary-SC)

6705.0 Rescue 305-Canadian Forces CC-130, radio check with Trenton Military, came from 9007 at 0228. (Cleary-SC)

6854.0 Cuban CW cut numbers (M8a), 5-letter groups in progress at 2221. (Sevart-KS) Cuban CW cut numbers (M8a), callup TUDRA WWRRN IRUDN (04361 55662 76432), at 2203. (Cam Castillo-Panama)

6855.0 Cuban AM Spanish numbers (V2a), 5-number groups, six times at 2100. (Castillo-Panama)

6932.0 Cuban CW cut numbers (M8a), callup TUDRA WWRRN IRUDN, at 2102. Callup MTRGN NRINA WDAUD (90682 26721 53143), at 2105. (Castillo-Panama)

6955.0 Cuban AM numbers (V2a), 5-number groups at 2106. (Castillo-Panama)

7481.0 Cuban CW cut numbers (M8a), 5-letter groups in progress

at 2205. (Sevart-KS)

7508.0 ZSJ-South African Navy, Silvermine, RTTY weather, simulkeying on 13538 and 18238, at 0940. (Hall-RSA)

7527.0 Juliet 36-USCG, departing Elizabeth City, NC, on a search, at 2146. (G. Jackson-OH)

7644.2 RFVICS-French Navy, Le Port, Reunion Island, ARQ idler at 1646. (Hall-RSA)

7887.0 Cuban AM numbers (V2a), callup 38541 29231 38931 at 2000. Incrementing callups 71431 23431 65331 and 71433 23433 65333, at 2000. Callup 21711 65641 96141, at 2000. (Castillo-Panama) Cuban AM Spanish numbers (V2a), 5-number groups at 2003. (Sevart-KS)

7905.0 GS8-Unknown station calling MR8 in ALE, at 1958. (Privat-France)

7974.0 Unid-Repeating ten 5-letter groups in CW until 1632, signed "SK" at 1627. (Castillo-Panama)

8010.0 Cuban AM numbers (V2a), callup 24033 71973 66243, two different weeks at 1701. Cuban AM numbers (V2a), started late at 1706, changed suddenly to 5-letter CW groups (M8a), at 1708. (Castillo-Panama)

8020.0 2528-Unknown station calling 2527 in ALE, at 1954. (Privat-France)

8096.0 Cuban CW cut numbers (M8a), in progress at 1807. M8a, incrementing callups DTWIA WADRA AWUNA (30571 51361 15321) at 1902, and DTWIN WADRN AWUNN (30572 51362 15322) at 1801 and 1902. (Castillo-Panama)

8097.0 Cuban AM Spanish numbers (V2a), callup 39312 15322 13542, at 1801 and 1902. (Sevart-KS) Cuban AM numbers (V2a), incrementing callup 09991 39601 14441 at 1802, 09992 39602 14442 at 1901, and 09993 39003 14443, at 1802. (Castillo-Panama)

8175.0 Unid-"Czech Woman" (S10d), callup 555 426, signed "Pozor 28 38 konec," at 2050. (Mike L-West Sussex, UK) *[Number right before "konec" (the ending signal) is always a group count. -Hugh]*

8190.0 Unid-"Czech Woman" (S10d), 5-number groups in progress, signed "Pozor 69 23 konec," at 1740. (Mike L-UK)

8414.5 266214000-MMSI for Swedish tanker *Shux Bro Provider*, requesting a DSC safety test from Lyngby Radio, Denmark, at 1052. (Larry Weiler-Ontario)

8420.0 WLO-Mobile Radio, AL, CW identifier in SITOR-A phasing marker, at 1343. (Stanley-NY)

8428.0 NMN-USCG, Portsmouth, VA, CW identifier in SITOR-A marker, at 1345. (Stanley-NY)

8574.0 NMC-USCG, special CW "Night of Nights," simulkeying 12552 and 17220.5, at 0043. (Stegman-CA)

8776.0 Airspace-US military, EAM at 2359. (Cleary-SC)

8912.0 Coast Guard 1503-USCG HC-130, position for CAMSLANT at 0054. (Cleary-SC)

8971.0 Golden Hawk-US Navy, ME, calling P-3C Fighting Tiger 21, at 1217. (Cleary-SC) Pelican 712-US Navy P-3C, working Fiddle (Jacksonville, FL), at 1736. (Allan Stern-FL)

8983.0 Coast Guard 2127-USCG helicopter, working CAMSLANT enroute to a search, at 0210. (Cleary-SC) Coast Guard 1501-USCG HC-130, working CAMSLANT on a training mission out of Elizabeth City, NC, at 1402. (Stern-FL) Coast Guard 1712-USCG aircraft with mechanical problems, patch to Clearwater Air, FL, at 1736. (Jackson-OH)

8992.0 Swift Boy-US military, EAM at 0135. (Cleary-SC)

9025.0 Coast Guard 2140-USCG helicopter, ALE-initiated patch to District 1, at 1522. (Cleary-SC)

9079.7 RFQP-French Navy, Djibouti, ARQ idler at 1640. (Hall-RSA)

9450.0 Unid-Unknown agency, with tone at 1140, then English callup 785 58 (E25), at 1146 (Mike L-UK)

10235.0 Cuban CW cut numbers (M8a), 5-letter groups in progress at 0405. (Sevart-KS)

10242.0 Coast Guard 1712-USCG HC-130, working CAMSLANT at 2125. (Cleary-SC)

10315.0 DHN66-German Air Force, Geilerkirchen, working AWACS Magic 60, at 1540. (Privat-France)

10872.0 "C"-Russian Navy, Moscow, CW cluster beacon (MX), at 2116. (Boender-Netherlands)

11175.0 King 91-US Air Force HC-130, patch via Andrews HF-GCS to Fort Campbell, looking for helicopter flights Raven 41/42 and Raven 51/52, at 0153. (Cleary-SC) Akela 31-US Air Force C-130 tanker, patch via Andrews HF-GCS to Coyote Ops, Kirtland AFB, NM to arrange helicopter refueling, at 0440. Shadow 21-US Air Force C-130, patch via Puerto Rico HF-GCS to Kirtland, at 0455. Akela 11, patch via Offutt HF-GCS to Kirtland Meteo for arrival weather, at 2145. (Stern-FL) Nail Hob-US military, possible Nightwatch net, working Golf Club at 1236. (Haverlah-TX)

11175.3 Raymond 07-US Air Force, NM, all-aircraft announcement at 1552. (Sevart-KS)

11220.0 Cathedral-US military, possible Nightwatch net, working Elmendorf at 0110. (Sevart-KS) Andrews-US Air Force, setting up data transmission to Hipbone (Nightwatch net), at 1253. (Cleary-SC)

11232.0 Sentry 05-US Air Force E-3 AWACS, patch via Trenton Military to Viking 3, Tinker AFB, OK, at 2205. (Cleary-SC)

11309.0 New York-Oceanic air control, working Air France 664 at 2115. (Sevart-KS)

11330.0 USA-285-US Air flight (N170US, an A320), up with New York oceanic air control, selcal check CS-AK, at 1304. US Air 739, an A319-112 (N704US), selcal check DQ-KR with New York at 1308. COA-475-Continental Airlines, passing position to New York, then sent to 6577 for a selcal check, at 1313. Continental 315, a Boeing 737-924 (N73406), selcal check JP-DR with New York, at 1315. (Weiler-ON)

11363.0 Unid-"Whale Sound" feedback signal (XM), usually military, at 0400. (Sevart-KS)

11545.0 "Lincolnshire Poacher"-UK Intelligence numbers (E3), 5-figure groups in progress at 2144 (Boender-Netherlands)

11565.0 Cuban CW cut numbers (M8a), 5-letter groups in progress, signed off at 1830. (Larry Van Horn-NC)

11566.0 Cuban CW cut numbers (M8a), 5-letter groups in progress at 1827. (Sevart-KS)

12577.0 548736000-Unknown Philippine vessel, sending own position to self in DSC, at 1226. *[Oops. -Hugh]* 249835000-Maltese registry cargo vessel *Inzhener Plavinskiy* (9HIA5), DSC safety test with USCG Portsmouth, at 1238. (Weiler-ON)

12579.0 NMC-USCG CAMSPAC, Point Reyes, CA, SITOR-B no-traffic notice at 1316. (Sevart-KS)

12579.0 WLO-Mobile Radio, AL, CW identifier in SITOR-A marker, at 1533. (Stanley-NY)

12603.0 "Lincolnshire Poacher" (E3), 5-figure groups in progress at 2218. (Sevart-KS)

12750.0 NMF-USCG, Boston, MA, FAX weather chart at 1906. (Sevart-KS)

12916.5 HLF-Seoul Radio, South Korea, CW calling marker at 1529. (Sevart-KS)

12935.0 HLG-Seoul Radio, South Korea, CW calling marker at 1530. (Sevart-KS)

12948.0 JJF-Japanese Navy, Tokyo, CW marker at 1531. (Sevart-KS)

13321.0 ZS-SFI-South African flight 48, an A319, HFDL position for Johannesburg at 1307. D-ALCB-Lufthansa Cargo 8296, an MD-11F freighter, HFDL position for Johannesburg at 1333. (Hall-RSA)

13419.0 Cuban CW cut numbers (M8a), callup WGMUD ADTDD TRRUD (58923 13033 06643), at 1802. (Castillo-Panama)

13443.7 RFQP-French Navy, Djibouti, ARQ idler at 1315. (Hall-RSA)

13927.1 Nightstar Alpha-US Air Force JSTARS, patch to Peachtree Ops, Robins AFB, GA, with formatted traffic at 1532. Yankee 74-US Marine Corps KC-130T tanker off Ecuador, patch via AFA2CU, FL, to Key West Joint Interagency Task Force-South, at 1701. Bandsaw Kilo-US Air Force AWACS, MARS patch via AFA2CU, FL, to Tinker Radar Maintenance, at 1913. Undulate-Possible TACAMO (TAke Charge And Move Out) command aircraft, checking four different radios with AFA1EN, US Air Force MARS, IN, at 2112. (Stern-FL) Teal 29-US Air Force Reserve WC-130J "Hurricane Hunter," MARS patches via AFA1EN and AFA4DD, at 2217. (Cleary-SC)

14305.0 Unknown-Amateurs with possible emergency traffic from the Middle East, in Arabic, at 0210. (Ed Yeary-TN)

15988.0 DDK-Pinneberg Meteo, Germany, weak FAX chart at 1700. (Hall-RSA)

16112.0 A9M-Hamala Radio, Bahrain, CW identifier in SITOR-A phasing marker, at 1220. (Hall-RSA)

23433.0 AUSTIN-Probable Texas Public Health Regional Office, ALE sounding at 1618. (Metcalfe-KY)

Mike Chace
mikechace@monitoringtimes.com

Which Decoder?

This month we take another break from our country reviews to answer a great letter from reader Gary in New Brighton, PA. Having been active in the early '70s with amateur RTTY, Gary took some time out, but now the bug is back. Gary asks which company's decoder allows you to decode the most? He also asks if PacTOR-II and III are proprietary still and remarks that monitoring digital signals seems to have changed a lot since he was involved.

How true those last comments ring! We've been at the forefront of explaining these changes and the very rapid transition of just about every HF inhabitant to more complex and difficult-to-decode PSK-based modes. In fact, the two modes that Gary cited, PacTOR-II and III, are prime examples of the shift that has occurred, with many organizations using these new, faster and more robust HF modes. Both modes remain largely proprietary. Some of the simpler PacTOR-II traffic can be decoded, but not PacTOR-III. You can buy the $500-900 PacTOR modems from SCS directly, but who wants to invest that kind of money in only two modes, especially if much of the traffic sent isn't in the clear anyway?

Unfortunately for us, the shift continues and our skills and capabilities in reading the new traffic are still playing catch-up, as are the capabilities of the decoding hardware and software on offer right now. So, let's take a stab at Gary's question.

❖ Hardware-based Decoders

Again, I'm indebted to Mike Agner, who maintains Utility Monitoring Central's decoder pages, for helping keep me up-to-date with the latest goings on.

Unquestionably, a "holy war" still rages among many experienced monitors as to Hoka vs WaveCom when it comes to hardware decoders. In my view, Hoka has traditionally been slow to release new modes to hobbyists (often only after their original government or military customer has given them the nod), and is renowned for poor customer service, but technically, Hoka usually gets it right.

Wavecom has better customer support, more modern gear, is generally quick to release new modes, but sometimes these are less than technically correct. Unlike Hoka, my guess is that Wavecom has also made use of ties to certain equipment manufacturers to give it an edge in the race to bring some new modes to market.

The latest models – for example, the Wavecom W51 and W61 – cost many thousands of dollars and both sport many different modes. If you can find a secondhand Hoka Code30, it'll probably also run into the thousands. But let's be clear: in both cases, those impressive lists of HF modes are largely redundant these days, most of them having shuffled off their mortal digital coils years ago.

So, the reality of both industry Goliaths? They are expensive, possess advanced analysis tools, both sport the most important new HF modes: PacTOR-II, STANAG4285 and 4529, MIL-188-110A and App B and 141A, HFDL and Skyfax, are not for the beginner and, should they ever return to HF, will decode just about any obsolete mode out there.

Looking at more modest solutions, one can pick up older Hoka and WaveCom gear second hand and even with the original software, these are still very capable decoders at a more affordable price.

Likewise, the venerable and respected Universal M8000 can still be found secondhand, but being of the pre-DSP age, these machines sport a very tired set of modes, most of which are no longer on the air. But, if you want to decode CW, RTTY, French Forces ARQ-E/E3, maritime traffic using SITOR-A/B, Packet Radio and PacTOR-I, the M8000 will do fine.

Modems from Kantronics and MFJ have a similar set of modes, but are aimed more at those used by the ham community and are not much use outside of the amateur bands.

As you can no doubt tell, there are two extremes here: the latest, most expensive gear with a steep learning curve that, even when mastered, still falls somewhat short of decoding most HF traffic, and the discontinued old generation of gear which is fine for the few older modes still active, but little use elsewhere and with no hope of being upgraded. In short, hardware has just about had its time.

❖ Software to the Rescue?

Nowadays, with a computer in just about every shack, it's natural to expect that software is available to turn them into an HF decoding machine. And just as with hardware decoders, some cover the mere basics while others offer far greater capabilities. In both cases, however, software decoders almost certainly offer the most cost effective route to digital decoding today and make use of today's powerful DSP-based soundcards.

For the Windows user, there is plenty of choice:

The most advanced choices are Hoka's Code300-32 and Monteria's Centurion, both of which offer a staggering set of modes with all the important modern PSK systems included. These decoders also sport sophisticated analysis tools that allow existing and new signals to be measured and deconstructed. As one might expect, all that capability comes at a price. Look to invest several thousand dollars in these products!

Probably somewhere in the middle of the capability vs price equation comes Skysweeper. For around $650, the Professional version of the software package will get you a very good set of modern modes and the analysis tools to boot. The standard version will set you back about $120 and still has a good set of basic tools and modes to play with, including ACARS, AX.25 Packet, DGPS, CW, GMDSS/DSC, HFDL, HF-FAX, MIL-STD-188-141A ALE, PACTOR-1, ICAO SELCAL, SITOR-A, SITOR-B/NAVTEX, and RTTY with SHIP and SYNOP.

For somewhere between free and around $100, there are a plethora of decoders that offer a few modes but nevertheless match the capabilities of most of the old hardware boxes:

Decoder	Modes	Average Price
DSC:	GMDSS/DSC and NAVTEX	$40
JVComm32:	RTTY, Fax and NAVTEX	85
MMTTY:	RTTY and other amateur radio modes	free
PC-ALE and PC-HFDL:	MIL-188-141A ALE and ARINC HFDL	free
SeaTTY:	RTTY, Fax and NAVTEX	35
TrueTTY:	most amateur radio modes	35

If you're on a Mac, the only real choice is still Black Cat System's MultiMode which does a good job of handling CW, RTTY, SSTV, FAX, SITOR-A & B, ACARS, Packet Radio, PSK31 and MIL-188-141A ALE among others.

Linux users have a few decoders focused on amateur radio modes like AX.25 Packet Radio and PSK31.

❖ The Final Analysis?

So, have we found an answer to Gary's original question? Maybe. We've probably established that if you want to decode modern modes, the hardware solution is pretty much obsolete with the exception of the pricey Hoka and Wavecom boxes. If you need the capabilities and have the cash, they can be a great choice.

It seems that software solutions using computer soundcards are by far the more cost-effective way to go and especially for anyone, like Gary, looking to get back into the hobby.

On the evidence, if you've got a PC, Skysweeper is probably the best bet and certainly on a Mac, it has to be MultiMode.

BUYER BEWARE:

In the United States it is illegal to manufacture, distribute, import, possess, or advertise equipment or other electronic devices which can receiver and/or decode cellular or cordless phone conversations, public land mobile radio service or paging service communications. Since paging modes are included in the equipment mentioned in this article, their sale to private individuals is not legal in the U.S. Equipment and software not certified by the FCC are also subject to seizure without reimbursement by US Customs.

- MT Editor

Resources:

UMC Hardware Page
www.chace-ortiz.org/umc/hardware.html
UMC Software Page
www.chace-ortiz.org/umc/software.html

GLOBAL FORUM

THE WORLD OF SHORTWAVE BROADCASTING

Glenn Hauser
P.O. Box 1684-MT, Enid, OK 73702
glennhauser@monitoringtimes.com
www.worldofradio.com

The Clock is Ticking for Radio Japan; Armenia; Uzbekistan

A press release from NHK in late July said it plans to cut radio programs in Italian, German, Swedish and Malay and shift its emphasis to TV. The cut will take effect in October 2007. SW radio programs for North America and Hawaii and for Europe, excluding Russia, will also be trimmed. French programs will be limited to audiences in Africa and Spanish restricted to Latin America. More than 100 megayen will be saved and those funds will be used to increase programs in English (as reported in *Japan Times* via Zacharias Liangas, Dan Say, Takahito Akabayashi)

Kai Ludwig points out that "trimmed" is just elaborate wording for entire cancellation. German programs of Radio Japan are believed to be rather popular; German listeners are known for their strong support of broadcasts in their language on many SW stations.

Listener inquiries and protests from Italy by Dario Monferini and Sweden by Henrik Klemetz drew form replies in English. (The least they could do would be to reply in the doomed languages, while they still can.)

Strangely enough, these are well heard in North America since they are relayed via Gabon 11970: 0530 Italian, 0545 Swedish!

And so we have one more year to enjoy Radio Japan in English to North America; we hope they will be continuing the Canadian relays until the end.

Also in late July, Voice of Armenia announced on its German broadcasts that it would "soon" leave SW, heard by Paul Gager, Austria, via Kai Ludwig. Rumen Pankov reported on Radio Bulgaria's DX program that Public Radio of Armenia would close the SW service at the end of October. English is at 1910-1930 Mon-Sat on 9960 and 4810. So get it while you can, if it is not too late already; Kai Ludwig pointed out that although Armenia may not have registered any schedules for B-06, this does not mean they must continue to the last day of A-06. Too bad they canceled the evening English to North America long ago.

The Gavar, Armenia, transmitter site also relays Voice of America, Voice of Russia, TWR and others. Would these also go off? Gavar is also a MW site, which no doubt would continue.

Uzbekistan abolished Radio Tashkent in March, and its shortwave service earlier at the end of 2005, but continued to run SW relays for various foreign stations, mostly Christian.

However, Andy Sennitt of Radio Netherlands says RN was notified that relays there would no longer be available in B-06, so that site could be closing, too. For the rest of A-06, October, RN is on 12065 at 1300-1400 in Dutch, 9345 at 1400-1600 in English.

For the British DX Club, Tony Rogers put together a full schedule of Uzbek relays, and here are a few more to monitor and perhaps QSL before it is too late:

- FEBA, 0030-0100 on 7375; 1400-1500 on 9530 in South Asian languages.
- CVC International, 0100-0300 on 7355 in English [not to be confused with WRNO if and when it actually returns]; 0300-0600 on 13685.
- Radio Que Me, clandestine to Vietnam, Sat 1200-1230 on 15385.
- Vatican Radio, 1430-1550 on 12065, including English at 1530.

From Jean-Michel Aubier came news that R. France Internationale announced it would terminate Creole programs in October; these have been airing Sundays at 1330 on 15515 via French Guiana.

AFGHANISTAN Radio Solh, Bagram, 9345 with Muslim music and talk, clear at 1707-1712, then blocked by Israel (Leif Råhäll, Sweden, *SW Bulletin*) The low-power transmitter actually in Afghanistan is its only known SWBC outlet, as we *still* await the 100 kW unit donated by India. AIR 2005-2006 Annual Report said it was in final stages of completion (gh)

ALBANIA R. Tirana did not shift to 7445, but after we again pointed out the RTTY problem on 7455, tested 7450, and made that permanent in mid-July, for 2300-0030 Albanian, 0145-0200 & 0230-0300 (except UT Mon) English to NAm, // 6115. However, a month later they were still announcing 7455, and times are always given in local, UT+2 in summer. In between, one of the transmitters was down for a week or more awaiting parts from China. Audio is lo-fi and levels vary, but we should encourage them with reception reports; see last month (gh)

ANGOLA The company I work for, LBA Group, has sold to Angola two SW transmitters, both 25 kW made by ELCOR. One is single frequency 4950 kHz; the other is a dual frequency 7245/11955. They are pulse step modulated using a single 4CX23000B in the final. It appears the antennas are going to be dipoles. To be shipped by late August (Glenn Swiderski, Chief Electronic Technician, LBA Group, Greenville NC, *DX LISTENING DIGEST*) Not heard on higher channels for some time (gh)

ARGENTINA R. Provincia de Buenos Aires, 1270, heard on 2nd harmonic 2540 at 0828 with talk about paper industry, superlative quality (Adán Mur, Paraguay, *Conexión Digital*) So maybe a chance to make it as far as NAm (gh) Also surprised to hear it here for first time (Héctor Álvaro Gutiérrez, Lima, Perú, *ibid*.)

AUSTRALIA Station 2WG, 1152 kHz in Wagga Wagga, NSW, has a studio-transmitter link listed on 27670 (Richard Fox, VK2UAL, *DXLD*)

ARDS (Aboriginal Resource & Development Services) had been inactive on SW for about a year, but heard again from mid-July on 5050, first reported as an unID: 0910-0950 choral music barely audible, not China or India or Tanzania; could be ARDS-Humpty Doo, running only listed 400-watts? (Alex Vranes, Jr., WV, *DXLD*) Streamer on the Yolngu Radio website **www.ards.com/au/radio.htm** now includes "Across north-east Arnhem Land on HF Radio 5050 kHz." ARDS was previously hostile to DX reports since they proved their short-range antenna was not working properly! Apparently it still is not, tsk tsk (gh) Stronger than before, ID in English at 1858 and another day at 1900 on 5049.95 (Chris Hambly, Victoria, *DXLD* and *ADXN*) Looks like I was hearing ARDS, but no longer possible here a month later due to a utility covering 5049-5054 (Alex Vranes, Jr., WV, *DXLD*)

After having been down many months for refurbishing, VL8A, Alice Springs, was back on 4835, heard in late July at 2130 and also on 2310 at night. Nigel Holmes tells me they may be testing on 3 MHz as well (Chris Hambly, Victoria, *DXLD*) 3 MHz rarely if ever used from the NT stations. *WRTH* 2006 says alternate frequencies are: 3230 Alice, 3315 Tennant Creek, 3370 Katherine (gh)

A press release from R. Australia in early July announced it was moving from shortwave broadcasting to online technology in Vietnam **www.bayvut.com** and local FM rebroadcasting in Cambodia, to develop new audiences.

By late July, *DX-Mix News*, Bulgaria, confirmed that all RA SW broadcasts in Vietnamese and Khmer had been canceled. Is there really a greater audience for RA already on Internet in Vietnam than on SW? If that is the case, or RA believes so, more and more languages may be taken off analog SW until nothing is left (gh)

Meanwhile, in late July, RA was running continuous *Waltzing Matilda* for hours at a time on several frequencies instead of English programming (gh) At random times between 0940-1400, I checked different frequencies and heard continuous *W.M.* on 5995, 6020, 9560, 9580 and 9590 (Ron Howard, CA, *DXLD*) Also reported were unscheduled BBC relays at 2200, perhaps a failure of program feed defaulting to best available content.

"I had refused to QSL 11750 after RA shifted to 9625 in early 2005. It seems the owners of the Darwin transmitters kept 11750 going // 9625 at times without the knowledge of RA (or me). I apologise to all reporters for not knowing the unknowable and invite them to resubmit 11750 reports" (Ian Johnson, QSL manager, Australian Radio DX Club **www.ardxc.info**, DXLD)

*All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; B-06=winter season; [non] = Broadcast* to *or* for *the listed country, but not necessarily originating there; u.o.s. = unless otherwise stated*

BAHRAIN R. Bahrain, 9745, has a window of possibility at 2345-2400 after Vatican closes DRM on 9745-9755, and before CRI via Bonaire opens at 0000 (gh) 9745-USB, presumed R. Bahrain, 2350-0001, continuous Arabic music; also around 2200, decent signal of more non-stop Arabic music, under co-channel HCJB (Scott R. Barbour, Jr., NH, *DXLD*)

BANGLADESH Bangladesh Betar, Home Ser-

vice around 1430 and 0130 on 4750, a new frequency previously tested (Jose Jacob, India, *DXLD*) 4750 with news and commentary in English 1530-1544 (Victor Goonetilleke, Sri Lanka, *BCDX*) until 1555 (Rumen Pankov, Bulgaria, *ibid.*) News and current affairs in English until 1700* (Maarten Van Delft, India, DSWCI *DX Window*) Inaugurated new 100 kW SW transmitter at Savar on July 11, and will set up a 1000 kW MW at Dhamrai (*Financial Express*, Dhaka, via Swopan Chakroborty, India, *DXLD*)

BRAZIL After a long time down for maintenance, R. Educadora de Limeira reactivated its 2380 kHz transmitter in late July, with religious programs, on the air only at night from 2200 UT until sunrise. Power is low but the techs can't tell me how low (Luiz Chaine Neto, Limeira, SP, *radioescutas*) Heard at 0030-0120; at first I thought it was a harmonic from 1190 (Paulo Cabral, Espírito Santo, *ibid.*) Used to be a good verifier; encourage them with reports (Rudolf Grimm, SP, *ibid.*)

R. Pioneira de Teresina, 5015, off with tube problems for many months, was reactivated in mid-July (Isaac Rosa, Ceará, *ibid.*) 1 kW at 1300-2300. Contact address: Rua 24 de Janeiro, 150 Sul, CEP: 64001-230, Teresina (PI). Manager is Rosemiro Robinson da Costa, rosemiro@radiopioneira.am.br

Also, R. Integração, Cruzeiro do Sul, AC, is inactive on 4765 (Paulo Roberto e Souza, AM, via Célio Romais, Panorama, *@tividade DX*)

R. Guarujá, Florianópolis, SC, reactivated 5980 in mid-July heard between 1420 and 2200 (Reinaldo Gomes, Paraná, *radioescutas*) But then reported by several with terrible modulation problems splattering far above and below 5980 (gh)

CANADA Thanks to Bill Westenhaver who sent CD liner notes, we learn the identity of the harmonica player RCI was using roughly every half hour all summer to fill one-minute gaps in CBC relays: Claude Garden (*a.k.a.* Jardin), from a 1991 Montréal release in the Intermede Ambiance Music Collection, *Tender Harmonica Stories*. There are 11 tracks totaling 43 minutes, by several composers including Claude himself (gh)

CHINA Following up last month's lead story: on July 22 we were hearing Firedrake instead of CNR-1 programming on the jammed frequencies such as 17350, 14260 monitored mostly between 1300 and 1400 (gh) The music jam is carried to transmitter station via satellite. One cycle about 62 minutes is on an mp3 file at **www.ndxc.org/audio/china/050911_035842.m3u** (Wolfgang Büschel, *DXLD*) The previous jamming source is in Shantou; the music coming from Hainan means that mainland has escalated this. This has probably been PRC military all along, but now roll out the big guns instead of using puny commercial facility. They have a unit dedicated to dealing with Falun Gong (Brett Graham, Hong Kong, via Uli Bihlmayer, *DXLD*)

Hainan would be a logical place as it is at one extreme edge of China. However, that would entail a skip zone of several hundred km on the higher frequencies, so to be really efficient they would be using at least two and probably more sites on the same frequency at the same time in widely separate regions of China. Don't assume that it is only Hainan, or that all Firedrake music jammers on many different frequencies, in-band and out, are necessarily coming from there. Also, are we to take this that Firedrake jamming is done by the military, and other jamming audio (such as CNR-1 which was used for this same target originally) is non-military? (gh)

China is a place that Army guys have special license plates and can run red lights, run over pedestrians and pretty much do what they please. PLA unit responsible to deal with FLG, and will be able to commandeer whatever resource they fancy in this fight with the enemy. Until Sound of Hope stops transmissions, mainland is unlikely to stop jamming (Brett Graham, *ibid.*) Follow developments on this and other intruder problems at **www.iarums-r1.org**

CUBA RHC is not the only Cuban station with an external service (gh) Such as 6120 at 0300 R. Rebelde (Erik Køie, Denmark, *DXLD*) Not // 5025, program called *Ventanas Rebelde*, for "compatriots in the Central America and the Caribbean" (gh) *"Rebelde Centro América,"* booming in on 11655 at 1700 UT (Brock Whaley, GA, *dxflorida*) Covering games from Cartagena, Colombia, blocked after 1659 by RN on 11655 (Manuel Méndez, Spain, *DXLD*) Another day, anti-American "news" and closed at 1730* sharp after *"Rebelde FM, La Habana"* ID (gh)

[non] Once Castro went in for surgery, Cuban exile demand for airtime on WRMI 9955 exploded. WRMI had to cancel many of its DX slots late at night, as well as Brother Stair and WRN, and the schedule kept changing. As of mid-August, *Radio República* was daily 0500-0700, M-F 1000-1400, daily 1600-2100, Sun & Mon 0200-0400. *Radio Cuba Libre* was back, Mon-Sat 0700-0900. *La Voz de la Fundación* was to return Sept. 3 at 0100-0200 UT Sundays, perhaps expanding in October, and more such programming was anticipated (via Jeff White, WRMI, *DXLD*)

CZECH REPUBLIC [non] R. Prague resumed relays via WRMI in July, to continue at least through year end, in English daily 0900 on 9955, 1400 on 7385; in Spanish daily 0430 and 0930 on 9955 (Jeff White)

DENMARK [non] see ITALY

ECUADOR HCJB's only English service, language lessons, heard at 2345-2400 on a Sat but not on a Mon, VG on 11720; probably will change frequency for B-06 (gh)

ETHIOPIA R. Ethiopia, 9704.2 in Amharic at 0400 with flute music, ID, news (Rich D'Angelo, PA, NASWA *Flashsheet*) See NIGER which jumps between 9704 and 9705

FRANCE unID in an African language on 23670 (2 x 11835) between 1857 and 1955 UT during Es propagation, mentioning Hausa, clandestine? HFCC says it's from Issoudun, France (Juergen Lohuis, Germany, *harmonics* yahoogroup) It's V. of Africa, Libya, relay via France // 15660 (*DX Mix News*, Bulgaria) Although RFI itself is planning to add Hausa, perhaps via Nigeria (gh)

GABON Africa No. 1 heard at 1841-1905 on 19160, 2 x 9580 with music, ID, time signal, news. Another day with African music at 1720 (José Miguel Romero, Spain, *DXLD*)

The Moyabi Story, a comprehensive chronology, illustrated, of the high power SW site on its 25th anniversary by Tony Rogers: **www.users.waitrose.com/~bdxc/moyabi.pdf** (British DX Club)

GERMANY [non] VT Communications has been awarded a 5-year contract to broadcast a significant number of analogue and digital SW programs for Deutsche Welle, initially 90 hours per day in 14 languages, from UK and global sites, targeting more than 108 countries in Europe, Africa, Asia and South America, from January 1 next year; includes a significant potential increase in program hours from May 2007 (VT via Mike Barraclough, DXLD) So sites in Germany can be used less for DW (gh)

The Wertachtal station at present runs about 115 frequency hours per day for Deutsche Welle (AM only), Nauen something around 33 hours, so both together around 150 hours. Going from 90 to 150 hours certainly would be a "potential significant increase." Remember also that two further transmitters are to be installed at Sines, Portugal. Looks like T-Systems could lose DW as customer for SW entirely (Kai Ludwig, Germany, *ibid.*)

HUNGARY R. Budapest announced that due to financial problems, and only two people remaining in the Spanish department, the fortnightly DX program would disappear for the time being (Dino Bloise, FL, *DXLD*) Sergio Pérez also said this was supposed to be temporary, but we've heard that many times before, and once personnel and programming are lost, they are never recuperated (José Bueno, Spain, *Noticias DX*)

INDONESIA VOI, 9525, in mid-July had a horrible hum or het including during English at 0800-0900 (Ron Howard, CA, *DXLD*) Fixed for a while, but then was on 9526 for a few days, when normally on until 1400 then missing completely from Aug 6 (gh)

IRAN [and non] V. of Islamic Republic of Iran, English as of August:

0130-0227	7235 9495 *"Voice of Justice"*
1030-1127	15600 17660
1530-1627	7370 9635
1930-2027	6205 7205 7540[via Lithuania] 9800 9925

(*DX Mix News*, Bulgaria)

On a Sunday *Listener's Special*, the hosts told a US listener their interval signal is called *"Baran Eshgh"* or Loves Rainfall, by Nasser Cheshmazar. I managed to locate a copy, a nice album (Christopher Lewis, England, *DXLD*)

ITALY RAI, 9780 heard on a Sunday at *1957-2021* in Danish. Fair (Rich D'Angelo, PA, NASWA *Flashsheet*) The last remaining SW broadcast in that language! Tue/Thu/Sun, also on 6110. I imagine the Danes will be very grateful to the Italians, and will do everything possible to preserve this service. Are there any other Danish language broadcasts outside Denmark (or Greenland) on air or on line? Perhaps some Danish pocket in North Dakota has 15 minutes a week on some little AM station. Or an ethnic commercial or university station in Canada or a major US city; SBS in Australia? (gh)

KOREA NORTH [non] Shiokaze-2, Sea Breeze, stayed on the same frequency, 9485, at least from mid-July to mid-August, at 1300-1330. Language by day varied, but several Fridays it was in English. Some shows had general news about North Korea; others actually read off names of abductees starting with their year of birth. Since this is aimed north from Taiwan, the signal carries on well to NAm (Glenn Hauser, OK) Blue and white QSL, "RESCUE! Abductees by N. Korea – Shortwave – Shiokaze" COMJAN card, received from Tokyo, in 13 days for an e-mailed report, in English, to chosakai@circus.ocn.ne.jp (Ron Howard, CA, *DXLD*)

NEW ZEALAND RNZI found on 9615 instead of 7145 around 1315 UT one day; 9615 supposed to be used only at 05-07! But at 1330 blocking KNLS in Chinese; and DRM was on 9440 instead of 6095. I suppose the automation failed or the clock controlling was way off. 24 hours later was back to proper frequencies. On another occasion, at 0458 on 13730, frequency change announcement to 9615 but kept right on going on 9615 past 0530. RNZI takes the cake as the station most unable to follow its own schedule. If the automation is so unreliable, they ought to have a human being on duty at all times to be sure things are properly switched (gh)

Tried after 0700 when supposed to be on 7145, and not on 9615 either, apparently still on 13730. It really is very frustrating; I am an expatriate NZ-er living in Sydney and like to catch the relays of domestic National Radio on weekend evenings. Is there another international shortwave service with such a lamentable record? (Robin Bromby, NSW, *DXLD*)

RNZI DRM was patchy at 0606 on 9440, SNR peaking at 14 dB. 9440 is variable, as are all their local daytime frequencies here, despite close proximity. There is generally enough signal to resolve DRM audio, but also intermittent drop-outs. In our evenings, RNZI is extremely solid, which seems to be what is really needed for pain-free DRM (Craig Seager, NSW, *DXLD*)

NIGER La Voix du Sahel back on 9705 from mid-July, 2150 French news mentioning president Mamadou Tandja; lots of interference (Thorsten Hallmann, Germany, *DXLD*) Nominal 100 kW. Had been listed as inactive and not reported for at least three years (gh) 1730 local languages; drumming session before 1900 French news (Jari Savolainen, Finland, *DXLD*) 1900 ID and news in French about Pres. Tandja. Mauno Ritola observed *1657 (Thorsten Hallmann, Germany, *ibid.*) 2100 ID, phone-ins (Stuart Austin, England, *ibid.*) Best on USB to avoid Ethiopia on 9704.2 (Guido Schotmans, Belgium, *BDX*) After 2100 best on LSB (Christoph Ratzer, Austria, *ADX* via *BCDX*)

On another day Niger was on 9704.0 instead, at 1730; Ethiopia stays on 9704.2 (Jari Savolainen, Finland, *DXLD*) Believe I was also hearing Niger last February (Dan Goldfarb, England, *ibid*.) An hour in French at 1900 with clear IDs starting the news, on 9704.1 one day, 9705.02 the next two days (Christer Brunström, Sweden, *ibid*.) Another night at 1900, Niger on 9704.98, Ethiopia on 9704.18 (Wolfgang Büschel, Germany, *ibid*.)

WYFR 9705 in Arabic via Germany blocks Niger at 2000 (Steve Lare, MI, and Erik Køie, Denmark, *ibid*.) No longer with English as was scheduled Sunday at 2000, just Sahel music (Wolfgang Büschel, Germany, *ibid*.) 9705 used to be the daytime frequency, 5020 the morning and evening frequency, from same transmitter (Kai Ludwig, Germany, *ibid*.) But no reports now of 5020, just 9705 (gh)

Also heard in French news and vernacular at 1214-1255 on 9705 (Carlos Gonçalves, Portugal, *DXLD*) On 9704 at 0605 in French news (Jean-Michel Aubier, France, *ibid*.) Some reports have it closing at 2200, others at 2300. Website is **http://www.ortn-niger.com** (gh)

9705 scheduled *0500-2300*. Best reception 1700-1750 and after 2100. Heterodyne from R Ethiopia until 2000*, splash from Bulgaria 9700 in Bulgarian *1800-2000*. QRM on 9705: VOA, Biblis *1930-2000* in Serbian; WYFR, Juelich *2000-2100* in Arabic (DSWCI *DX Window*)

I lived about 1 km from their transmitters from 1999 to 2002. The Niamey HF and MF station is at Goudel on the northwest side of Niamey. The correct co-ordinates are 2-03-19 E, 13-31-55 N. On Google Earth you will see a rectangle with denser vegetation and a large parabolic antenna at the far end. There are two pairs of masts which I have not managed to identify on Google.

During my time in Niger I heard 7155 and 5020 sicken and die. Towards the end, 9705 was often so weak that you could hear the interference under the transmission from my home just across the fields from the station (John Staniforth, UK, *DXLD*)

NIGERIA For a while in August, V. of Nigeria was using 15120 only from 0500 to 2300; then went back to alternating with 7255 depending on language. On 15120 at 1500 Kiswahili, 1530 Yoruba, 1600 Igbo. Got a short reply for E-Mail to englishvon@yahoo.com saying letters and emails were received and passed to the responsible people for frequency planning, also giving listeners' letters new time slot, Sat 0505, and asking for music requests for *VON Linkup,* Sun 1805. Signed by Carl Erukaa, Senior Producer. You can often hear him on *African Safari*. 15120 signal often suffering from low audio again (Thorsten Hallmann, Germany, **http://www.africalist.de.ms** *DXLD*) 15120 collides with RL/VOA at 1200-1630, including a new transmission in Fulfulde at 1530-1630 (*DX Mix News*, Bulgaria) Contradicting info above (gh) It's still the usual chaos (Hallmann, *DXLD*)

PERÚ I worked for R. Municipal, 3173 for a while, in Panao. Schedule is 09-11 and 23-02 UT. If you hear it, please send me a reception report: Pablo Alfredo Albornoz Rojas, Jirón Tacna 385, Panao, Pachitea, Huánuco, Perú (via Juan Carlos, *Noticias DX*)

R. Huanta 2000, heard at various times and dates between 2210 and 0030, kept flipping between 4747 and 4755 (Rogildo Aragão, Bolivia, *DXLD*)

SAINT HELENA Radio St. Helena Day: the party on the shortwaves. Official info about the "RSD REVIVAL" broadcasts from Radio St. Helena, on 11092.5 kHz USB, Saturday, 4 November 2006 at:

1800-1930 UT to New Zealand (via short path)
2000-2130 UT to Japan (via short path)
2200-2330 UT to Europe
2330-0100 (into UT Sunday) to NAm

There will be a new and interesting QSL card for this "Revival" broadcast. It will take several months to process the reception reports, so please be patient. Only reception reports sent by regular mail will be accepted. Email-reports will *not* be accepted. Return postage is absolutely required and is "at least" three IRC's or "Greenstamps". "At least" means that RSH welcomes donations at any time and in any amount. All reports should be addressed to the Station Manager of RSH, Ms. Laura Lawrence. Good DX to one and all! Robert Kipp (from **www.sthelena.se/radioproject/Broadcast_Times_2006.htm** *q.v.* for latest updates)

SERBIA [non] I learned, in a phone conversation with an individual in Belgrade, that the transmitter site of R. Serbia in Bijeljina, Bosnia-Hercegovina, had been temporarily closed for maintenance. Transmissions could return in August. Necessary works were being carried out on the SW transmitters (Christopher Lewis, England, *DXLD*)

SLOVAKIA RSI remained off the air, but on July 21 reported that Culture Minister Marek Madarits, after meeting President Ivan Gashparovich, said that foreign broadcasting is very important and he wants SW broadcasting to restart (TASR & SITA via Swopan Chakroborty, *DXLD*, and *Media Network* blog)

Restoring RSI to shortwave is easy in theory. But the station made half its producers redundant at the end of June, and others left out of sheer disgust at the situation. It's possible that, if the government acts quickly, some of them may be enticed to return, but since "no timescale was mentioned" there could be a lot of political dithering over details of state contributions. It's likely to be quite a while – maybe sometime in 2007 – before shortwave broadcasts resume (Andy Sennitt, *Media Network* blog)

If you want to encourage the culture minister about this, write to Ministerkultury@culture.gov.sk (Ladislava Hudzovicova, Spanish section via José Miguel Romero, *DXLD*)

TIBET Xizang Radio, 11860 at 0830 with "Welcome to Our English Class," Lessons 21 and 22 (Adán Mur, Paraguay, *Conexión Digital*)

Except for harmonics, this aimed east and // 11950 aimed west are the highest frequencies from Lhasa, including English 0810-0840 daily exc. the Tuesday afternoon siesta, per S. Aoki's list (gh)

UKRAINE From mid-July, Radio Dniprovska Khvilya, on 11980 from 0600 (Alexander Egorov, Kiev, Ukraine, *RusDX*) Low power outlet

U K [non] From Aug 1, BBCWS unexpectedly changed frequencies and sites for the Caribbean, which is as close as they come any more to serving NAm (gh)

6130	1100-1200 Montsinéry (French Guiana)
9750	1200-1300 Montsinéry
9660	1100-1300 Cypress Creek (SC)
11675	2100-2200 Greenville (NC)
5975	2200-2300 Montsinéry
13765	2100-2300 Cypress Creek

(Mark Deutsch, BBCWS London via George Poppin, CA, *DXLD*)

WHRI frequencies boom in here, but 11675 was missing until 6 days later (Raúl Saavedra, Costa Rica, *ibid*.) 13765 quite weak and fadey for WHRI, but aimed away from us (gh, OK) WHRI useless here; 5975 the best for that hour (Mike Cooper, GA, *ibid*.) We now get a full half-hour of News/World Briefing/Business Report at 22 UT. Wonder what made them decide to add 3-1/2 more transmitter hours to the Caribbean? Maybe more SWLs there than they thought? Surprise, surprise. A ray of sunshine for a change. 9660 poor and improving, 9750 solid but deteriorating (Stephen Luce, TX, *DXLD*) 6130 poor but may improve with shorter days; 9660 inaudible at first, but fair by 1245 (Jerry Lenamon, TX, *ibid*.)

U S A Castro's illness prompted increased broadcasting to Cuba by TV Martí and R. Martí on MW, but apparently no changes on SW (gh)

The best medium to overcome jamming is SW, because the more distant transmitter is often received with a stronger signal than closer jamming transmitters. It's uncertain, however, how many Cubans own SW radios these days. And the number of SW transmitters available to Radio Martí is receding.

One of the two International Broadcasting Bureau sites near Greenville, North Carolina, has been mothballed. A recent post to *rec.radio.shortwave* mentions that another key IBB shortwave site used by Radio Martí – Delano, California – might also close by next February (**www.kimandrewelliott.com**) Martí, R. Thailand, and a little bit of VOA are all it carries any more (gh)

That new SWBC station coming in Pensacola: I did a quick search and found this long-standing item in Terry Krueger's list: 93.5 MHz, Smyrna Baptist Church, Pensacola; per the *Pensacola News Journal*, April 27, 2004: this station was closed by the FCC for operating without a license (allegedly applied for an LPFM license). (Mike Cooper, GA, *DXLD*)

In July WRMI added new programs on 9955, including Sun 2230-2300 *Tierra de Gracia,* all about Venezuela. And Daniel Camporini's radio history show from Argentina, *Monitor DX*, Sat 2345. See also CUBA [non]

In mid-July, KTVT, CBS ch. 11 in Dallas-Fort Worth, carried an erroneous report that WRNO, now based in Fort Worth, was on the air to the Middle East, with potential to reach more than a billion people throughout the world. John England pointed out on the *Media Network* blog that the WRNO office is KTVT's neighbor down the street. It was a puff piece for Robert Mawire, overlooking inconvenient facts such as that the transmitter is in New Orleans and in disrepair. The WRNO Worldwide website had not been updated for 3 or 4 years (gh)

But then did get an update claiming the station would be on the air by Sept. 10, in Arabic to the Mideast, except for news in English on the hour, 4 hours per day each on 7355 and 7395. See **www.wrnoworldwide.org** (via Artie Bigley, *DXLD*)

On July 10, 2006, I visited the old WRNO Worldwide transmitter site near my hometown of New Orleans. No one was home at the site, as expected. It is apparent that no RF can emit from this location as the feedline from the transmitter building to the log periodic antenna was broken and lying on the ground. This damage appears to have existed before hurricane Katrina. I took many photos of the site and listened to the radio for any transmissions from this site. No blowers operating. Grass overgrown, but may have been mowed more than a month before. An RF unit (high power cavity, filter or something) lying on the ground outside the rear of the transmitter shack – probably part of the old Harris SW-100 transmitter. I also saw the old WRNO STL feedline draped over a tower guy line as they must have removed the [STL] antenna when the station was sold. The [SW] antenna only seems to need minor repairs. Almost ready to hook up a ham rig! Later they told me they are installing a new 100 kW ELCOR transmitter (Dan Brown, MA, *DXLD*)

VENEZUELA [non] Although accurate schedules are hard to come by, R. Nacional de Venezuela, via Cuba, appeared on a clear new frequency, 15250, at 23-24 in Spanish, // 13680 which continued to collide with China via Canada (gh) RNV ID also heard until 1200* on 6180, but not the next day (Joe VA3EOJ Karthaus, ON, HCDX and DXLD)

Until the Next, Best of DX and 73 de Glenn!

BROADCAST LOGS

NOTEWORTHY LOGS FROM OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

0146 UTC on 4844.9
BOLIVIA: Radio Norteno (tent). Spanish. Station reactivated? Spanish ballads and easy-listening music. Brief announcer's item at 0155 followed by barely audible tentative identification. Lengthy martial chorus/music (national anthem?) until 0200*. Fair signal with occasional data bursts. (Scott Barbour, Interval, NH) Bolivian stations in Spanish monitored: **Radio San Gabriel** 6079.97, 0857-1002; **Radio Fides** 6155.07, 0904-0932. (Dave Valko, PA/Cumbre DX) 1110-1120 (Arnaldo Slaen, Buenos Aires, Argentina) **Radio Virgen de Remedios** 4545.35, 2135-2140; **Radio San José** 5680.3, 2240-2245; **Radio Difusora Tropico** (tent.) 6037.7, 2321-2330. (Slaen, ARG)

0156 UTC on 11905
SRI LANKA: SLBC. Vernacular. Familiar format of Hindu style music and lady's presentations. Poor signal quality. (Scott Barbour, Intervale, NH) SLBC observed 15475 at 0341. Wonderfully warm programming and very old fashioned with wooly audio and special greetings to listeners in Bangalore and Dubai. Exclusively western music with some fading but perfectly audible. (Walter Salmaniw, Masset B.C. Canada)

0333 UTC on 6940
ETHIOPIA: Radio Fana. Amharic. Male/female talk segment. Musical bridge *Horn of Africa* at 0340 into announcers in studio contact with on site remote reporter. Three similar segments with musical bridges and indigenous Africa vocal music. Moderate signal with significant atmospheric noise and fading, down to just above noise level at tune out. SINPO 34222 at best // 6209.97 with much weaker signal. (Jim Evans, Germantown, TN)

0425 UTC on 9720
PERU: Radio Victoria. Spanish. Religious programming and text with poor signal quality. (Joe Wood, Greenback, TN) Heard station on 6019.4, 2315-2320 with religious text. (Slaen, ARG) Peruvians in Spanish noted: **Radio La Oroya** 4900.85, 1015-1035. (GVH, NC) **Radio Santa Rosa** 6047.1, 2335-2342. Andean music to ID, "...o bien en Radio Santa Rosa..." SINPO 24432. (Slaen, ARG)

0549 UTC on 6010
MÉXICO: Radio Mil. Spanish/English gospel preaching from St. John with Spanish translations. Station identification with poor signal copy. México's **Radio Educación** 6185, 0603-0611. Hip hop music to Spanish programing. (Wood, TN) **XEOI-Radio Mil** 1222-1237+ political talk, ads and public service announcements at 1230. **XEXQ-Radio Universidad** 6045.06, 1245-1303 classical piano music to 1301 announcement too weak to copy. (John Wilkins, Wheat Ridge, CO)

0850 UTC on 9765
RUSSIA: Radio Tikhy Okean. Russian. Folk music tunes to male/female announcement spot and brief news items. SINPO 44444. (Slaen, ARG) **Voice of Russia** 15595 via Petropaulavsk 0422-0430. *This is Russia* program to ID, "Voice of Russia World Service," into news at 0430. (Wood, TN) **VOR** 12070 at 1912. *News and Views* (fair signal) // 9890 (poor). (Bob Fraser, Belfast, ME)

1143 UTC on 7259.53
VANUATU: Radio Vanuatu. (tent). Noted on frequency with talks and music too weak to copy much. They had been on 3944.76 for the previous five days or more, apparently the 41 meter band frequency is only used occasionally. (Wilkins, CO)

1145 UTC on 3995.04
INDONESIA: RRI-Kendari (tent) Bahasa Indonesian. Light vocal music to 1200 Jakarta network news relay. Local studio programming at 1220 from soft-spoken announcer, as usual difficult to understand. Still have not positively IDed this station. **RRI-Pontianak** 3976.08, 1151-1233. Male/female chatting to *Song-of-the Coconut Islands* interval signal to Jakarta network news relay at 1200. Local program at 1222, vocal music, and ads at 1229. ID: "Radio Republik Indonesia Pontianak dengan acara berita...di Kalimantan Barat." (Wilkins, CO)

1300 UTC on 9485
CLANDESTINE: Shiokaze (Sea Breeze) via Taiwan. Monitored with opening, "This is Shiokaze from Tokyo, Japan." Station gave schedules and frequencies with programs *News Flash*, *Special Story* and *Editorial Study*, followed by reference to website *www.chosa.kai.jp* and email address. Signal was strong, a solid S7 or better despite slight interference from unidentified station. (Edward Kusalik, Alberta, Canada)

1333 UTC on 3345.02
INDONESIA: RRI-Ternate. Bahasa Indonesian. Solid S5 to S6 reception quality with standard Indonesian programming with lone female announcer preview to Indo music. Indo's **RPDT Manggarai** 2960, 1318+. A real treat and a regular on the DXpedition circuit. Female announcer taking calls (and giggling). S5 signal a good hour after local sunrise, some amateur-radio interference. Not heard the following three mornings. **RRI-Serui** 4604.96, 1343+ Nice signal with male DJ taking calls from listeners and mentions of "Timor" (Salmaniw, CAN)

1335 UTC on 9650
CANADA: China Radio International. Report on plays and films of China // 9570. (Fraser, ME) **CBC Northern Service** 9625, 0305+ (Salmaniw, CAN) **CFRX** 6070, 2019-2030+. "News-Talk 10-10" CFRB. Call-in show on "what does it take to be a Canadian?" (Frodge, MI)

1500 UTC on 15650
CLANDESTINE: Voice of Oromia Independence. Sign-on with partial identification, "International" (for Radio Miami International ?) Opening melody and partial ID or slogan as "adda...Oromiyaa" followed by commentary segment. Slogan repeated for station closedown plus frequency. Station's audio is varied, low keyed and some what muffled. Three additional clannies heard: **Voice of Ethiopian People** (via Samara, Russia) 11840, *1700-1730 and station's Jülich site 15565, *1900+ with distorted signal quality. (Kusalik, CAN) **Hmong Lao Radio** 11785 via WHRI 1337-1358*. Talk in presumed Hmong language to 1349 and two vocal selections. Closing announcement at 1358 with schedule, but didn't catch ID. WHRI identification at 1359. (Wilkins, CO) Noted station on freq to 1400. Station is a Sat/Sun broadcast probably aimed to large Hmong communities in North America rather than Southeast Asia. (Wendal Craighead, Prairie Village, KS)

2141 UTC on 15720
NEW ZEALAND: Radio NZ Int'l. National news and *Dateline Pacific*, followed by brief segment in a local language and Polynesian music at 2154 to news and sports at 2200. Station identification at 2214 into repeat of *Dateline Pacific* program on 15515. News to 2137 was // 15515 Australia. (Frodge, MI)

2153 UTC on 9330
SYRIA: Radio Damascus. Fair-good reception with Arabic music // 12085 weaker. About a S7 signal. The transmitter cut for almost a minute at 2157, then came back. Freq 12085 is marred somewhat by CODAR interference. (Salmaniw, CAN)

2226 UTC on 9715
UNITED KINGDOM: Radio Algerienne (tent). Arabic. Lengthy commentaries by male followed by brief announcements. Qu'ran to 2258 to frequency quote pause. Only one mention of Algeria heard. SIO 3+53 // 7150 SIO 243. 9710 signal better until about 2235, then 7150 improved. (Frodge, MI)

Thanks to our contributors – Have you sent in YOUR logs?
Send to Gayle Van Horn, c/o Monitoring Times
English broadcast unless otherwise noted.

Fred Waterer
fredwaterer@monitoringtimes.com

Learning the Language

International radio programming is a gateway to many different cultures and languages around the world. One has the opportunity to hear any number of exotic (and not so exotic) languages, and even learn them.

Many world band radio stations facilitate the learning of their own particular national languages by creating special language instruction programs.

These programs serve many purposes. Sometimes it is an altruistic desire on behalf of a broadcaster to facilitate the learning of their language. Sometimes it may just be a way to fill in a schedule or demonstrate a wide variety of programming. But more often than not, the programs are used as a "hook" to lure in regular listeners. A listener who is invested in learning a language that may take weeks, months or years to learn, will probably stick around for other programming offered by the station.

I first encountered these language instruction programs as a young listener in the 1970s and became an avid participant. (I should add that I have always had an interest in languages, which has come in quite handy as both a DXer and a shortwave listener. In high school I had already taken courses in French and German and later in University, where I majored in Slavic Studies, I was to add Russian and a course in Slovak.)

In the 1970s, Radio RSA in Johannesburg, South Africa, had *Afrikaans by Radio* programs and would send textbooks at no charge. In the lead-up to the 1980 Olympics in Moscow, the then relatively new Radio Moscow World Service introduced *Russian by Radio* programs, catering to the influx of tourists they expected. Again, textbooks were provided free of charge and the good folks at Radio Moscow would even correct your homework, if you mailed it in!

Radio Peking/Beijing and the Voice of Free China have had dueling Chinese language courses for decades, and in the 1980s, popular radio stations like Deutsche Welle and Radio Netherlands also added these programs, again with complimentary textbooks.

One of my favorites was Spanish Foreign Radio and its program *Spanish, A Language Without Bounds.* Except initially I always missed that last word. Shortwave signals being what they are, I heard it as "a language without vowels," which obviously couldn't be true, or "sounds," which was equally improbable. Eventually I figured it out, but at least it made the program memorable and always brought a smile whenever I heard it introduced!

Fast forward to the internet age. Gone (for the most part) are the printed textbooks, but many, many programs still go out every week. In the 21st century, thanks to the information highway, you often have the option of listening again (and again) on demand, downloading your own copy of the program (in some cases), or reading and downloading a copy of the print materials accompanying the courses. While it's nice to have a hard copy of a text in your hands, having this information a click away is handy indeed.

Chinese Studio – China Radio International

Chinese Studio is a brief segment at the end of each CRI English transmission. Usually just under five minutes in duration, a few conversational points are covered in each program. Recent episodes have covered such diverse topics as a trip to the dentist (3 lessons), computers and the internet (7 lessons), and snacks, fruits and vegetables (15 lessons). It is purely a practical, conversational course. You won't become fluent, but you will pick up some words and phrases. There are texts for a number of past lessons (but not all) on the CRI website. For details, go to **http://en.chinabroadcast.cn/chinese/** then click "Chinese Studio"

Let's Learn Chinese – Radio Taiwan International

Heard at the end of Monday transmissions from RTI, *Let's Learn Chinese* is based around a printed textbook (which may or may not be available from RTI). While checking for more information about this broadcast, it was noted that the web page for the program was blank. Hopefully by the time you read this it will be updated. The host was Carlson Wong, who suggested that individual lesson details were available on the website.

According to the RTI website, "Carlson was born in Indonesia and has lived in Taiwan half his life. He is a graduate of National Taiwan University. He also went to the graduate school of American Studies at Tamkang University. He has been an English translator, teacher, and now a radio personality. His first job as an announcer was at the Broadcasting Corporation of China (BCC), one of the oldest and largest radio stations in Taiwan. Since then he has been fascinated with radio work."

A recent episode featured a brief dialogue, followed by a word-by-word analysis. It featured lots of repetition, as they went over the pronunciation of each word and phrase very carefully, spoken by both a male and female instructor. As language courses go, I found it very easy to follow. If I ever have to say, "How are you, Mr. Wong," I'm all set.

This is not to minimize the program. Building a vocabulary and understanding of a language takes time, and all too often these programs try to "rush" the learning process. Go to **http://english.rti.org.tw/** and follow the links.

The ABC of Czech – Radio Prague

Radio Prague has a weekly program called the *ABC of Czech*. As with CRI, this is not a formal language course. Each program features some particular facet of the Czech language. In recent weeks the theme of the program has been "Czech by Numbers." Programs were based around a number and all the variations of the word and phrases

incorporating it: for instance, the number 9, how to say ninth, and phrases incorporating the number nine, such as "nine lives."

Radio Prague is really very good at archiving past text, so have a look around their website if you are interested in the Czech language. **www.radio.cz/en/current/abc**

The ABC of Czech can be heard on UTC Saturday transmissions of Radio Prague. Recent shows can be heard on demand at the website.

" L'Affaire du Coffret " – Radio France Internationale

Perhaps the most unusual language "course" is provided by RFI in the form of a bilingual crime serial!

"Follow the adventures of British journalist in Paris, Lucas. Is he an accomplice or a victim?

"One morning, Lucas, a British journalist, wakes up in a hotel room with the mother of all headaches. He can't remember a thing. Room service (who ordered that?) brings him breakfast and a parcel containing 20,000 euros, a walkman with a minidisc and a note: 'A bientôt, Nadia.' So, he must be in Paris, but who's this Nadia? As if that weren't enough, a police officer asks him to come to the station…

"Is he an accomplice or a victim of a crime? Lucas decides to trust no one and to carry out a private investigation: Rather a tall order for someone who has lost his memory and doesn't speak French beyond 'bonjour' and 'au revoir'."

In the program you hear appropriate dialogue in French, and then Lucas "mulls it over" in his head, in English, trying to make sense of it. It's an intriguing approach to language instruction. It can be heard every Monday at 1210, 1435 and 1630 UT. Recently I attempted to hear it at 1210 and struck out, but was able to hear it by downloading the 1200 broadcast from the RFI website, **www.rfi.fr.**

German by Radio – Deutsche Welle

Deutsche Welle offers a number of German courses, on air and on line. On air, they currently have what seems to be a beginner's course called *Radio D*. Although there is nary a word about it on their website, I'm sure that will change eventually. As with most DW language courses, it is prepared by the Goethe Institute. The 15-minute program takes you through a brief "skit" which introduces, in a fun way, the concepts to be taught. Then the "professor" is introduced, who picks apart the dialogue and explains the usage of the words. UTC Saturdays at 1045, 1545, 1945, 2145, 2345, UTC Sundays 0045, 0245, 2045

A second program is *Business German*. In the words of the DW website: "Is your German already quite good? Are you interested in German economics and business topics? Throughout the 26 chapters of this course you'll learn the style and language for conducting business in Germany." *Business German*, or *Marktplatz*, can be heard UTC Tuesdays at 1845, 2045 and 2245, UTC Wednesdays at 0045, 0445, 0645, 0845, 1345 and 1545.

Sadly, DW no longer broadcasts to North America, but, nonetheless, DW gets my vote for best provider of language courses. All language courses, including some past ones, are not only available online, but you can download the programs as mp3 files, and the texts as pdf files. (Except for *Radio D*. Stay tuned on that one.) Go to the DW website, at **www.dw-world.de**, and click "German Courses" on the left.

Basic Japanese for You - Radio Japan

Radio Japan provides the listener with two programs of Japanese instruction. The first is *Basic Japanese For You*, broadcast on UTC Tuesdays (best bet for North America 1125 UTC on 6120 via Canada). "A Japanese language program for beginning learners. The program aims at allowing listeners to learn new expressions and increase their vocabulary. The Japanese lyrics to English songs are also introduced."

On UTC Thursdays (again, best bet for North America 1125 UTC on 6120 via Canada) Radio Japan airs *Brush Up Your Japanese*. "This Japanese language program aims at providing applications of expressions previously learnt to "brush up" one's Japanese skills."

Thanks to the internet, one can listen to the lessons again, and study the texts.

"The most recent episode of 'Basic Japanese for You' appears on the website on every Wednesday, and that of 'Brush Up Your Japanese' on every Friday. You can always listen to the back numbers of the last fourteen weeks in addition to the latest episode, so you will be free from the worry about missing some of the lessons." You will need the "RealPlayer" to access them, at **www.nhk.or.jp/lesson/english/index.html** Internet audio lessons are re-edited.

Russian by Radio – Voice of Russia

To be honest, I don't know too much about this one. A casual tuning revealed a grammar lesson devoted to declensions of pronouns and verbs. It was fairly advanced; presumably it's a fair way into the course.

The Voice of Russia website, **www.vor.ru/English/new,** lists the program at UTC Sunday 1530, UTC Tuesday 1930, UTC Saturday 2030, UTC Monday, Friday 0230, UTC Monday, Wednesday 0530 and UTC Tuesday 0630. Not much useful information about the course on the VoR website.

Your best bet to hear *Russian by Radio* in North America is at 0230 UTC Mondays and Fridays on 15595, 15555, 9860 and 9665 are listed frequencies. In August 9665 was the best frequency.

Spanish, A Language Without Bounds - Radio Exterior de España

Unlike Deutsche Welle, Radio Exterior de España still broadcasts to North America, but, much to the chagrin of many listeners, they have recently been largely inaudible, which is really too bad because their programming has been consistently excellent for years.

Radio Exterior de España

Their Spanish course is an example of what's good and what's bad about language courses by radio. REE provides a daily Spanish lesson, 90 beginner lessons, 90 intermediate, and 90 advanced lessons. Every tenth program is a revision.

Each lesson opens with a description of a dialogue in English. Some simple explanations of particularly difficult points of vocabulary and expressions then follow, as well as the dialogue itself. The program concludes with a grammar commentary in English.

What's bad about this? In a particularly long series, if you arrive half way through, you may lack incentive to stick with it, having missed so much of the course work.

Nevertheless, REE's course is very good, teaching bite-sized chunks daily. At least I think so. Please, REE, get some better frequencies! With any luck they will be better heard in the next broadcast season. In the meantime, the first 20 lessons are available online at **www.rtve.es/rne/ree/**

And that concludes a brief look at language courses by radio. We did not even get into the work that stations like VoA, BBC, Radio Australia and even CRI do to teach the English language. Perhaps in a future column. Cheers.

THE QSL REPORT

VERIFICATIONS RECEIVED BY OUR READERS

Gayle Van Horn, W4GVH
gaylevanhorn@monitoringtimes.com

Radio Saint Helena to return to the airwaves!

The project to *Revive Radio St. Helena Day* has become a reality. The revival is thanks to the international listening community who contributed time and donations to see the once popular broadcast return to the air. This is likely the first time that shortwave radio friends have ever helped to build their own radio station.

It has been no easy task, considering the cost and logistics of shipping an entire shortwave broadcasting facility, including a three element beam antenna, to the remote island in the South Atlantic Ocean.

At this time, the transmissions are scheduled to take place on 11092.5 kHz USB on Saturday, November 4, 2006, as follows:

1800-1930 UTC to New Zealand via short path
2000-2130 UTC to Japan via short path
2200-2330 UTC to Europe
2330 (Saturday) - 0100 (Sunday) UTC to North America

There will be a new and interesting QSL card for the revival broadcast. It will take several months to process the reception reports, so please be patient. Only reception reports sent by regular mail will be accepted, and email will not be accepted. Return postage is absolutely required totalling at least three IRCs or US currency. Reports should be addressed to: Station Manager of RSH, Ms. Laura Lawrence, Saint Helena, South Atlantic Ocean. To read about this project visit **www.sthelena.se/radioproject/**

AMATEUR RADIO

Estonia-ES5RY, 12 meters SSB. Full data color photo card. Received in 75 days via ARRL bureau. (Larry Van Horn N5FPW, NC)

Honduras-HQ9F. 17 meters CW. Full data QSL card. Received in four months for a SWL card and one US dollar. QSL Manager-Seppo Sunikka OH3MKH, Raitasenpolku 6, FI-11100 Riihmaki, Finland. (Gregory Harris, WDX9KHY, Park Forest, IL)

Jersey-GJ2A (IOTA EU-013). Full data color photo card. Received in 75 days via ARRL bureau. (Van Horn, NC)

Isle of Man-MD4K (IOTA EU-116). Full data two color card. Received in 75 days via ARRL bureau. (Van Horn, NC)

W9IMS-*The Indy Racing Special Event Station* 7240 SSB kHz. Full data folder card of Indy track signed by Jim K9RU, plus personal letter. Received in 34 days for an English report and three mint stamps. Station address: Indianapolis Radio League, P.O. Box 18495, Indianapolis, IN 46218. (Joe Wood, Greenback, TN)

AUSTRALIA

ABC Far North-Cairns Studio, Queensland via Shepparton, 6020 kHz. Verification letter signed by Richard Dinnen-Manager (email *dinnen.richard@abc.net.au*) a "keen shortwave listener since childhood." Noted he welcomes letters from listeners. Enclosed a ABC Far North Cyclone Information Map and decals. Received in 28 days for an English report. Station address: ABC Radio Far North, P.O. Box 932, Cairns, QLD 4870 Australia (or) Corner of Upwards and Sheridan Streets, Cairns, QLD 4870 Australia. (Edward Kusalik, Alberta, Canada)

CLANDESTINE

Skiokaze (Sea Breeze) via Taiwan 9485 kHz. Full data blue and white QSL card with COMJAN imprinted with Korean lettering. Received in 16 days for an email report to *chosakai@circus.ocn.ne.jp* Website: *www.chosa-kai.jp* (Kusalik, CAN) Received same card in one month for report to: 3-8-401 Koraku 2-chome, Bunkyo-ku, Tokyo 112-0004 Japan. (Wendal Craighead, Prairie Village, KS)

DJIBOUTI

Radio Djibouti 4780 kHz. Full data QSL card signed by Le Chef du Service Technique, plus stickers. Received in two months for email report to *rtdtech@intnet.dj*. Station address: 1, Avenue Saint Laurent de Var, Boite Postal 97, Djibouti, Republic of Djibouti (or) Ministére de la Communication et de la Culture, Charge des Postes et de Telecommunications, 1, Rue de Moscou Boite Postal 32, Djibouti, Republic of Djibouti. (Arnaldo Slaen, Buenos Aires, Argentina)

KUWAIT

Radio Free Afghanistan via Radio Free Europe/Radio Liberty, 12140 kHz. Full data scenery card of RFE/RL building, with site and language notation. My first card of this new design. Received in six weeks for an English report. Station address: REE/RL Radio Free Europe-Radio Liberty, 1201 Connecticut Avenue NW, Washington, DC 20036 USA. Website: *www.rferl.org*. (Craighead, KS)

MEDIUM WAVE

KCFO 970 kHz AM. Full data prepared card signed by Dale McPherson. Received in seven days for an AM report, SASE and prepared card. Station address: 3737 37th West Ave., Tulsa, OK 74107. (Harris, IL)

KOGA 930 kHz AM. Full data prepared QSL card signed by John Maquis. Received in 15 days for an AM report, SASE and prepared QSL card. Station address: 113 W. 4th Street, Ogallala, NE 69153. (Harris, IL)

WYRD 1330 kHz AM. Full data verification letter signed by Ed McDade-Chief Engineer, plus business card. Received in 30 days for an AM report. Nice surprise to receive this one! Station address: Entercom Greenville LLC, 25 Garlington Road, Greenville, SC 29615. (Patrick Martin, Seaside, OR)

NETHERLANDS ANTILLES

Radio Netherlands-Bonaire 9845 kHz. Partial data card *One Spring Morning in Bussum* (card #2). Received in 128 days for an English report. Station address: Radio Nederland Weredroep, P.O. Box 222, 4290-JG Hilversum, The Netherlands. (Wood, TN)

PHILIPPINES

Radio Pilipinas 11730 kHz. Partial data card signed by Tanny V. Rodriguez-Station Manager, plus sticker, schedule and personal letter. Received in 478 days for an English report. Station address: Philippine Broadcasting Service, 4th Floor PIA Building Visayas Avenue, Quezon City 1100 Metro Manila, Philippines Website *www.pbs.gov.ph/DZRP_page.htm*. (Scott Barbour, Interval, NH)

TAJIKISTAN

Voice of Tibet (Tajikistan tent. as country) 17525 kHz. Full data (except site) showing two photos from their website, with illegible signature from Editor in Chief. Received in two months for an English report. Correspondence address: Narthang Building, Gangchen Kyishong, Dharamsala-17625, H.P., India. No response from Oslo, Norway address. Verification for logging from Bao Loc, Vietnam. (Craighead, KS)

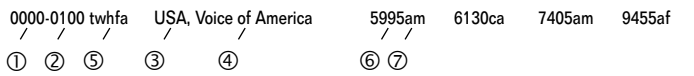
TIME & FREQUENCY STATION

HD2IOA Guayaquil 3810 kHz. Full data card, form letter and brochure. Received in two months for a CD recording and two US dollars. Station address: Instituto Oceanográfico de la Armada, Avenida de la Marina, Via Puerto Maritimo, Código Postal 5940, Guayaquil, Ecuador. (Jim Pogue, Memphis, TN)

TRAVELERS' INFORMATION STATION

WNVA814 Kelso, WA 530 kHz AM. Full data QSL from portable TIS station, signed by Terry C. Miller-Communications System Director. Received in 11 days for a TIS report. Station address: WSDOT, P.O. Box 47300, Olympia, WA 98504-7300. (Martin, OR)

How to Use the Shortwave Guide



Convert your time to UTC.

Broadcast time on ① and time off ② are expressed in Coordinated Universal Time (UTC) – the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Daylight Savings Time) 4, 5, 6 or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

Note that all *dates*, as well as times, are in UTC; for example, a show which might air at 0030 UTC *Sunday* will be heard on *Saturday* evening in America (in other words, 8:30 pm Eastern, 7:30 pm Central, etc.).

Find the station you want to hear.

Look at the page which corresponds to the time you will be listening. On the top half of the page English broadcasts are listed by UTC time on ① , then alphabetically by country ③, followed by the station name ④. (If the station name is the same as the country, we don't repeat it, e.g., "Vanuatu, Radio" [Vanuatu].)

If a broadcast is not *daily*, the days of broadcast ⑤ will appear in the column following the time of broadcast, using the following codes:

Day Codes	
s/S	Sunday
m/M	Monday
t/T	Tuesday
w/W	Wednesday
h/H	Thursday
f/F	Friday
a/A	Saturday
D	Daily
mon/MON	monthly
occ:	occasional
DRM:	Digital Radio Mondiale

In the same column ⑤, irregular broadcasts are indicated "tent" and programming which includes languages besides English are coded "vl" (various languages).

Choose the most promising frequencies for the time, location and conditions.

The frequencies ⑥ follow to the right of the station listing; all frequencies are listed in kilohertz (kHz). Not all listed stations will be heard from your location and virtually none of them will be heard all the time on all frequencies.

Shortwave broadcast stations change some of their frequencies at least twice a year, in April and October, to adapt to seasonal conditions. But they can also change in response to short-term conditions, interference, equipment problems, etc. Our frequency manager coordinates published station schedules with confirmations and reports from her monitoring team and *MT* readers to make the Shortwave Guide up-to-date as of one week before print deadline.

To help you find the most promising signal for your location, immediately following each frequency we've included information on the target area ⑦ of the broadcast. Signals beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible.

Target Areas

af:	Africa
al:	alternate frequency (occasional use only)
am:	The Americas
as:	Asia
ca:	Central America
do:	domestic broadcast
eu:	Europe
irr:	irregular (Costa Rica RFPI)
me:	Middle East
na:	North America
oc:	Oceania
pa:	Pacific
sa:	South America
va:	various

MT Monitoring Team

Gayle Van Horn
Frequency Manager
gaylevanhorn@monitoringtimes.com

Daniel Sampson
danielsampson@monitoringtimes.com

Larry Van Horn, MT Asst. Editor
larryvanhorn@monitoringtimes.com

Thank You ...

Additional Contributors to This Month's Shortwave Guide:

Azizul Alam Al-Amin, Rajshahl, Bangladesh; Rich D'Angelo/NASWA Flash Sheet; Wendel Craighead, Prairie Village, KS; Anker Petersen/DX Window; Adrian Sainsbury/R.NZ Intl; Harold Sellers/ODXA/DX Ontario; Larry Van Horn N5FPW, MT Asst. Editor; BCL News; Cumbre DX; Hard Core DX; NASWA Journal; WWDXC-Top News.

Shortwave Broadcast Bands

kHz	Meters
2300-2495	120 meters (Note 1)
3200-3400	90 meters (Note 1)
3900-3950	75 meters (Regional band, used for broadcasting in Asia only)
3950-4000	75 meters (Regional band, used for broadcasting in Asia and Europe)
4750-4995	60 meters (Note 1)
5005-5060	60 meters (Note 1)
5730-5900	49 meter NIB (Note 2)
5900-5950	49 meter WARC-92 band (Note 3)
5950-6200	49 meters
6200-6295	49 meter NIB (Note 2)
6890-6990	41 meter NIB (Note 2)
7100-7300	41 meters (Regional band, not allocated for broadcasting in the western hemisphere) (Note 4)
7300-7350	41 meter WARC-92 band (Note 3)
7350-7600	41 meter NIB (Note 2)
9250-9400	31 meter NIB (Note 2)
9400-9500	31 meter WARC-92 band (Note 3)
9500-9900	31 meters
11500-11600	25 meter NIB (Note 2)
11600-11650	25 meter WARC-92 band (Note 3)
11650-12050	25 meters
12050-12100	25 meter WARC-92 band (Note 3)
12100-12600	25 meter NIB (Note 2)
13570-13600	22 meter WARC-92 band (Note 3)
13600-13800	22 meters
13800-13870	22 meter WARC-92 band (Note 3)
15030-15100	19 meter NIB (Note 2)
15100-15600	19 meters
15600-15800	19 meter WARC-92 band (Note 3)
17480-17550	17 meter WARC-92 band (Note 3)
17550-17900	17 meters
18900-19020	15 meter WARC-92 band (Note 3)
21450-21850	13 meters
25670-26100	11 meters

Notes

Note 1 Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world.

Note 2 Broadcasters can use this frequency range on a (NIB) non-interference basis only.

Note 3 WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007. They are only authorized on a non-interference basis until that date.

Note 4 WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide

0000 UTC - 8PM EDT / 7PM CDT / 5PM PDT

0000	0015		Japan, Radio Japan/NHK World			13650as
			17810as			
0000	0015	s	USA, WRMI Miami FL	9955am		
0000	0027		Czech Rep, Radio Prague	7345na	9440na	
0000	0030		Australia, HCJB	15405as	15525as	
0000	0030		Burma, Dem Voice of Burma	5955eu		
0000	0030		Egypt, Radio Cairo	11950na		
0000	0030		Thailand, Radio	9570va		
0000	0030		UK, BBC World Service	3915as	5970as	
			9740as	9790as	11945as	15360as
			17615as			
0000	0030		USA, Voice of America	7555as		
0000	0040		Lithuania, Radio Vilnius	9875na		
0000	0045		India, All India Radio	9705as	9950as	
			11620as	11645as	13605as	
0000	0045		USA, WYFR/Family R Okeechobee FL			17805am
0000	0057		Canada, Radio Canada Intl	11700as		
0000	0059		Canada, Radio Canada Intl	9755am		
0000	0059		Spain, Radio Exterior Espana	15385am		
0000	0100		Anguilla, University Network	6090am		
0000	0100		Australia, ABC NT Alice Springs			2310irr
			4835do			
0000	0100		Australia, ABC NT Katherine	5025do		
0000	0100		Australia, ABC NT Tennant Creek			4910do
0000	0100		Australia, Radio	9660pa	12080pa	13670pa
			15240va	17715pa	17750as	17775va
			17795va			
0000	0100		Canada, CFRX Toronto ON	6070na		
0000	0100		Canada, CFVP Calgary AB	6030na		
0000	0100		Canada, CKZN St John's NF	6160na		
0000	0100		Canada, CKZU Vancouver BC	6160na		
0000	0100		China, China Radio Intl	6020na	7180as	
			9515as	9570na	13600eu	
0000	0100		Costa Rica, University Network	5030va	6150va	
			7375va	9725va		
0000	0100		Cuba, Radio Havana	9550na		
0000	0100	f	Germany, Bible Voice BC Network			6140me
0000	0100		Germany, Deutsche Welle	9695as	9825as	
			9885as			
0000	0100	m	Greece, Voice of	7475va	9420va	15650va
0000	0100		Guyana, Voice of	3291do		
0000	0100		Japan, Radio Japan/NHK World			6145na
0000	0100		Malaysia, RTM/Trax FM	7295as		
0000	0100	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
0000	0100		Netherlands, Radio	9845na		
0000	0100		New Zealand, Radio NZ Intl	13730pa		
0000	0100	DRM	New Zealand, Radio NZ Intl	15720pa		
0000	0100	vl	Papua New Guinea, Wantok R.	Light		7120va
0000	0100		Singapore, MediaCorp Radio	6150do		
0000	0100		UK, BBC World Service	6195as	9410as	
			11955as	15280as	15310as	17790as
0000	0100	DRM	UK, BBC World Service	6010na		
0000	0100	f	UK, Bible Voice	6140me		
0000	0100	f	UK, Bible Voice	6140me		
0000	0100		Ukraine, Radio Ukraine Intl	7440va		
0000	0100		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	13362usb	
0000	0100		USA, KAIJ Dallas TX	5755na		
0000	0100		USA, KTBN Salt Lake City UT	7505na		
0000	0100		USA, WBCQ Kennebunk ME	5110na	7415na	
			9330na			
0000	0100		USA, WBOH Newport NC	5920am		
0000	0100		USA, WEWN Birmingham AL	5810va	5835va	
0000	0100		USA, WHRA Greenbush ME	7520na		
0000	0100	m	USA, WHRI Noblesville IN	7490am	7555am	
0000	0100	twhfa	USA, WHRI Noblesville IN	9820am	13760am	
0000	0100		USA, WINB Red Lion PA	9265am		
0000	0100	twhfa	USA, WRMI Miami FL	7385am		
0000	0100		USA, WTJC Newport NC	9370na		
0000	0100		USA, WWCR Nashville TN	5070na	7465na	
			9985na	13845na		
0000	0100		USA, WWRB Manchester TN	3185na	5050na	
			5745na	6890na		
0000	0100		USA, WYFR/Family R Okeechobee FL			6065am
			9505am	11835am		
0000	0100		Zambia, Christian Voice	4965af		
0015	0030	m	USA, WRMI Miami FL	9955am		
0030	0045	s	USA, WRMI Miami FL	9955am		
0030	0100		Thailand, Radio	5890na		
0030	0100		UK, BBC World Service	5970as	6195as	
			9410as	9790as	11955as	15280as
			15310as	15360as		
0030	0100		USA, Voice of America	9715va	9780va	
			15185va	15205va	15290va	15560va
			17740va	17820va		
0035	0100	sm	Austria, Radio Austria Intl	9870am		
0043	0058	twhfa	Austria, Radio Austria Intl	9870am		
0055	0100		Italy, RAI Intl	11800na		

0100 UTC - 9PM EDT / 8PM CDT / 6PM PDT

0100	0100		Cuba, Radio Havana	6000na	6060na	
			9820na			
0100	0115		Italy, RAI Intl	11800na		
0100	0127		Czech Rep, Radio Prague	6200na	7345na	
0100	0128		Vietnam, Voice of	6175na		
0100	0129	s	Germany, Universal Life	9480as		
0100	0130		Hungary, Radio Budapest	9590na		
0100	0156		Romania, Radio Romania Intl	9690na	11825na	
0100	0159		Canada, Radio Canada Intl	9755am	13710am	
0100	0200		Anguilla, University Network	6090am		
0100	0200		Australia, ABC NT Katherine	5025do		
0100	0200		Australia, ABC NT Tennant Creek			4910do
0100	0200		Australia, CVC International	7355as		
0100	0200		Australia, Radio	9660pa	12080pa	13670pa
			15240va	15415va	17715pa	17750as
			17775va	17795va		
0100	0200		Canada, CFRX Toronto ON	6070na		
0100	0200		Canada, CFVP Calgary AB	6030na		
0100	0200		Canada, CKZN St John's NF	6160na		
0100	0200		Canada, CKZU Vancouver BC	6160na		
0100	0200	DRM	China, China Radio Intl	6140na		
0100	0200		China, China Radio Intl	6020na	6080na	
			9570na	9580na	9790na	11870as
			13600eu	13640as		
0100	0200		Costa Rica, University Network	5030va	6150va	
			7375va	9725va		
0100	0200	f	Germany, Bible Voice BC Network			6140me
0100	0200		Guyana, Voice of	3291do		
0100	0200		Indonesia, Voice of	9525as	11785pa	
			15150al			
0100	0200		Japan, Radio Japan/NHK World			5960va
			11720va	11935sa	15325as	17685oc
			17810as	17825va	17845as	
0100	0200		Malaysia, RTM/Trax FM	7295as		
0100	0200	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
0100	0200		Netherlands, Radio	9845na		
0100	0200		New Zealand, Radio NZ Intl	13730pa		
0100	0200	DRM	New Zealand, Radio NZ Intl	15720pa		
0100	0200		North Korea, Voice of Korea	7140as	9345as	
			9730am	11735ca	13760ca	15180ca
0100	0200	vl	Papua New Guinea, Wantok R.	Light		7120va
0100	0200		Russia, Voice of	7250na	9665na	15555na
			15595na			
0100	0200		Singapore, MediaCorp Radio	6150do		
0100	0200		Sri Lanka, SLBC	6005eu	9770eu	15745eu
0100	0200		Taiwan, Radio Taiwan Intl	11875as	15465as	
0100	0200		UK, BBC World Service	6195as	9410as	
			11955as	15280as	15310as	15360as
			17790as			
0100	0200	f	UK, Bible Voice	6140me		
0100	0200		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
0100	0200		USA, KAIJ Dallas TX	5755na		
0100	0200		USA, KTBN Salt Lake City UT	7505na		
0100	0200		USA, KWHR Naalehu HI	17655as		
0100	0200		USA, Voice of America	9885va	11705va	
			11725va			
0100	0200		USA, WBCQ Kennebunk ME	5110na	7415na	
			9330na			
0100	0200		USA, WBOH Newport NC	5920am		
0100	0200		USA, WEWN Birmingham AL	5810va	5835va	
0100	0200		USA, WHRA Greenbush ME	5850na		
0100	0200		USA, WHRI Noblesville IN	5875am	7490am	
			9515am			
0100	0200	sm	USA, WHRI Noblesville IN	7315am		
0100	0200		USA, WINB Red Lion PA	9265am		
0100	0200	twhfa	USA, WRMI Miami FL	7385am		
0100	0200	s	USA, WRMI Miami FL	9955am		
0100	0200		USA, WTJC Newport NC	9370na		
0100	0200		USA, WWCR Nashville TN	3215na	5070na	
			5765na	13845na		
0100	0200		USA, WWRB Manchester TN	3185na	5050na	
			5745na	6890na		
0100	0200		USA, WYFR/Family R Okeechobee FL			6065va
			9505va	15195va		
0100	0200		Uzbekistan, Christian Vision	7355as		
0100	0200		Zambia, Christian Voice	4965af		
0103	0200		Iran, Voice of the Islamic Rep	7235am	9495am	
0105	0110		Pakistan, Radio	7445eu	9340eu	
0105	0130	sm	Austria, Radio Austria Intl	9870am		
0113	0130	twhf	Austria, Radio Austria Intl	9870am		
0115	0130	a	Austria, Radio Austria Intl	9870na		
0115	0130	twhf	Seychelles, FEBA	7365va		
0130	0200		Sweden, Radio	6010na	9435va	
0130	0200	twhfa	USA, Voice of America	7405am	13740am	
0133	0200	sm	Austria, Radio Austria Intl	9870na		
0140	0200		Vatican City, Vatican Radio	7335as	9650as	
0143	0158	twhfa	Austria, Radio Austria Intl	9870na		
0145	0200	twhfas	Albania, Radio Tirana	6115eu	7455eu	
0145	0200	w	Australia, HCJB	15405as		

0200 UTC - 10PM EDT / 9PM CDT / 7PM PDT

0200	0215		Croatia, Croatian Radio	9925na		
0200	0227		Iran, Voice of the Islamic Rep	7235am	9495am	
0200	0230		Thailand, Radio	5980na		
0200	0245		USA, WYFR/Family R Okeechobee FL		11835va	
0200	0300		Anguilla, University Network	6090am		
0200	0300	twhfa	Argentina, RAE	11710am		
0200	0300		Australia, ABC NT Alice Springs		2310irr	
			4835do			
0200	0300		Australia, ABC NT Katherine	5025do		
0200	0300		Australia, ABC NT Tennant Creek		4910do	
0200	0300		Australia, CVC International	7355as		
0200	0300		Australia, Radio	9660pa	12080pa	13630pa
			13670pa	15240va	15415va	15515va
			17750as	21725va		
0200	0300		Bulgaria, Radio	9700na	11700na	
0200	0300		Canada, CFRX Toronto ON	6070na		
0200	0300		Canada, CFVP Calgary AB	6030na		
0200	0300		Canada, CKZN St John's NF	6160na		
0200	0300		Canada, CKZU Vancouver BC	6160na		
0200	0300		China, China Radio Intl	11870as	13640as	
0200	0300		Costa Rica, University Network	5030va	6150va	
			7375va	9725va		
0200	0300		Cuba, Radio Havana	6000na	6060na	
			9820na			
0200	0300		Egypt, Radio Cairo	7270na		
0200	0300	s	Greece, Voice of	7475va	9420va	17520va
0200	0300		Guyana, Voice of	3291do		
0200	0300		Malaysia, RTM/Trax FM	7295as		
0200	0300	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
0200	0300		New Zealand, Radio NZ Intl	13730pa		
0200	0300	DRM	New Zealand, Radio NZ Intl	15720pa		
0200	0300		North Korea, Voice of Korea	13650as	15100as	
0200	0300	vl	Papua New Guinea, Wantok R.Light		7120va	
0200	0300		Philippines, Radio Pilipinas	11885va	15270va	
			17665va			
0200	0300		Russia, Voice of	9665na	9860na	15555na
			15595na			
0200	0300		Singapore, MediaCorp Radio	6150do		
0200	0300		South Korea, KBS World Radio		9560na	
			11810sa	15575na		
0200	0300		UK, BBC World Service	6195me	11760me	
			11955as	15280as	15310as	15360as
			17790as			
0200	0300		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
0200	0300		USA, KAIJ Dallas TX	5755na		
0200	0300		USA, KJES Vado NM	7555na		
0200	0300		USA, KTBN Salt Lake City UT	7505na		
0200	0300		USA, KWHR Naalehu HI	17655as		
0200	0300		USA, WBCQ Kennebunk ME	5110na	7415na	
			9330na			
0200	0300		USA, WBOH Newport NC	5920am		
0200	0300		USA, WEWN Birmingham AL	5810va	5835va	
0200	0300		USA, WHRA Greenbush ME	5850na		
0200	0300	sm	USA, WHRI Noblesville IN	7315am		
0200	0300		USA, WHRI Noblesville IN	5875am	7490am	
			9515am			
0200	0300		USA, WINB Red Lion PA	9265am		
0200	0300	twhfa	USA, WRMI Miami FL	7385am		
0200	0300	twhfa	USA, WRMI Miami FL	7385am		
0200	0300		USA, WTJC Newport NC	9370na		
0200	0300		USA, WWCR Nashville TN	3215na	5070na	
			5765na	5935na		
0200	0300		USA, WWRB Manchester TN	3185na	5050na	
			5745na	6890na		
0200	0300		USA, WYFR/Family R Okeechobee FL		5985va	
			6065va	9505va	11855va	
0200	0300		Uzbekistan, Christian Vision	7355as		
0200	0300		Zambia, Christian Voice	4965af		
0200	3000		Taiwan, Radio Taiwan Intl	5950na	9680na	
0215	0220		Vatican City, Vatican Radio	15560oc		
0215	0230		Nepal, Radio	3230as	5005as	6100as
			7165as			
0230	0258		Vietnam, Voice of	6175na		
0230	0300	twhfas	Albania, Radio Tirana	6115eu	7450eu	
0230	0300		Hungary, Radio Budapest	9795eu		
0230	0300		Sweden, Radio	6010na		
0245	0300		Myanmar, Radio	9730do		
0250	0300		Vatican City, Vatican Radio	7305am	9610am	

0300 UTC - 11PM EDT / 10PM CDT / 8PM PDT

0300	0320		Vatican City, Vatican Radio	7305am	9610am	
0300	0327		Czech Rep, Radio Prague	7345na	9870na	
0300	0330	mtwhfa	Belarus, Radio	5970eu	6155eu	7210eu
0300	0330		Egypt, Radio Cairo	7270na		
0300	0330		Myanmar, Radio	9730do		
0300	0330		Philippines, Radio Pilipinas	11885va	15270va	
			17665va			
0300	0330		UK, BBC World Service	3255af	6005af	
			6035af	6190af	7160af	9750af
			12035af			
0300	0330		USA, KJES Vado NM	7555na		
0300	0330		USA, Voice of America	4930af	6080af	
			7340af	9885af	12080af	15580af
0300	0330		USA, WBCQ Kennebunk ME	5110na	7415na	
			9330na			
0300	0330		Vatican City, Vatican Radio	9660af		
0300	0350		Turkey, Voice of	5975va	7270va	
0300	0355		South Africa, Channel Africa	5960af		
0300	0400		Anguilla, University Network	6090am		
0300	0400		Australia, ABC NT Alice Springs		2310irr	
			4835do			
0300	0400		Australia, ABC NT Katherine	5025do		
0300	0400		Australia, ABC NT Tennant Creek		4910do	
0300	0400		Australia, CVC International	13685as		
0300	0400		Australia, Radio	9660pa	12080pa	13630pa
			13670va	15240va	15415va	15515va
			17750as	21725va		
0300	0400	twhfas	Canada, CBC NQ SW Service	9625na		
0300	0400		Canada, CFRX Toronto ON	6070na		
0300	0400		Canada, CFVP Calgary AB	6030na		
0300	0400		Canada, CKZN St John's NF	6160na		
0300	0400		Canada, CKZU Vancouver BC	6160na		
0300	0400		China, China Radio Intl	9690na	9790na	
			11870as	15110as		
0300	0400		Costa Rica, University Network	5030va	6150va	
			7375va	9725va		
0300	0400		Cuba, Radio Havana	6000na	6060na	
			9820na			
0300	0400		Guyana, Voice of	3291do		
0300	0400		Japan, Radio Japan/NHK World		21610oc	
0300	0400		Malaysia, RTM/Trax FM	7295as		
0300	0400		Malaysia, Voice of	6175as	9750as	15295as
0300	0400	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
0300	0400		New Zealand, Radio NZ Intl	13730pa		
0300	0400	DRM	New Zealand, Radio NZ Intl	15720pa		
0300	0400		North Korea, Voice of Korea	7140as	9345as	
			9730as			
0300	0400		Oman, Radio Oman	15355as		
0300	0400	vl	Papua New Guinea, Wantok R.Light		7120va	
0300	0400		Russia, Voice of	5900na	9665na	9860na
			9890na	15425na	15455na	15555na
			15595na			
0300	0400	vl	Rwanda, Radio	6055do		
0300	0400		Singapore, MediaCorp Radio	6150do		
0300	0400		South Africa, Channel Africa	3345af		
0300	0400		Taiwan, Radio Taiwan Intl	5950va	15215va	
			15320va			
0300	0400		UK, BBC World Service	6195va	9410eu	
			11760me	15575me		
0300	0400		Ukraine, Radio Ukraine Intl	7440na		
0300	0400		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
0300	0400		USA, KAIJ Dallas TX	5755na		
0300	0400		USA, KTBN Salt Lake City UT	7505na		
0300	0400		USA, KWHR Naalehu HI	17655as		
0300	0400		USA, WBCQ Kennebunk ME	5110na	7415na	
0300	0400		USA, WBOH Newport NC	5920am		
0300	0400		USA, WEWN Birmingham AL	5810va	5835va	
0300	0400		USA, WHRA Greenbush ME	5850na		
0300	0400	twhfa	USA, WHRI Noblesville IN	5860am		
0300	0400	sm	USA, WHRI Noblesville IN	7520am		
0300	0400		USA, WHRI Noblesville IN	5875am	7315am	
0300	0400		USA, WINB Red Lion PA	9265am		
0300	0400	twhfa	USA, WRMI Miami FL	7385am		
0300	0400	sm	USA, WRMI Miami FL	9955am		
0300	0400		USA, WTJC Newport NC	9370na		
0300	0400		USA, WWCR Nashville TN	3215na	5070na	
			5765na	5935na		
0300	0400		USA, WWRB Manchester TN	3185na	5050na	
			5745na	6890na		
0300	0400		USA, WYFR/Family R Okeechobee FL		6065am	
			9505am	11740am	15255am	
0300	0400		Uzbekistan, Christian Vision	13685as		
0300	0400		Zambia, Christian Voice	4965af		
0300	0400	vl	Zimbabwe, ZBC Corp	5975do		
0300	0500	vl/mtwhf	UK, Sudan Radio Service	7120af		
0330	0345		Israel, Kol Israel	9345va	7530va	17600va
0330	0357		Czech Rep, Radio Prague	9445va	11600va	
0330	0358		Vietnam, Voice of	6175am		
0330	0400	s	Belarus, Radio	5970eu	6155eu	7210eu
0330	0400		UK, BBC World Service	3255af	6005af	
			6035af	6190af	7160af	9750af
			12035af	15420af		
0330	0400		USA, Voice of America	4930af	6080af	
			9885af	12080af	12080af	15580af
0330	0400	twhfa	USA, WBCQ Kennebunk ME	9330na		

0400 UTC - 12AM EDT / 11PM CDT / 9PM PDT

0400	0427		Czech Rep, Radio Prague	6100na		
0400	0430	mtwhf	France, Radio France Intl	9805af	11700af	
0400	0430		USA, Voice of America	4930af	4960af	
			6080af 7405af	9575af	9885af	
			11835af 12080af	15580af		
0400	0445		USA, WYFR/Family R Okeechobee FL		6065va	
			6855va 9505va			
0400	0456		Romania, Radio Romania Intl	9780va	11795na	
			15110va 17780va			
0400	0458		New Zealand, Radio NZ Intl	13730pa		
0400	0458	DRM	New Zealand, Radio NZ Intl	15720pa		
0400	0459		South Africa, Channel Africa	3345af		
0400	0500		Anguilla, University Network	6090am		
0400	0500		Australia, ABC NT Alice Springs		2310irr	
			4835do			
0400	0500		Australia, ABC NT Katherine	5025do		
0400	0500		Australia, ABC NT Tennant Creek		4910do	
0400	0500		Australia, CVC International	13685as		
0400	0500		Australia, Radio 9660pa	12080pa	13670va	
			15240pa 15415va	15515va	21725va	
0400	0500	twhfas	Canada, CBC NQ SW Service	9625na		
0400	0500		Canada, CFRX Toronto ON	6070na		
0400	0500		Canada, CKZN St John's NF	6160na		
0400	0500		Canada, CKZU Vancouver BC	6160na		
0400	0500		China, China Radio Intl	6020na	6080na	
			9560na 9755na	11750af		
0400	0500		Costa Rica, University Network	5030va	6150va	
			7375va 9725va			
0400	0500		Cuba, Radio Havana	6000na	6060na	
			9820na			
0400	0500		Germany, Deutsche Welle	7225af	9630af	
			12045af 15445af			
0400	0500		Guyana, Voice of 3291do			
0400	0500		Malaysia, RTM/Trax FM	7295as		
0400	0500		Malaysia, Voice of 6175as	9750as	15295as	
0400	0500	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do 6175do			
0400	0500		Netherlands, Radio	6165am	9590va	
0400	0500		Nigeria, Radio/Kaduna	6090do		
0400	0500	vl	Papua New Guinea, Wantok R.Light		7120va	
0400	0500		Russia, Voice of 5900na	9665na	9860na	
			15555na			
0400	0500	vl	Rwanda, Radio 6055do			
0400	0500		Singapore, MediaCorp Radio	6150do		
0400	0500	vl	Uganda, Radio 4976do	5026do	7196do	
0400	0500		UK, BBC World Service	3255af	6005af	
			6190af 6195eu	7120af	7160af	
			9410va 11760me	12035af	15280as	
			15310as 15360as	15420af	15575me	
			17760as 17790as	21660as		
0400	0500	DRM	UK, BBC World Service	6010na		
0400	0500		USA, American Forces Radio	4319usb	5446usb	
			5765usb 6350usb	7812usb	10320usb	
			12133usb 12579usb	12579usb		
0400	0500		USA, KAIJ Dallas TX	5755na		
0400	0500		USA, KTBN Salt Lake City UT	7505na		
0400	0500		USA, KWHR Naalehu HI	17655as		
0400	0500		USA, WBCQ Kennebunk ME	5110na	7415na	
0400	0500		USA, WBOH Newport NC	5920am		
0400	0500		USA, WEWN Birmingham AL	5810va	5835va	
0400	0500		USA, WHRA Greenbush ME	5850na		
0400	0500	twhfa	USA, WHRI Noblesville IN	5860am		
0400	0500	sm	USA, WHRI Noblesville IN	7520am		
0400	0500		USA, WHRI Noblesville IN	5875am	7315am	
0400	0500	mtwhfa	USA, WMLK Bethel PA	9265eu		
0400	0500	a	USA, WRMI Miami FL	9955am		
0400	0500		USA, WTJC Newport NC	9370na		
0400	0500		USA, WWCR Nashville TN	3215na	5070na	
			5765na 5935na			
0400	0500		USA, WWRB Manchester TN	3185na	5050na	
			5745na 6890na			
0400	0500		USA, WYFR/Family R Okeechobee FL		7780va	
			9715va			
0400	0500		Uzbekistan, Christian Vision	13685as		
0400	0500		Zambia, Christian Voice	4965af	6065af	
0400	0500	vl	Zimbabwe, ZBC Corp	5975do		
0430	0500		Nigeria, Radio/Ibadan	6050do		
0430	0500		Nigeria, Radio/Kaduna	4770do		
0430	0500		Nigeria, Radio/Lagos	3326do	4990do	
0430	0500		Swaziland, TWR 3200af	4775af		
0430	0500		USA, Voice of America	4930af	4960af	
			6080af 7405af	9575af	11835af	
			12080af 15580af			
0445	0500		Italy, RAI Intl	6110af	6145af	7235af
0459	0500		New Zealand, Radio NZ Intl	9615pa		
0459	0500	DRM	New Zealand, Radio NZ Intl	9440pa		

0500 UTC - 1AM EDT / 12AM CDT / 10PM PDT

0500	0507	twhfas	Canada, CBC NQ SW Service	9625na		
0500	0520		Vatican City, Vatican Radio	5885eu	7250eu	
			9645eu			
0500	0530	mtwhf	France, Radio France Intl	13680af	15160af	
0500	0530	vl	Rwanda, Radio 6055do			
0500	0530		UK, BBC World Service	6005af	6190af	
			6195eu 7160af	9410af	11765af	
			11955as 15280as	15310as	15360as	
			15420af 17640af	17760as	17790as	
			17885af 21660as			
0500	0530		Vatican City, Vatican Radio	9660af	11625af	
			13765af			
0500	0555		South Africa, Channel Africa	9685af		
0500	0600		Anguilla, University Network	6090am		
0500	0600		Australia, ABC NT Alice Springs		2310irr	
			4835do			
0500	0600		Australia, ABC NT Katherine	5025do		
0500	0600		Australia, ABC NT Tennant Creek		4910do	
0500	0600		Australia, CVC International	13685as		
0500	0600		Australia, Radio 9660pa	12080pa	13670va	
			15160va 15240va	15415va	15515va	
			17750as			
0500	0600		Bhutan, BBS 6035as			
0500	0600		Canada, CFRX Toronto ON	6070na		
0500	0600		Canada, CKZN St John's NF	6160na		
0500	0600		Canada, CKZU Vancouver BC	6160na		
0500	0600		China, China Radio Intl	6020na	6190na	
			9560na 11880as	15350as	15360af	
			15465as 17505as	17540as		
0500	0600		Costa Rica, University Network	5030va	6150va	
			7375va 9725va			
0500	0600		Cuba, Radio Havana	6000va	6060va	
			9550va 9820va	11760va		
0500	0600		Germany, CVC The Voice Africa		9430af	
0500	0600		Germany, Deutsche Welle 9630af		9700af	
			15410af 17800af			
0500	0600		Guyana, Voice of 3291do			
0500	0600		Japan, Radio Japan/NHK World		5975eu	
			6110na 7230eu	15195as	17810as	
			21755oc			
0500	0600		Malaysia, RTM/Trax FM	7295as		
0500	0600		Malaysia, Voice of 6175as	9750as	15295as	
0500	0600	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do 6175do			
0500	0600		New Zealand, Radio NZ Intl	9615pa		
0500	0600	DRM	New Zealand, Radio NZ Intl	9440pa		
0500	0600		Nigeria, Radio/Ibadan	6050do		
0500	0600		Nigeria, Radio/Kaduna	4770do	6090do	
0500	0600		Nigeria, Radio/Lagos	3326do	4990do	
0500	0600		Nigeria, Voice of 15120af			
0500	0600	vl	Papua New Guinea, Wantok R.Light		7120va	
0500	0600		Russia, Voice of 17635oc	21790oc		
0500	0600		Singapore, MediaCorp Radio	6150do		
0500	0600		South Africa, Channel Africa	7240af		
0500	0600		Swaziland, TWR 3200af	4775af	9500af	
0500	0600	vl	Uganda, Radio 4976do	5026do	7196do	
0500	0600		UK, BBC World Service	11760me	15575me	
0500	0600	vl/ mtwhf	UK, Sudan Radio Service	9525af		
0500	0600		USA, American Forces Radio	4319usb	5446usb	
			5765usb 6350usb	7812usb	10320usb	
			12133usb 12579usb	12579usb		
0500	0600		USA, KAIJ Dallas TX	5755na		
0500	0600		USA, KTBN Salt Lake City UT	7505na		
0500	0600		USA, KWHR Naalehu HI	11565as	13650as	
0500	0600		USA, Voice of America	4930af	6080af	
			6180af 7405af	12080af	15580af	
0500	0600		USA, WBCQ Kennebunk ME	5110na	7415na	
0500	0600		USA, WBOH Newport NC	5920am		
0500	0600		USA, WEWN Birmingham AL	5050va	5850va	
0500	0600		USA, WHRA Greenbush ME	6145na		
0500	0600	twhfa	USA, WHRI Noblesville IN	5860am	7465am	
0500	0600	sm	USA, WHRI Noblesville IN	7315am		
0500	0600	mtwhfa	USA, WMLK Bethel PA	9265eu		
0500	0600asm		USA, WRMI Miami FL	9955am		
0500	0600		USA, WTJC Newport NC	9370na		
0500	0600		USA, WWCR Nashville TN	3215na	5070na	
			5765na 5935na			
0500	0600		USA, WWRB Manchester TN	3185na		
0500	0600		USA, WYFR/Family R Okeechobee FL		6855va	
			9355va			
0500	0600		Uzbekistan, Christian Vision	13685as		
0500	0600		Zambia, Christian Voice	4965af	6065af	
0500	0600	vl	Zimbabwe, ZBC Corp	5975do		
0505	0520	m	Austria, Radio Austria Intl	17870me		
0505	0530	as	Austria, Radio Austria Intl	17870me		
0515	0600		Germany, CVC The Voice Africa		9555af	
0525	0600	vl	Ghana, Ghana BC Corp	3366do	4915do	
0530	0600		Thailand, Radio 17655eu			
0530	0600		UK, BBC World Service	3255af	6005af	
			6190af 6195eu	7160af	9410af	
			11765af 11955as	15310as	15360as	
			15420af 17640af	17760as	21660as	
0530	0600	mtwhf	UK, BBC World Service	17885af		
0530	0600	vl/ mtwhf	Vatican City, Vatican Radio	6185va		
0535	0600	as	Austria, Radio Austria Intl	17870me		
0545	0600	twhf	Austria, Radio Austria Intl	17870me		
0545	0600	vl	Rwanda, Radio 6055do			

0600 UTC - 2AM EDT / 1AM CDT / 11PM PDT

0600	0615	as	South Africa, TWR	11640af		
0600	0630	mtwhf	France, Radio France Intl	15160af	17800af	
0600	0630		UK, BBC World Service	6005af	6190af	
			9410af	9530af	11765af	11940af
			12095af	17640af		
0600	0645	mtwhf	South Africa, TWR	11640af		
0600	0645	vl/ mtwhf	Vatican City, Vatican Radio	6185va		
0600	0655		South Africa, Channel Africa	15255af		
0600	0658		New Zealand, Radio NZ Intl	9615pa		
0600	0658	DRM	New Zealand, Radio NZ Intl	9440pa		
0600	0659		South Africa, Channel Africa	7240af		
0600	0700		Anguilla, University Network	6090am		
0600	0700		Australia, ABC NT Alice Springs			2310irr
			4835do			
0600	0700		Australia, ABC NT Katherine	5025do		
0600	0700		Australia, ABC NT Tennant Creek			4910do
0600	0700		Australia, CVC International	15335as		
0600	0700		Australia, Radio	9660pa	12080pa	13670va
			15160va	15240va	15415va	15515va
			17750as			
0600	0700		Canada, CFRX Toronto ON	6070na		
0600	0700		Canada, CFVP Calgary AB	6030na		
0600	0700		Canada, CKZN St John's NF	6160na		
0600	0700		Canada, CKZU Vancouver BC	6160na		
0600	0700		China, China Radio Intl	11870as	11880as	
			13620as	15350as	15465as	17490eu
			17505as	17540as		
0600	0700		Costa Rica, University Network	5030va	6150va	
			7375va	9725va	11870va	
0600	0700		Cuba, Radio Havana	6000va	6060va	
			9550va	9820va	11760va	
0600	0700		Germany, CVC The Voice Africa			9555af
			15640af			
0600	0700		Germany, Deutsche Welle	6140eu	7170af	
			15275af	17860af		
0600	0700	vl	Ghana, Ghana BC Corp	3366do	4915do	
0600	0700		Guyana, Voice of	3291do		
0600	0700		Japan, Radio Japan/NHK World			11715eu
			11740as	11760eu	13630va	15195as
			17870pa	21755oc		
0600	0700		Liberia, ELWA	4760do		
0600	0700		Malaysia, RTM/Trax FM	7295as		
0600	0700		Malaysia, Voice of	6175as	9750as	15295as
0600	0700	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
0600	0700		Netherlands, Radio	9700pa		
0600	0700		Nigeria, Radio/Ibadan	6050do		
0600	0700		Nigeria, Radio/Kaduna	4770do	6090do	
0600	0700		Nigeria, Radio/Lagos	3326do	4990do	
0600	0700		Nigeria, Voice of	15120af		
0600	0700	vl	Papua New Guinea, Wantok R.	Light		7120va
0600	0700		Russia, Voice of	17635oc	21790oc	
0600	0700	irreg/ vl	Sierra Leone, SLBS	3316do		
0600	0700		Singapore, MediaCorp Radio	6150do		
0600	0700	vl	Solomon Islands, SIBC	5020do	9545do	
0600	0700		Swaziland, TWR	3200af	4775af	9500af
0600	0700	as	UK, BBC World Service	17885af		
0600	0700		UK, BBC World Service	6195eu	9410eu	
			11955as	12095eu	15310as	15360as
			15565eu	15575me	17760as	17790as
			21660as			
0600	0700		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
0600	0700		USA, KAIJ Dallas TX	5755na		
0600	0700		USA, KTBN Salt Lake City UT	7505na		
0600	0700		USA, KWHR Naalehu HI	11565as	13650as	
0600	0700		USA, Voice of America	6080af	6180af	
			7405af	12080af	15580af	
0600	0700		USA, WBCQ Kennebunk ME	5110na	7415na	
0600	0700		USA, WBOH Newport NC	5920am		
0600	0700		USA, WEWN Birmingham AL	5050va	7570va	
0600	0700		USA, WHRA Greenbush ME	5860na	7490na	
0600	0700		USA, WHRI Noblesville IN	7315am	7465am	
0600	0700	mtwhfa	USA, WMLK Bethel PA	9265eu		
0600	0700	s	USA, WRMI Miami FL	9955am		
0600	0700		USA, WTJC Newport NC	9370na		
0600	0700		USA, WWCR Nashville TN	3215na	5070na	
			5765na	5935na		
0600	0700		USA, WWRB Manchester TN	3185na		
0600	0700		USA, WYFR/Family R Okeechobee FL			6000va
			7780va	9680va	11530va	11580va
0600	0700		Uzbekistan, Christian Vision	13685as		
0600	0700	vl	Vanuatu, Radio	4960do		
0600	0700		Yemen, Rep of Yemen Radio	9780me		
0600	0700		Zambia, Christian Voice	6065af		
0600	0700	vl	Zimbabwe, ZBC Corp	5975do		
0630	0645		Vatican City, Vatican Radio	4005eu	5885eu	
			6185eu	7250eu	9645eu	11740eu
			15595va			
0630	0645		Vatican City, Vatican Radio	15595va		
0630	0656		Romania, Radio Romania Intl	9655va	11830va	
			15440va	17770va		
0630	0700		Bulgaria, Radio	9500eu	11500eu	
0630	0700		UK, BBC World Service	6005af	6190af	
			9410af	9530af	11765af	11940af
			11990af	12095af	17640af	
0630	0700		Vatican City, Vatican Radio	11625af	13765af	
			15570af	15595af		
0645	0700	s	Albania, TWR Europe	11865eu		
0645	0700	s	Monaco, TWR	9800eu		
0659	0700		New Zealand, Radio NZ Intl	7145pa		
0659	0700	DRM	New Zealand, Radio NZ Intl	6095pa		

0700 UTC - 3AM EDT / 2AM CDT / 12AM PDT

0700	0715		UK, BBC World Service	6005af	6190af	
			11940af	11765af	15400af	15485af
			17640af	17830af		
0700	0727		Czech Rep, Radio Prague	9880eu	11600eu	
0700	0745		USA, WYFR/Family R Okeechobee FL			7780va
0700	0800	smtwhf	Albania, TWR Europe	11865eu		
0700	0800		Anguilla, University Network	6090am		
0700	0800		Australia, ABC NT Alice Springs			2310irr
			4835do			
0700	0800		Australia, ABC NT Katherine	5025do		
0700	0800		Australia, ABC NT Tennant Creek			4910do
0700	0800		Australia, CVC International	15335as		
0700	0800		Australia, HCJB	11750as		
0700	0800		Australia, Radio	9660pa	9710pa	12080pa
			13630pa	15160pa	15240va	15415va
			17750as			
0700	0800		Canada, CFRX Toronto ON	6070na		
0700	0800		Canada, CFVP Calgary AB	6030na		
0700	0800		Canada, CKZN St John's NF	6160na		
0700	0800		Canada, CKZU Vancouver BC	6160na		
0700	0800		China, China Radio Intl	11880as	13710eu	
			15350as	15465as	17490eu	
0700	0800		Costa Rica, University Network	5030va	6150va	
			7375va	9725va	11870va	
0700	0800		France, Radio France Intl	17800af		
0700	0800	f	Germany, Bible Voice BC Network			6140me
0700	0800	s	Germany, Bible Voice BC Network			5945eu
0700	0800		Germany, CVC The Voice Africa			9555af
			15640af			
0700	0800		Germany, CVC The Voice Africa			9555af
			15640af			
0700	0800		Germany, Deutsche Welle	6140eu		
0700	0800	vl	Ghana, Ghana BC Corp	3366do	4915do	
0700	0800		Guyana, Voice of	3291do	5950do	
0700	0800	as	Italy, IRRS	9310eu		
0700	0800		Liberia, ELWA	4760do		
0700	0800		Liberia, Star Radio	9525af		
0700	0800		Malaysia, RTM/Trax FM	7295as		
0700	0800		Malaysia, Voice of	6175as	9750as	15295as
0700	0800		Monaco, TWR	9800eu	11865eu	
0700	0800		Myanmar, Radio	9730do		
0700	0800	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
0700	0800		Netherlands, Radio	9700pa		
0700	0800		New Zealand, Radio NZ Intl	7145pa		
0700	0800	DRM	New Zealand, Radio NZ Intl	6095pa		
0700	0800		Nigeria, Radio/Ibadan	6050do		
0700	0800		Nigeria, Radio/Kaduna	4770do	6090do	
0700	0800		Nigeria, Radio/Lagos	3326do	4990do	
0700	0800	vl	Papua New Guinea, Wantok R.	Light		7120va
0700	0800		Russia, Voice of	17495oc	17635oc	21790oc
0700	0800	irreg/ vl	Sierra Leone, SLBS	3316do		
0700	0800		Singapore, MediaCorp Radio	6150do		
0700	0800	vl	Solomon Islands, SIBC	5020do	9545do	
0700	0800		Swaziland, TWR	6120af	9500af	
0700	0800		Taiwan, Radio Taiwan Intl	5950na		
0700	0800		UK, BBC World Service	11955as	15310as	
			15575me	17760va	17790as	17885as
			21660as			
0700	0800	as	UK, Bible Voice	5945eu		
0700	0800		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
0700	0800		USA, KAIJ Dallas TX	5755na		
0700	0800		USA, KTBN Salt Lake City UT	7505na		
0700	0800		USA, KWHR Naalehu HI	11565as	13650as	
0700	0800		USA, WBCQ Kennebunk ME	5110na	7415na	
0700	0800		USA, WBOH Newport NC	5920am		
0700	0800		USA, WEWN Birmingham AL	5050va	7570va	
0700	0800		USA, WHRA Greenbush ME	5860na	7490na	
0700	0800		USA, WHRI Noblesville IN	7315am	7495am	
0700	0800	mtwhfa	USA, WMLK Bethel PA	9265eu		
0700	0800		USA, WTJC Newport NC	9370na		
0700	0800		USA, WWCR Nashville TN	3215na	5070na	
			5765na	5935na		
0700	0800		USA, WWRB Manchester TN	3185na		
0700	0800		USA, WYFR/Family R Okeechobee FL			5985va
			6855va	9505va	9715va	9930va
0700	0800	vl	Vanuatu, Radio	4960do		
0700	0800		Zambia, Christian Voice	6065af		
0715	0745	s	Monaco, TWR	9800eu	11865eu	

SHORTWAVE GUIDE

0715	0750	a	Albania, TWR Europe		11865eu	
0715	0750	a	Monaco, TWR	9800eu	11865eu	
0715	0800	f	UK, Bible Voice	5945eu		
0730	0800	as	Guam, TWR/KTWR	17665as		
0730	0800		Pakistan, Radio	15100eu	17835eu	
0730	0800		UK, BBC World Service	6190af	11765af	
			11940af	15400af	15485af	17640af
			17830af			
0740	0800	mtwhf	Guam, TWR/KTWR	17665as		

0800 UTC - 4AM EDT / 3AM CDT / 1AM PDT

0800	0815	f	Germany, Bible Voice BC Network			6140me
0800	0820	smtwhf	Albania, TWR Europe		11865eu	
0800	0820		Monaco, TWR	9800eu	11865eu	
0800	0830		Australia, ABC NT Katherine	5025do		
0800	0830		Australia, ABC NT Tennant Creek			4910do
0800	0830		Liberia, ELWA	4760do		
0800	0830		Malaysia, Voice of	6175as	9750as	
0800	0830		Myanmar, Radio	9730do		
0800	0830		Pakistan, Radio	15100eu	17835eu	
0800	0830	f	UK, Bible Voice	5945eu		
0800	0830		Vatican City, Vatican Radio		9625na	
0800	0845	s	Germany, Bible Voice BC Network			5945eu
0800	0845	as	UK, Bible Voice	5945eu		
0800	0845		USA, WYFR/Family R Okeechobee FL			5950va
			9930va			
0800	0900		Anguilla, University Network		6090am	
0800	0900		Australia, ABC NT Alice Springs			2310irr
			4835do			
0800	0900		Australia, CVC International		15335as	
0800	0900		Australia, HCJB	11750as		
0800	0900		Australia, Radio	5995pa	9580pa	9590pa
			9710pa	12080pa	13630pa	15240va
			15415va	17750as		
0800	0900		Bhutan, BBS	6035as		
0800	0900	DRM	Bulgaria, World Radio Network			13865 ei
0800	0900		Canada, CFRX Toronto ON		6070na	
0800	0900		Canada, CFVP Calgary AB		6030na	
0800	0900		Canada, CKZN St John's NF		6160na	
0800	0900		Canada, CKZU Vancouver BC		6160na	
0800	0900		China, China Radio Intl		11880as	13710eu
			15350as	15465as	17490eu	17540as
0800	0900		Costa Rica, University Network		5030va	6150va
			7375va	9725va	11870va	
0800	0900		Germany, CVC The Voice Africa			9555af
			15640af			
0800	0900		Germany, Deutsche Welle		6140eu	
0800	0900	DRM	Germany, Deutsche Welle		21820af	
0800	0900	vl	Ghana, Ghana BC Corp		3366do	4915do
0800	0900		Guam, TWR/KTWR	11840as	17665as	
0800	0900		Guyana, Voice of	3291do	5950do	
0800	0900		Indonesia, Voice of		9525as	11785pa
			15150al			
0800	0900	as	Italy, IRRS	9310eu		
0800	0900		Liberia, Star Radio	9525af		
0800	0900		Malaysia, RTM/Trax FM		7295as	
0800	0900		Malaysia, Voice of	15295as		
0800	0900		New Zealand, Radio NZ Intl		7145pa	
0800	0900	DRM	New Zealand, Radio NZ Intl		6095pa	
0800	0900		Nigeria, Radio/Ibadan		6050do	
0800	0900		Nigeria, Radio/Kaduna		4770do	6090do
0800	0900		Nigeria, Radio/Lagos		3326do	4990do
0800	0900		Papua New Guinea, Catholic Radio			4960do
0800	0900		Papua New Guinea, NBC		4890do	
0800	0900	vl	Papua New Guinea, Wantok R.Light			7120va
0800	0900		Russia, Voice of	17495oc	17635oc	21790oc
0800	0900	DRM	Russia, Voice of	15780eu		
0800	0900	irreg/ vl	Sierra Leone, SLBS	3316do		
0800	0900		Singapore, MediaCorp Radio		6150do	
0800	0900	vl	Solomon Islands, SIBC		5020do	9545do
0800	0900		South Korea, KBS World Radio			9570as
			9640eu			
0800	0900		Swaziland, TWR	6120af	9500af	
0800	0900		Taiwan, Radio Taiwan Intl		9610as	
0800	0900		UK, BBC World Service		6190af	6195as
			9740as	11760me	11940af	15310as
			15360as	15400af	15485af	15575me
			17640af	17760as	17790as	17830af
			17885af	21470af	21660as	
0800	0900		USA, American Forces Radio		4319usb	5446usb
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
0800	0900		USA, KAIJ Dallas TX		5755na	
0800	0900		USA, KNLS Anchor Point AK		11765as	
0800	0900		USA, KTBN Salt Lake City UT		7505na	
0800	0900		USA, KWHR Naalehu HI		9930as	11565as
0800	0900		USA, WBOH Newport NC		5920am	
0800	0900		USA, WEWN Birmingham AL		5050na	7570na
0800	0900		USA, WHRA Greenbush ME		5860na	7490na
0800	0900		USA, WHRI Noblesville IN		7315am	7495am
0800	0900		USA, WTJC Newport NC		9370na	
0800	0900		USA, WWCR Nashville TN		3215na	5070na
			5765na	5935na		
0800	0900		USA, WWRB Manchester TN		3185na	
0800	0900		USA, WYFR/Family R Okeechobee FL			5985va
			6855va			
0800	0900	vl	Vanuatu, Radio	4960do		
0800	0900		Zambia, Christian Voice		6065af	
0815	0900	as	Guam, TWR/KTWR	11840as		
0830	0900		Australia, ABC NT Katherine	2485do		
0830	0900		Australia, ABC NT Tennant Creek			2325do
0845	0900	f	UK, Bible Voice	17595va		

0900 UTC - 5AM EDT / 4AM CDT / 2AM PDT

0900	0900		USA, WBCQ Kennebunk ME		5110na	7415na
0900	0915	vl	Ghana, Ghana BC Corp		3366do	4915do
0900	0927		Czech Rep, Radio Prague		9880eu	21745va
0900	0930	as	Guam, TWR/KTWR	11840as		
0900	0930		USA, WRMI Miami FL		9955am	
0900	1000		Anguilla, University Network		6090am	
0900	1000		Australia, ABC NT Alice Springs			2310do
			4835irr			
0900	1000		Australia, ABC NT Katherine	2485do		
0900	1000		Australia, ABC NT Tennant Creek			2325do
0900	1000		Australia, CVC International		11955as	
0900	1000		Australia, Radio	9580pa	9590pa	11880as
			15240as	15415va		
0900	1000	DRM	Bulgaria, World Radio Network			13865eu
0900	1000		Canada, CFRX Toronto ON		6070na	
0900	1000		Canada, CFVP Calgary AB		6030na	
0900	1000		Canada, CKZN St John's NF		6160na	
0900	1000		Canada, CKZU Vancouver BC		6160na	
0900	1000		China, China Radio Intl		15210oc	17490eu
			17690oc			
0900	1000		Costa Rica, University Network		5030va	6150va
			7375va	9725va	11870va	13750va
0900	1000		Germany, CVC The Voice Africa			9555af
0900	1000		Germany, Deutsche Welle		6140eu	
0900	1000	DRM	Germany, Deutsche Welle		21820af	
0900	1000		Germany, Overcomer Ministries			6110eu
			13810eu			
0900	1000		Guyana, Voice of	3291do	5950do	
0900	1000	as	Italy, IRRS	9310eu		
0900	1000		Malaysia, RTM/Trax FM		7295as	
0900	1000		Malaysia, Voice of	15295as		
0900	1000	vl	Namibia, Namibian BC Corp		3270do	3290do
			6060do	6175do		
0900	1000		New Zealand, Radio NZ Intl		7145pa	
0900	1000	DRM	New Zealand, Radio NZ Intl		6095pa	
0900	1000		Nigeria, Radio/Ibadan		6050do	
0900	1000		Nigeria, Radio/Kaduna		4770do	6090do
0900	1000		Nigeria, Radio/Lagos		3326do	4990do
0900	1000		Papua New Guinea, Catholic Radio			4960do
0900	1000		Papua New Guinea, NBC		4890do	
0900	1000	vl	Papua New Guinea, Wantok R.Light			7120va
0900	1000	vl	Rwanda, Radio	6055do		
0900	1000	irreg/ vl	Sierra Leone, SLBS	3316do		
0900	1000		Singapore, MediaCorp Radio		6150do	
0900	1000	vl	Solomon Islands, SIBC		5020do	9545do
0900	1000		UK, BBC World Service		6190af	6195as
			9605as	9740as	11940af	15310as
			15360as	15400af	15485af	17640af
			17760as	17830af	17885af	21470af
0900	1000	f	UK, Bible Voice	17595va		
0900	1000		USA, American Forces Radio		4319usb	5446usb
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
0900	1000		USA, KAIJ Dallas TX		5755na	
0900	1000		USA, KTBN Salt Lake City UT		7505na	
0900	1000		USA, KWHR Naalehu HI		9930as	11565as
0900	1000		USA, WBCQ Kennebunk ME		5110na	7415na
0900	1000		USA, WBOH Newport NC		5920am	
0900	1000		USA, WEWN Birmingham AL		5050na	
0900	1000		USA, WHRI Noblesville IN		7315am	7520am
0900	1000		USA, WTJC Newport NC		9370na	
0900	1000		USA, WWCR Nashville TN		5070na	5765na
			5935na	9985na		
0900	1000		USA, WWRB Manchester TN		3185na	
0900	1000		USA, WYFR/Family R Okeechobee FL			5985va
			6885va	9755va		
0900	1000	vl	Vanuatu, Radio	4960do		
0900	1000		Zambia, Christian Voice		6065af	
0905	1000	s	Greece, Voice of	9420eu	12120eu	15630eu
0930	0945		Israel, Kol Israel	13680eu	15760eu	

1000 UTC - 6AM EDT / 5AM CDT / 3AM PDT

1000	1015	f	UK, Bible Voice	17595va		
1000	1015	as	USA, WRMI Miami FL		9955am	
1000	1025	DRM	Germany, Deutsche Welle		21820af	
1000	1030		Mongolia, Voice of	12085as		
1000	1030		UK, BBC World Service		6195as	9690as
			9740as	15310as	15360as	17760as
			17790as	21660as		
1000	1059		New Zealand, Radio NZ Intl		7145pa	
1000	1100		Anguilla, University Network		11775am	

1000	1100		Australia, ABC NT Alice Springs 4835irr				2310do
1000	1100		Australia, ABC NT Katherine	2485do			
1000	1100		Australia, ABC NT Tennant Creek				2325do
1000	1100		Australia, CVC International	11955as			
1000	1100		Australia, HCJB	15400as	15540as		
1000	1100		Australia, Radio	9580pa	9590pa		11880as
			15240as	15415va			
1000	1100	DRM	Bulgaria, World Radio Network				13865eu
1000	1100		Canada, CFRX Toronto ON	6070na			
1000	1100		Canada, CFVP Calgary AB	6030na			
1000	1100		Canada, CKZN St John's NF	6160na			
1000	1100		Canada, CKZU Vancouver BC	6160na			
1000	1100		China, China Radio Intl	6040na			17490eu
1000	1100		Costa Rica, University Network	5030va			6150va
			7375va	9725va			11870va 13750va
1000	1100		Germany, CVC The Voice Africa				9555af
1000	1100		Germany, Overcomer Ministries				6110eu
			13810eu				
1000	1100		Guyana, Voice of	3291do	5950do		
1000	1100		India, All India Radio				13695oc 15020as
			15410as	17510as	17800as		17895oc
1000	1100	as	Italy, IRRS	9310eu			
1000	1100		Japan, Radio Japan/NHK World				6120na
			9695as	11730as	17585va		17720me
			21755oc				
1000	1100		Malaysia, RTM/Trax FM	7295as			
1000	1100		Malaysia, Voice of	15295as			
1000	1100		Netherlands, Radio	12065as			13710as
			13820as				
1000	1100	DRM	Netherlands, Radio	7240eu			
1000	1100	DRM	New Zealand, Radio NZ Intl	6095pa			
1000	1100		Nigeria, Voice of	15120af			
1000	1100		North Korea, Voice of Korea	6185as			6285am
			9335ca	9850as			
1000	1100		Papua New Guinea, Catholic Radio				4960do
1000	1100		Papua New Guinea, NBC	4890do			
1000	1100	vl	Papua New Guinea, Wantok R.Light				7120va
1000	1100		Singapore, MediaCorp Radio	6150do			
1000	1100	vl	Solomon Islands, SIBC	5020do			9545do
1000	1100		South Africa, Channel Africa	9620af			
1000	1100		UK, BBC World Service	6190af			11940af
			15485af	15575me			
1000	1100	as	UK, BBC World Service	15400af			
1000	1100		USA, American Forces Radio	4319usb			5446usb
			5765usb	6350usb	7812usb		10320usb
			12133usb	12579usb	12579usb		
1000	1100		USA, KAIJ Dallas TX	5755na			
1000	1100		USA, KNLS Anchor Point AK	9795as			
1000	1100		USA, KTBN Salt Lake City UT	7505na			
1000	1100		USA, KWHR Naalehu HI	9930as			11565as
1000	1100		USA, WBCQ Kennebunk ME	5110na			7415na
1000	1100		USA, WBOH Newport NC	5920am			
1000	1100		USA, WEWN Birmingham AL	5050na			
1000	1100		USA, WHRI Noblesville IN	7520am			7555am
1000	1100		USA, WINB Red Lion PA	9265am			
1000	1100		USA, WTJC Newport NC	9370na			
1000	1100		USA, WWCR Nashville TN	5070na			5765na
			5935na	15825na			
1000	1100		USA, WWRB Manchester TN	3185na			
1000	1100		USA, WYFR/Family R Okeechobee FL				5950va
			5985va	6855va	9755va		
1000	1100		Zambia, Christian Voice	6065af			
1030	1045	mtwhf	Ethiopia, Radio	5990af	7110af		9704af
1030	1057		Czech Rep, Radio Prague	9880eu			11665va
1030	1058		Vietnam, Voice of	7285as			
1030	1100		Iran, Voice of the Islamic Rep	15600as			17660as
1030	1100		UK, BBC World Service	6195as			9740as
			15310as	17760as	17790as		
1059	1100		New Zealand, Radio NZ Intl	9870pa			

1100 UTC - 7AM EDT / 6AM CDT / 4AM PDT

1100	1127		Iran, Voice of the Islamic Rep	15600as			17600as
1100	1128		Vietnam, Voice of	9840as			7220as 7285as
1100	1130		Australia, HCJB	15540as			
1100	1130		Australia, Radio	5995pa	9475va		9590va
			9580pa	9590pa	11880va		15240va
1100	1130		UK, BBC World Service	6190af			11940af
			15400af	15485af	17640af		17830af
			17885af	21470af			
1100	1145		USA, WYFR/Family R Okeechobee FL				9550va
			9755va				
1100	1159	s	Germany, Universal Life	6055me			
1100	1200		Anguilla, University Network	11775am			
1100	1200		Australia, ABC NT Alice Springs 4835irr				2310do
1100	1200		Australia, ABC NT Katherine	2485do			
1100	1200		Australia, ABC NT Tennant Creek				2325do
1100	1200		Australia, CVC International	13635as			
1100	1200	DRM	Bulgaria, World Radio Network				13865eu
1100	1200	as	Canada, CBC NQ SW Service	9625na			
1100	1200		Canada, CFRX Toronto ON	6070na			
1100	1200		Canada, CFVP Calgary AB	6030na			
1100	1200		Canada, CKZN St John's NF	6160na			
1100	1200		Canada, CKZU Vancouver BC	6160na			
1100	1200		China, China Radio Intl	6040na			11750na
			13650eu	17490eu			
1100	1200		Costa Rica, University Network	5030va			6150va
			7375va	9725va	11870va		13750va
1100	1200		Germany, CVC The Voice Africa				9555af
1100	1200	1st a	Germany, Overcomer Ministries				6110eu
1100	1200	as	Italy, IRRS	9310eu			
1100	1200		Japan, Radio Japan/NHK World				6120na
			9695as	11730as			
1100	1200	vl	Libya, Voice of Africa			17725af	21695af
1100	1200		Malaysia, RTM/Trax FM	7295as			
1100	1200		Malaysia, Voice of	15295as			
1100	1200		Netherlands, Radio	11675na			
1100	1200		New Zealand, Radio NZ Intl	9870pa			
1100	1200	DRM	New Zealand, Radio NZ Intl	6095pa			
1100	1200		Nigeria, Voice of	15120af			
1100	1200		Papua New Guinea, Catholic Radio				4960do
1100	1200		Papua New Guinea, NBC	4890do			
1100	1200	vl	Papua New Guinea, Wantok R.Light				7120va
1100	1200		Singapore, Radio Singapore Intl				6080as
			6150as				
1100	1200		South Africa, Channel Africa	9620af			
1100	1200		Taiwan, Radio Taiwan Intl	7445as			
1100	1200		UK, BBC World Service	6130sa			6195asas
			9660va	9740as	11865va		15310as
			15575me	17760as	17790as		
1100	1200		Ukraine, Radio Ukraine Intl	15675eu			
1100	1200		USA, American Forces Radio	4319usb			5446usb
			5765usb	6350usb	7812usb		10320usb
			12133usb	12579usb	12579usb		
1100	1200		USA, KAIJ Dallas TX	5755na			
1100	1200		USA, KTBN Salt Lake City UT	7505na			
1100	1200		USA, KWHR Naalehu HI	9930as			11565as
1100	1200		USA, Voice of America	15205va			
1100	1200		USA, WBOH Newport NC	5920am			
1100	1200		USA, WEWN Birmingham AL	5050na			
1100	1200		USA, WHRI Noblesville IN	7520am			7555am
1100	1200		USA, WINB Red Lion PA	9265am			
1100	1200		USA, WTJC Newport NC	9370na			
1100	1200		USA, WWCR Nashville TN	5070na			5935na
			7465na	15825na			
1100	1200		USA, WWRB Manchester TN	3185na			
1100	1200		USA, WWRB Manchester TN	3185na			
1100	1200		USA, WYFR/Family R Okeechobee FL				5950va
			5985va	7780va	9625va		
1100	1200		Zambia, Christian Voice	6065af			
1115	1200	s	USA, WRMI Miami FL	9955am			
1130	1159	a	Germany, Universal Life	6055me			
1130	1200	mtwhfa	Australia, HCJB	15425as			
1130	1200		Australia, Radio	5995pa	9475va		9590va
			9580pa	9590pa	11880va		
1130	1200		Bulgaria, Radio	11700eu	15700eu		
1130	1200		Guam, AWR/KSDA	15435as			
1130	1200		UK, BBC World Service	6190af			11940af
			15485af	17640af	17830af		17885af
			21470af				
1130	1200		Vatican City, Vatican Radio	15595va			17515va
1157	1200		Greece, Macedonias Radio	9935eu			

1200 UTC - 8AM EDT / 7AM CDT / 5AM PDT

1200	1230		France, Radio France Intl			17815af	21620af
1200	1230		Malaysia, Voice of	15295as			
1200	1230		UAE, AWR Africa	15140as	15365as		
1200	1245		USA, WYFR/Family R Okeechobee FL				5950am
			5985am				
1200	1259		Canada, Radio Canada Intl	9660as			15170as
1200	1259		New Zealand, Radio NZ Intl	9870pa			
1200	1259		Poland, Radio Polonia	9525eu			11850eu
1200	1300		Anguilla, University Network	11775am			
1200	1300		Australia, ABC NT Alice Springs 4835irr				2310do
1200	1300		Australia, ABC NT Katherine	2485do			
1200	1300		Australia, ABC NT Tennant Creek				2325do
1200	1300		Australia, CVC International	17860me			
1200	1300		Australia, Radio	5995pa	9475va		9590va
			9580pa	9590pa	11880va		
1200	1300	DRM	Bulgaria, World Radio Network				13865eu
1200	1300	as	Canada, CBC NQ SW Service	9625na			
1200	1300		Canada, CFRX Toronto ON	6070na			
1200	1300		Canada, CFVP Calgary AB	6030na			
1200	1300		Canada, CKZN St John's NF	6160na			
1200	1300		Canada, CKZU Vancouver BC	6160na			
1200	1300		China, China Radio Intl	9730as			9760oc
			11760oc	11980as	13650eu		13790eu
			17490eu	17625af			
1200	1300		Costa Rica, University Network	9725va			11870va
			13750va				
1200	1300		Germany, CVC International	13860eu			17830as
1200	1300		Germany, CVC The Voice Africa				9555af
1200	1300		Germany, Overcomer Ministries				13810eu
1200	1300	f	Italy, IRRS	15750af			
1200	1300	vl	Libya, Voice of Africa			17670af	17675af
			17680af	21695af			

1200	1300		Malaysia, RTM/Trax FM	7295as		
1200	1300		Malaysia, Voice of	6175as		
1200	1300	DRM	Netherlands, Radio	7240eu		
1200	1300	DRM	New Zealand, Radio NZ Intl	6095pa		
1200	1300		Nigeria, Voice of	15120af		
1200	1300		Papua New Guinea, Catholic Radio			4960do
1200	1300		Papua New Guinea, NBC	4890do		
1200	1300	vl	Papua New Guinea, Wantok R.Light			7120va
1200	1300		Singapore, Radio Singapore Intl 6150as			6080as
1200	1300		South Korea, KBS World Radio			9650na
1200	1300		Taiwan, Radio Taiwan Intl	7130na		
1200	1300		UK, BBC World Service	6190af	6195as	
			9660va	9740va	9750af	11865va
			11940af	15310as	15485af	15575me
			17640af	17760as	17790as	17830af
			17885af	21470af		
1200	1300		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
1200	1300		USA, KAIJ Dallas TX	5755na		
1200	1300		USA, KNLS Anchor Point AK	9615as	9780as	
1200	1300		USA, KTBN Salt Lake City UT	7505na		
1200	1300		USA, KWHR Naalehu HI	11565as	12130as	
1200	1300		USA, Voice of America	6160va	9645va	
			9760va	11750va		
1200	1300		USA, WBOH Newport NC	5920am		
1200	1300		USA, WEWN Birmingham AL	5050na		
1200	1300		USA, WHRA Greenbush ME	15665na		
1200	1300		USA, WHRI Noblesville IN	9495am	9840am	
			12050am			
1200	1300		USA, WINB Red Lion PA	13570am		
1200	1300		USA, WTJC Newport NC	9370na		
1200	1300		USA, WWCR Nashville TN	7465na	9985na	
			13845na	15825na		
1200	1300		USA, WWRB Manchester TN	3185na		
1200	1300		USA, WYFR/Family R Okeechobee FL			17555am
			17750am			
1200	1300		Zambia, Christian Voice	6065af		
1205	1220	m	Austria, Radio Austria Intl	6155eu	13730eu	
			17715as			
1205	1230	as	Austria, Radio Austria Intl	6155eu	13730eu	
			17715va			
1215	1230	twhf	Austria, Radio Austria Intl	17715va		
1215	1300		Egypt, Radio Cairo	17835as		
1230	1258		Vietnam, Voice of	9840as	12020as	
1230	1300		Bangladesh, Bangla Betar	7185as		
1230	1300		Sweden, Radio	13580va	15240na	15735va
1230	1300		Thailand, Radio	9835va		
1230	1300		Turkey, Voice of	15450eu	15535va	
1235	1300	as	Austria, Radio Austria Intl	6155eu	13730eu	
			17715va			
1245	1300	twh	Austria, Radio Austria Intl	6155eu	13730eu	
			17715va			
1255	1258		Finland, YLE/Radio Finland	13715do	15400do	

1300 UTC - 9AM EDT / 8AM CDT / 6AM PDT

1300	1315	w	Australia, HCJB	15405as		
1300	1320		Turkey, Voice of	15450eu	15535va	
1300	1327		Czech Rep, Radio Prague	13580as	17540na	
1300	1330		Australia, HCJB	15400as		
1300	1330		Egypt, Radio Cairo	17835as		
1300	1330	DRM	Netherlands, Radio	7240eu		
1300	1350	s	Italy, IRRS	15750as		
1300	1356		Romania, Radio Romania Intl	11845eu	15105eu	
1300	1400		Anguilla, University Network	11775am		
1300	1400		Australia, CVC International	17860me		
1300	1400		Australia, Radio	5995pa	6020pa	9560pa
			9580pa	9590pa		
1300	1400	DRM	Bulgaria, World Radio Network			13865eu
1300	1400	as	Canada, CBC NQ SW Service	9625na		
1300	1400		Canada, CFRX Toronto ON	6070na		
1300	1400		Canada, CFVP Calgary AB	6030na		
1300	1400		Canada, CKZN St John's NF	6160na		
1300	1400		Canada, CKZU Vancouver BC	6160na		
1300	1400		Canada, Radio Canada Intl	9515am	13655am	
			17800am			
1300	1400		China, China Radio Intl	9570na	9650pa	
			11760oc	11900oc	11980as	13790eu
			15260na	17490eu		
1300	1400		Costa Rica, University Network	9725va	11870va	
			13750va			
1300	1400		Germany, CVC International	13860eu	17830as	
1300	1400		Germany, CVC The Voice Africa			9555af
1300	1400		Germany, Deutsche Welle	6140eu		
1300	1400		Germany, Overcomer Ministries			13810eu
1300	1400		Jordan, Radio	11690na		
1300	1400	vl	Libya, Voice of Africa	17690af	17675af	
			17680af	21695af		
1300	1400		Malaysia, RTM/Trax FM	7295as		
1300	1400		Malaysia, Voice of	6175as		
1300	1400		New Zealand, Radio NZ Intl	7145pa		
1300	1400	DRM	New Zealand, Radio NZ Intl	6095pa		
1300	1400		Nigeria, Voice of	15120af		
1300	1400		North Korea, Voice of Korea	7570eu	9335na	
			11710na	12015eu	13760eu	15245eu
1300	1400		Papua New Guinea, Catholic Radio			4960do
1300	1400		Papua New Guinea, NBC	4890do		
1300	1400	vl	Papua New Guinea, Wantok R.Light			7120va
1300	1400		Singapore, Radio Singapore Intl 6150as			6080as
1300	1400		South Korea, KBS World Radio 9770na			9570na
1300	1400		UK, BBC World Service	6190af	6195as	
			9740as	11760me	11940af	12095eu
			15310as	15420af	15485af	15565eu
			15575me	17640va	17760as	17790as
			17830af	17885af	21470af	
1300	1400		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
1300	1400		USA, KAIJ Dallas TX	5755na		
1300	1400		USA, KTBN Salt Lake City UT	7505na		
1300	1400		USA, KWHR Naalehu HI	12130as		
1300	1400		USA, Voice of America	9645va	9760va	
1300	1400	w f	USA, WBCQ Kennebunk ME	9330na		
1300	1400		USA, WBOH Newport NC	5920am		
1300	1400		USA, WEWN Birmingham AL	5050na		
1300	1400		USA, WHRA Greenbush ME	15665na		
1300	1400		USA, WHRI Noblesville IN	9840am	11785am	
			12050am			
1300	1400		USA, WINB Red Lion PA	13570am		
1300	1400		USA, WTJC Newport NC	9370na		
1300	1400		USA, WWCR Nashville TN	7465na	9985na	
			13845na	15825na		
1300	1400		USA, WWRB Manchester TN	9385na		
1300	1400		USA, WYFR/Family R Okeechobee FL			9415eu
			11520va	11560va	11830va	11865va
			11910va	17750va		
1300	1400		Zambia, Christian Voice	6065af		
1330	1400	s	Australia, HCJB	15435as		
1330	1400	twhfa	Guam, AWR/KSDA	15275as		
1330	1400		Guam, TWR/KTWR	9585as		
1330	1400		India, All India Radio	9690as	11620as	
			13710as			
1330	1400		Laos, National Radio	7145as		
1330	1400		Sweden, Radio	15240na	15735va	

1400 UTC - 10AM EDT / 9AM CDT / 7AM PDT

1400	1415		Russia, FEBA	9500as		
1400	1415		Seychelles, FEBA	9500va		
1400	1430		Australia, Radio	5995pa	6080pa	7420va
			9590pa	11750as		
1400	1430	DRM	Canada, Radio Canada Intl	9815eu		
1400	1430		Thailand, Radio	9830va		
1400	1500		Anguilla, University Network	11775am		
1400	1500		Australia, CVC International	15795as		
1400	1500	DRM	Bulgaria, World Radio Network			11540eu
1400	1500	as	Canada, CBC NQ SW Service	9625na		
1400	1500		Canada, CFRX Toronto ON	6070na		
1400	1500		Canada, CFVP Calgary AB	6030na		
1400	1500		Canada, CKZN St John's NF	6160na		
1400	1500		Canada, CKZU Vancouver BC	6160na		
1400	1500		Canada, Radio Canada Intl	9515am	13655am	
			17800am			
1400	1500		China, China Radio Intl	6100af	9560as	
			11675as	11765as	11775as	13685af
			13710na	13740na	13790na	17490eu
			17650eu			
1400	1500		Costa Rica, University Network	9725va	11870va	
			13750va			
1400	1500		France, Radio France Intl	21620as		
1400	1500	as	Germany, Bible Voice BC Network			15690as
1400	1500		Germany, CVC International	13860eu	15795as	
1400	1500		Germany, CVC The Voice Africa			9555af
1400	1500		Germany, Deutsche Welle	6140eu		
1400	1500		Germany, Overcomer Ministries			13810me
1400	1500	a	Greece, Voice of	9420eu	15630eu	
1400	1500		Guam, TWR/KTWR	9975as		
1400	1500		India, All India Radio	9690as	11620as	
			13710as			
1400	1500	s	Italy, IRRS	9310eu		
1400	1500		Japan, Radio Japan/NHK World			7200as
			11730as	11840oc		
1400	1500		Jordan, Radio	11690na		
1400	1500		Libya, Voice of Africa	17725af	17850af	
1400	1500		Malaysia, RTM/Trax FM	7295as		
1400	1500		Malaysia, Voice of	6175as		
1400	1500		Netherlands, Radio	9345as	9890as	
			11835as			
1400	1500		New Zealand, Radio NZ Intl	7145pa		
1400	1500	DRM	New Zealand, Radio NZ Intl	6095pa		
1400	1500		Nigeria, Voice of	15120af		
1400	1500		Oman, Radio Oman	15140as		
1400	1500	vl	Papua New Guinea, Wantok R.Light			7120va
1400	1500		Russia, Voice of	6205as	7165as	7370as
			9745as	11755as	12055as	15605as
			17645as			

1400	1500		Singapore, MediaCorp Radio	6150do		
1400	1500		South Africa, Channel Africa	9620af		
1400	1500		Taiwan, Radio Taiwan Intl	15265as		
1400	1500		UK, BBC World Service	6190af	6195as	
			9740as	11940af	15310as	12095eu
			15485va	15565eu	15575me	17640va
			17760as	17790as	17830af	21470af
			21660af			
1400	1500	as	UK, Bible Voice	15690as		
1400	1500		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
1400	1500		USA, KAIJ Dallas TX	13815na		
1400	1500		USA, KJES Vado NM	11715na		
1400	1500		USA, KNLS Anchor Point AK	9795as		
1400	1500		USA, KTBN Salt Lake City UT	7505na		
1400	1500		USA, KWHR Naalehu HI	9930as		
1400	1500		USA, Voice of America	4930af	6080af	
			7125va	9760va	13795af	15185af
			15490af	15580af	17720af	17730af
1400	1500		USA, WBCQ Kennebunk ME	9330na		
1400	1500		USA, WBOH Newport NC	5920am		
1400	1500		USA, WEWN Birmingham AL	9955na		
1400	1500		USA, WHRA Greenbush ME	17650na		
1400	1500		USA, WHRI Noblesville IN	9840am	11785am	
			12050am			
1400	1500		USA, WINB Red Lion PA	13570am		
1400	1500		USA, WRMI Miami FL	7385am		
1400	1500		USA, WTJC Newport NC	9370na		
1400	1500		USA, WWCR Nashville TN	9985na	12160na	
			13845na	15825na		
1400	1500		USA, WWRB Manchester TN	9385na		
1400	1500		USA, WYFR/Family R Okeechobee FL		9415eu	
			11520va	11560va	11830va	11910va
			13695va	17750va		
1400	1500		Zambia, Christian Voice	6065af		
1415	1430		Nepal, Radio	3230as	5005as	6100as
			7165as			
1430	1459	s	UK, Bible Voice	12005as		
1430	1500		Australia, Radio	5995pa	6080pa	7420va
			9475pa	9590pa	11660va	11750va
1430	1500	DRM	South Korea, KBS World Radio			9770eu

1500 UTC - 11AM EDT / 10AM CDT / 8AM PDT

1500	1510	mtwhfa	Turkmenistan, Turkmen Radio	5015eu		
1500	1528		Vietnam, Voice of	9550va	9840va	12020va
			13860va			
1500	1530	s	Hungary, Radio Budapest	6025eu	9690eu	
1500	1530		Mongolia, Voice of	12015eu		
1500	1530		UK, BBC World Service	9695af	11690af	
			11940af	15400af	15420af	15485af
			17640af	17830af	21470af	21660af
1500	1530	fs	UK, Bible Voice	13840as		
1500	1545		Germany, CVC The Voice Africa			9555af
			15715af			
1500	1545		Russia, FEBA	7320as		
1500	1545		Seychelles, FEBA	7320va		
1500	1545	a	UK, Bible Voice	15690as		
1500	1545		USA, WYFR/Family R Okeechobee FL			15770va
1500	1555		South Africa, Channel Africa	17770af		
1500	1557		Canada, Radio Canada Intl	11675as	15360as	
			17720as			
1500	1559		Canada, Radio Canada Intl	9515as	13655as	
			17800as			
1500	1559		South Africa, Channel Africa	9620af		
1500	1559	w	UK, Bible Voice	15680as		
1500	1600		Anguilla, University Network	11775am		
1500	1600		Australia, CVC International	15795as		
1500	1600		Australia, Radio	5995pa	6080pa	7420va
			9475pa	9590pa	11660va	11750va
1500	1600	DRM	Bulgaria, World Radio Network			11540eu
1500	1600	as	Canada, CBC NQ SW Service	9625na		
1500	1600		Canada, CFRX Toronto ON	6070na		
1500	1600		Canada, CFVP Calgary AB	6030na		
1500	1600		Canada, CKZN St John's NF	6160na		
1500	1600		Canada, CKZU Vancouver BC	6160na		
1500	1600		China, China Radio Intl	6100af	7160as	
			9800as	11965eu	13640eu	13685af
			13740na	17490eu		
1500	1600		Costa Rica, University Network	9725va	11870va	
			13750va			
1500	1600		France, Radio France Intl	17850af		
1500	1600	a	Germany, Bible Voice BC Network			15680as
1500	1600		Germany, CVC International	13800eu	15795as	
1500	1600		Germany, Deutsche Welle	6140eu		
1500	1600		Germany, Overcomer Ministries			13720me
1500	1600		Japan, Radio Japan/NHK World			6190as
			7200as	9505va	11730as	
1500	1600		Jordan, Radio	11690na		
1500	1600		Libya, Voice of Africa		17725af	17850af
			21695af			
1500	1600		Malaysia, RTM/Trax FM	7295as		
1500	1600		Malaysia, Voice of	6175as		
1500	1600		Netherlands, Radio	9345as	9890as	
			11835as			
1500	1600		New Zealand, Radio NZ Intl	7145pa		
1500	1600	DRM	New Zealand, Radio NZ Intl	6095pa		
1500	1600		North Korea, Voice of Korea	7570eu	9335na	
			11710na	12015eu	13760eu	15245eu
1500	1600	vl	Papua New Guinea, Wantok R.Light			7120va
1500	1600		Russia, Voice of	4965me	4975me	7370eu
			9660as	7300eu	9810eu	
1500	1600		Singapore, MediaCorp Radio	6150do		
1500	1600		UK, BBC World Service	5975as	6195as	
			9740as	11750as	12095eu	15310as
			15485eu	15565eu	17640va	17790as
1500	1600	vl/ mtwhf	UK, Sudan Radio Service	15575af		
1500	1600		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
1500	1600		USA, KAIJ Dallas TX	13815na		
1500	1600		USA, KJES Vado NM	11715na		
1500	1600		USA, KTBN Salt Lake City UT	7505na		
1500	1600		USA, KWHR Naalehu HI	9930as		
1500	1600		USA, Voice of America	4930af	6160va	
			7125af	7405va	9590va	12040va
			12150af	13795va	15105va	15195va
			15445va	15550af	15580af	17895af
1500	1600		USA, WBCQ Kennebunk ME	9330na		
1500	1600		USA, WBOH Newport NC	5920am		
1500	1600		USA, WEWN Birmingham AL	9955na		
1500	1600		USA, WHRA Greenbush ME	17650na		
1500	1600		USA, WHRI Noblesville IN	9840am	11785am	
			13760am			
1500	1600		USA, WINB Red Lion PA	13570am		
1500	1600	smtwhf	USA, WMLK Bethel PA	9265eu		
1500	1600		USA, WRMI Miami FL	7385am		
1500	1600		USA, WTJC Newport NC	9370na		
1500	1600		USA, WWCR Nashville TN	9985na	12160na	
			13845na	15825na		
1500	1600		USA, WWRB Manchester TN	9385na	11915na	
1500	1600		USA, WYFR/Family R Okeechobee FL		6280va	
			11830va	11910va	15750af	17750va
1500	1600		Zambia, Christian Voice	4965af		
1500	1600	f DRM	Taiwan, Radio Taiwan Intl	9770eu		
1505	1520	m	Austria, Radio Austria Intl	13775am		
1505	1530	as	Austria, Radio Austria Intl	13775am		
1515	1530	twhf	Austria, Radio Austria Intl	13775am		
1530	1559	smhf	UK, Bible Voice	15680as	13840al	
1530	1600	mh	Germany, Bible Voice BC Network			15680as
1530	1600	s	Germany, Bible Voice BC Network			13590me
1530	1600		Iran, Voice of the Islamic Rep	7370as	9635as	
1530	1600		UAE, AWR Africa	15225as		
1530	1600		UK, BBC World Service	6190af	11940af	
			15400af	15485af	17640af	17830af
			21470af	21660af		
1530	1600		Vatican City, Vatican Radio	12065va	13765va	
			15235va			
1535	1600	as	Austria, Radio Austria Intl	13755am		
1540	1600	mtwhf	Germany, Bible Voice BC Network			13590me
1540	1600	t	UK, Bible Voice	13590me		
1545	1600	mtwhf	Austria, Radio Austria Intl	13755am		
1545	1600	a	UK, Bible Voice	13590me		

1600 UTC - 12PM EDT / 11AM CDT / 9AM PDT

1600	1615	mtwhf	Germany, Bible Voice BC Network			13590me
1600	1615		Pakistan, Radio	9380va	11570va	12105va
			15725va			
1600	1615	f	Seychelles, FEBA	9850va		
1600	1615		UK, BBC World Service	3255af	6190af	
			12095af	15105af	15400af	15485af
			17830af	17885af	21470af	21660af
1600	1615	mwf	UK, Bible Voice	13590me		
1600	1620	mtwh	Moldova, Radio DMR Pridnestrovye			5965eu
1600	1627		Czech Rep, Radio Prague	5930eu	17485af	
1600	1627		Iran, Voice of the Islamic Rep	7370as	9635as	
1600	1628		Vietnam, Voice of	7280va	9550va	9730va
			11630va	13860va		
1600	1630		Guam, AWR/KSDA	11640as	11680as	
1600	1630		Jordan, Radio	11690na		
1600	1630		Myanmar, Radio	9730do		
1600	1640	f	Moldova, Radio DMR Pridnestrovye			5965eu
1600	1645	h	UK, Bible Voice	13590me		
1600	1645		USA, WYFR/Family R Okeechobee FL			11830va
			11865va	17750va		
1600	1650		New Zealand, Radio NZ Intl	7145pa		
1600	1650	DRM	New Zealand, Radio NZ Intl	6095pa		
1600	1700		Anguilla, University Network	11775am		
1600	1700		Australia, CVC International	15795as		
1600	1700		Australia, Radio	5995pa	6080pa	7240va
			9475pa	9710pa	11660as	
1600	1700	DRM	Bulgaria, World Radio Network			11540eu
1600	1700	a	Canada, CBC NQ SW Service	9625na		
1600	1700		Canada, CFRX Toronto ON	6070na		
1600	1700		Canada, CFVP Calgary AB	6030na		
1600	1700		Canada, CKZN St John's NF	6160na		
1600	1700		Canada, CKZU Vancouver BC	6160na		
1600	1700		China, China Radio Intl	6100af	9570af	

SHORTWAVE GUIDE

				11900af	11940eu	11865eu	13760eu
				17490eu			
1600	1700		Costa Rica, University Network			11870va	13750va
1600	1700		Egypt, Radio Cairo	11740af			
1600	1700		Ethiopia, Radio	5990af	7110af	7165af	
			9560af	9704af			
1600	1700		France, Radio France Intl		7170af	11615af	
			15160af	15605af	17605af		
1600	1700		Germany, CVC International			13800eu	15795as
1600	1700		Germany, CVC The Voice Africa				15715af
1600	1700		Germany, Deutsche Welle			6170as	9485as
			15705as				
1600	1700	f	Italy, IRRS	9310va			
1600	1700	s	Italy, IRRS	9310eu			
1600	1700		Malaysia, RTM/Trax FM			7295as	
1600	1700		Malaysia, Voice of	6175as			
1600	1700		North Korea, Voice of Korea			9990va	11545va
1600	1700	vl	Papua New Guinea, Wantok R.Light				7120va
1600	1700		Russia, Voice of	6070as	7370eu	9405as	
			11755as	11985af	12055va	12115as	
			15540me				
1600	1700		South Korea, KBS World Radio				5975va
1600	1700		Swaziland, TWR	6130af			
1600	1700		Taiwan, Radio Taiwan Intl			11550as	
1600	1700		UK, BBC World Service			3915as	5975as
			6195as	7160as	9510as	11955as	
			12095va	15485eu	15565eu	17790va	
1600	1700	ta	UK, Bible Voice	13590me			
1600	1700	vl/ mtwhf	UK, Sudan Radio Service			15575af	
1600	1700		USA, American Forces Radio			4319usb	5446usb
			5765usb	6350usb	7812usb	10320usb	
			12133usb	12579usb	12579usb		
1600	1700		USA, KAIJ Dallas TX			13815na	
1600	1700		USA, KJES Vado NM			11715na	
1600	1700		USA, KTBN Salt Lake City UT			15590na	
1600	1700		USA, KWHR Naalehu HI			9930as	
1600	1700		USA, Voice of America			4930af	7405af
			15195va	12080af	13600va	15410af	
			15445va	15580af	17895af		
1600	1700		USA, WBCQ Kennebunk ME			9330na	
1600	1700		USA, WBOH Newport NC			5920am	
1600	1700		USA, WEWN Birmingham AL			13615na	
1600	1700		USA, WHRA Greenbush ME			17640na	
1600	1700		USA, WHRI Noblesville IN			9840am	13760am
			15285am				
1600	1700		USA, WINB Red Lion PA			13570am	
1600	1700	smtwhf	USA, WMLK Bethel PA			9265eu	
1600	1700		USA, WTJC Newport NC			9370na	
1600	1700		USA, WWCR Nashville TN			9985na	12160na
			13845na	15825na			
1600	1700		USA, WWRB Manchester TN			9385na	11915na
1600	1700		USA, WYFR/Family R Okeechobee FL				6085va
			13695va	18980va	21455va		
1600	1700		Zambia, Christian Voice			4965af	
1615	1630		Vatican City, Vatican Radio			4005eu	5885eu
			7250eu	9645eu	15595va		
1615	1700		UK, BBC World Service			3255af	6190af
			12095af	15105af	15420af	15485af	
			17830af	17885af	21470af	21660af	
1615	1700	as	UK, BBC World Service			9695af	11690af
1615	1700	mwf	UK, Bible Voice	9430me			
1630	1700	as	Germany, Bible Voice BC Network				9430me
1630	1700		Guam, AWR/KSDA	11975as			
1630	1700	mtwf	UK, Bible Voice	13580me			
1630	1700	as	UK, Bible Voice	9430me			
1640	1650	mtwhfa	Turkmenistan, Turkmen Radio			4930eu	
1650	1700		New Zealand, Radio NZ Intl			6095pa	
1651	1700	DRM	New Zealand, Radio NZ Intl			7145pa	

1700 UTC - 1PM EDT / 12PM CDT / 10AM PDT

1700	1715	t	UK, Bible Voice	13580me			
1700	1727		Czech Rep, Radio Prague			5930va	17485va
1700	1730		France, Radio France Intl			15605af	17605af
1700	1735	mwf	UK, Bible Voice	9430me		13580al	
1700	1745		UK, BBC World Service			3255af	6005af
			6190af	9630af	9740as	11945af	
			12095va	15105af	15400af		
			17830af	17885af	21470af		
1700	1755		South Africa, Channel Africa			15235af	
1700	1759		Poland, Radio Polonia			7220eu	7265eu
1700	1759	as	UK, Bible Voice	9430me			
1700	1800		Anguilla, University Network			11775am	
1700	1800		Australia, CVC International			13635as	
1700	1800		Australia, Radio	5995pa	6080pa	9475va	
			9580pa	9710pa	11880pa		
1700	1800	DRM	Bulgaria, World Radio Network				11540eu
1700	1800	a	Canada, CBC NQ SW Service			9625na	
1700	1800		Canada, CFRX Toronto ON			6070na	
1700	1800		Canada, CFVP Calgary AB			6030na	
1700	1800		Canada, CKZN St John's NF			6160na	
1700	1800		Canada, CKZU Vancouver BC			6160na	
1700	1800		China, China Radio Intl			9570af	9600eu
			11900af	11940eu	13760eu		
1700	1800		Costa Rica, University Network			11870va	13750va
1700	1800		Egypt, Radio Cairo	11740af			
1700	1800	as	Germany, Bible Voice BC Network				13590me
1700	1800		Germany, CVC The Voice Africa				15715af
1700	1800	f	Italy, IRRS	9310va			
1700	1800	s	Italy, IRRS	9310va			
1700	1800		Japan, Radio Japan/NHK World				9535na
			11970eu	15355af			
1700	1800	DRM	Japan, Radio Japan/NHK World				9770eu
1700	1800		Japan, Radio Japan/NHK World				9535va
			11970eu	15355af			
1700	1800		Malaysia, RTM/Trax FM			7295as	
1700	1800		Malaysia, Voice of	6175as			
1700	1800		New Zealand, Radio NZ Intl			6095pa	
1700	1800	DRM	New Zealand, Radio NZ Intl			7145pa	
1700	1800		Nigeria, Voice of	15120af			
1700	1800	vl	Papua New Guinea, Wantok R.Light				7120va
1700	1800		Russia, Voice of	7370eu	9405as	9890eu	
			11510af	11985af			
1700	1800	as	Russia, Voice of	7390eu	11675eu		
1700	1800		Swaziland, TWR	3200af			
1700	1800		Taiwan, Radio Taiwan Intl			15690va	
1700	1800		UK, BBC World Service			3915as	5975as
			6195eu	7160as	9410eu	9510as	
			11955as	15485va	15565eu		
1700	1800	vl/ mtwhf	UK, Sudan Radio Service			11705af	
1700	1800		USA, American Forces Radio			4319usb	5446usb
			5765usb	6350usb	7812usb	10320usb	
			12133usb	12579usb	12579usb		
1700	1800		USA, KAIJ Dallas TX			13815na	
1700	1800		USA, KTBN Salt Lake City UT			15590na	
1700	1800		USA, KWHR Naalehu HI			9930as	
1700	1800		USA, Voice of America			7405af	15410af
			15580af				
1700	1800		USA, WBCQ Kennebunk ME			9330na	18910na
1700	1800		USA, WBOH Newport NC			5920am	
1700	1800		USA, WEWN Birmingham AL			13615va	15220va
1700	1800		USA, WHRA Greenbush ME			17640na	
1700	1800		USA, WHRI Noblesville IN			13760am	15285am
			15665am	15785am			
1700	1800		USA, WINB Red Lion PA			13570am	
1700	1800	smtwhf	USA, WMLK Bethel PA			9265eu	
1700	1800		USA, WTJC Newport NC			9370na	
1700	1800		USA, WWCR Nashville TN			9985na	12160na
			13845na	15825na			
1700	1800		USA, WWRB Manchester TN			9385na	11915na
			15250na				
1700	1800		USA, WYFR/Family R Okeechobee FL				13690va
			17795va	va		18980va	21455va
1700	1800		Zambia, Christian Voice			4965af	
1730	1745		Israel, Kol Israel			9345va	11590va 13675va
1730	1745	mtwhf	UK, United Nations Radio			7170af	15495me
			17810af				
1730	1800		Bulgaria, Radio		9500eu	11500eu	
1730	1800		Guam, AWR/KSDA	9385as			
1730	1800		Liberia, ELWA	4760do			
1730	1800		Philippines, Radio Pilipinas			11720va	15190va
			17720va				
1730	1800		Swaziland, TWR	9500af			
1730	1800		Sweden, Radio	6065va			
1730	1800	mtwhf	USA, Voice of America			13755af	17730af
1730	1800		Vatican City, Vatican Radio			11625af	13765af
			15570af				
1745	1800		Bangladesh, Bangla Betar			7185eu	
1745	1800		India, All India Radio			7410eu	9445af
			9950eu	11620eu	11935af	13605af	
			15075af	15155af	17670af		
1745	1800		UK, BBC World Service			3255af	6190af
			11945af	12095af	15105af	15400af	
			15485af	17830af	17885af	21470af	

1800 UTC - 2PM EDT / 1PM CDT / 11AM PDT

1800	1815		Bangladesh, Bangla Betar			7185eu	
1800	1815	t	UK, Bible Voice	13590me			
1800	1828		Vietnam, Voice of	5955eu	7280va	9730va	
1800	1830		Austria, AWR Europe			15315af	
1800	1830		South Africa, AWR Africa			3215af	3345af
			9610af				
1800	1830		UK, BBC World Service			3255af	5975as
			6190af	9510as	11945af	12095af	
			15400af				
1800	1830	as	UK, Bible Voice	13590me	13810al		
1800	1830	whf	UK, Bible Voice	11710me			
1800	1830		USA, Voice of America			7405af	15410af
			15580af	17895af			
1800	1830	as	USA, Voice of America			4930af	
1800	1845		USA, WYFR/Family R Okeechobee FL				17535va
1800	1850		New Zealand, Radio NZ Intl			6095pa	
1800	1850	DRM	New Zealand, Radio NZ Intl			7145pa	
1800	1856		Romania, Radio Romania Intl			9635eu	11730eu
1800	1859		Canada, Radio Canada Intl			9530af	11765af
			13730af	15255af			
1800	1900		Anguilla, University Network			11775am	
1800	1900	mtwhf	Argentina, RAE		9690eu	15345eu	
1800	1900		Australia, Radio		6080pa	7240pa	9475va

			9580pa	9710pa	11880pa	
1800	1900	DRM	Bulgaria, World Radio Network			9310eu
1800	1900		Canada, CFRX Toronto ON	6070na		
1800	1900		Canada, CFVP Calgary AB	6030na		
1800	1900		Canada, CKZN St John's NF	6160na		
1800	1900		Canada, CKZU Vancouver BC	6160na		
1800	1900		China, China Radio Intl	9600eu	11940eu	
			13760eu			
1800	1900		Costa Rica, University Network	11870va	13750va	
1800	1900	fas	Germany, Bible Voice BC Network			9430me
1800	1900		Germany, CVC The Voice Africa			13820af
1800	1900		Germany, Overcomer Ministries			13855af
1800	1900		India, All India Radio	7410eu	9445af	
			9950eu	11620eu	11935af	13605af
			15075af	15155af	17670af	
1800	1900		Italy, IRRS	9310va		
1800	1900		Liberia, ELWA	4760do		
1800	1900		Malaysia, RTM/Trax FM	7295as		
1800	1900		Malaysia, Voice of	6175as		
1800	1900		Netherlands, Radio	6020af	7120af	
			11655af			
1800	1900		North Korea, Voice of Korea	7570eu	12015eu	
			13760eu	15245eu		
1800	1900	vl	Papua New Guinea, Wantok R.	Light	7120va	
1800	1900		Philippines, Radio Pilipinas	11720va	15190va	
			17720va			
1800	1900		Russia, Voice of	7300eu	9430af	9745af
			9820eu	9890eu	11510af	
1800	1900		Swaziland, TWR	3200af	9500af	
1800	1900		Taiwan, Radio Taiwan Intl	3965eu		
1800	1900		UK, BBC World Service	6195eu	9410eu	
			12095eu			
1800	1900	as	UK, Bible Voice	6015eu	11710al	
1800	1900		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
1800	1900		USA, KAIJ Dallas TX	13815na		
1800	1900		USA, KTBN Salt Lake City UT	15590na		
1800	1900	smtwhf	USA, WBCQ Kennebunk ME	7415na		
1800	1900		USA, WBCQ Kennebunk ME	9330na	18910na	
1800	1900		USA, WBOH Newport NC	5920am		
1800	1900		USA, WEWN Birmingham AL	13615va	15220va	
1800	1900		USA, WHRA Greenbush ME	17640na		
1800	1900		USA, WHRI Noblesville IN	13760am	15285am	
			15665am	15785am		
1800	1900		USA, WINB Red Lion PA	13570am		
1800	1900	smtwhf	USA, WMLK Bethel PA	9265eu		
1800	1900		USA, WTJC Newport NC	9370na		
1800	1900		USA, WWCR Nashville TN	9975na	12160na	
			13845na	15825na		
1800	1900		USA, WWRB Manchester TN	9385na	11915na	
			15250na			
1800	1900		USA, WYFR/Family R Okeechobee FL		7240va	
			13690va	13800af	15750va	17795va
			18980va			
1800	1900		Yemen, Rep of Yemen Radio	9780me		
1800	1900		Zambia, Christian Voice	4965af		
1815	1900		Bangladesh, Bangla Betar	7185eu		
1830	1900		Turkey, Voice of	9785eu		
1830	1900		UK, BBC World Service	3255af	6005af	
			6190af	9630af	11945af	12045me
			12095af	15400af	17795af	17830af
			21470af			
1830	1900		USA, Voice of America	4930af	7405af	
			15410af	15580af	17895af	
1845	1900	mtwhfa	Albania, Radio Tirana	7465eu	9920eu	
1845	1900		Congo, RTV Congolaise	4765af	5985af	
1851	1900		New Zealand, Radio NZ Intl	9630pa		
1851	1900	DRM	New Zealand, Radio NZ Intl	9440pa		

1900 UTC - 3PM EDT / 2PM CDT / 12PM PDT

1900	1915		Congo, RTV Congolaise	4765af	5985af	
1900	1920		Turkey, Voice of	9785eu		
1900	1925		Israel, Kol Israel	9400va	11590va	15640af
1900	1928		Vietnam, Voice of	7280va	9730va	
1900	1929	s	Germany, Universal Life	11880me		
1900	1930		Hungary, Radio Budapest	3975eu	6025eu	
1900	1930		Lithuania, Radio Vilnius	9710eu		
1900	1930		Philippines, Radio Pilipinas	11720va	15190va	
			17720va			
1900	1930	as	UK, Bible Voice	6015eu	9775al	
1900	1945		India, All India Radio	7410eu	9445af	
			9950eu	11620eu	11935af	13605af
			15075af	15155af	17670af	
1900	1945		USA, WYFR/Family R Okeechobee FL		6085va	
1900	1950		New Zealand, Radio NZ Intl	9630pa		
1900	1950	DRM	New Zealand, Radio NZ Intl	9440pa		
1900	2000		Anguilla, University Network	11775am		
1900	2000		Australia, Radio	6080pa	7240pa	9500as
			9580pa	9710pa	11880pa	
1900	2000	DRM	Bulgaria, World Radio Network			9310eu
1900	2000		Canada, CFRX Toronto ON	6070na		
1900	2000		Canada, CFVP Calgary AB	6030na		
1900	2000		Canada, CKZN St John's NF	6160na		
1900	2000		Canada, CKZU Vancouver BC	6160na		
1900	2000		China, China Radio Intl	7295af	9440va	
			11940eu			
1900	2000		Costa Rica, University Network	11870va	13750va	
1900	2000		Eqt Guinea, Radio Africa	15190af		
1900	2000	as	Germany, Bible Voice BC Network			9775af
1900	2000		Germany, CVC The Voice Africa			13820af
1900	2000		Germany, Deutsche Welle	13780af	15620af	
1900	2000		Germany, Overcomer Ministries			13855af
1900	2000	vl	Ghana, Ghana BC Corp	3366do	4915do	
1900	2000		Italy, IRRS	5775eu		
1900	2000		Liberia, ELWA	4760do		
1900	2000		Malaysia, RTM/Trax FM	7295as		
1900	2000	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
1900	2000		Netherlands, Radio	5905af	7120af	
			11655af	17810af		
1900	2000	as	Netherlands, Radio	15315na	17735na	
			17660na			
1900	2000		Nigeria, Radio/Ibadan	6050do		
1900	2000		Nigeria, Radio/Kaduna	4770do	6090do	
1900	2000		Nigeria, Radio/Lagos	3326do	4990do	
1900	2000		Nigeria, Voice of	15120af		
1900	2000		North Korea, Voice of Korea	3560va	7100af	
			11535 9975	11535va	11910af	
1900	2000		Papua New Guinea, Catholic Radio		4960do	
1900	2000		Papua New Guinea, NBC	4890do		
1900	2000	vl	Papua New Guinea, Wantok R.	Light	7120va	
1900	2000		Russia, Voice of	7310eu	9890eu	12070eu
1900	2000	irreg/ vl	Sierra Leone, SLBS	3316do		
1900	2000	vl	Solomon Islands, SIBC	5020do	9545do	
1900	2000		South Korea, KBS World Radio		5975va	
			7275eu			
1900	2000	a	Sri Lanka, SLBC	6010eu		
1900	2000		Swaziland, TWR	3200af		
1900	2000		Thailand, Radio	7155eu		
1900	2000	vl	Uganda, Radio	4976do	5026do	7196do
1900	2000		UK, BBC World Service	3255af	6005af	
			6190af	6195eu	9410eu	9630af
			12045me	12095af	15400af	17795af
			17830af			
1900	2000		UK, Bible Voice	9405af		
1900	2000		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
1900	2000		USA, KAIJ Dallas TX	13815na		
1900	2000		USA, KJES Vado NM	15385na		
1900	2000		USA, KTBN Salt Lake City UT	15590na		
1900	2000		USA, Voice of America	4930af	4940af	
			6040me	7405af	9670me	15410af
			15445af	15580af	17895af	
1900	2000		USA, WBCQ Kennebunk ME	7415na	9330na	
			18910na			
1900	2000		USA, WBOH Newport NC	5920am		
1900	2000		USA, WEWN Birmingham AL	13615va	15220va	
1900	2000		USA, WHRA Greenbush ME	13710na		
1900	2000		USA, WHRI Noblesville IN	13760am	15285am	
			15665am	15785am		
1900	2000		USA, WINB Red Lion PA	13570am		
1900	2000		USA, WTJC Newport NC	9370na		
1900	2000		USA, WWCR Nashville TN	9975na	12160na	
			13845na	15825na		
1900	2000		USA, WWRB Manchester TN	9385na	11915na	
			15250na			
1900	2000		USA, WYFR/Family R Okeechobee FL		3230va	
			7370va	13800va	17795va	17845va
			18930va	18980va		
1900	2000		Zambia, Christian Voice	4965af		
1900	2000	vl	Zimbabwe, ZBC Corp	5975do		
1930	2000		Iran, Voice of the Islamic Rep	6205eu	7205eu	
			7540af	9800af	9925af	
1930	2000		Sweden, Radio	6065va		
1930	2000	s	UK, Bible Voice	9775af		
1935	1955		Italy, RAI Intl	5960eu	9485eu	
1945	2000	vl	Rwanda, Radio	6055do		
1950	2000		Vatican City, Vatican Radio	4005eu	5885eu	
			7250eu	9645eu		
1951	2000		New Zealand, Radio NZ Intl	15720pa		
1951	2000	DRM	New Zealand, Radio NZ Intl	13730pa		

2000 UTC - 4PM EDT / 3PM CDT / 1PM PDT

2000	2020		Vatican City, Vatican Radio	4005eu	5885eu	
			7250eu	9645eu		
2000	2027		Czech Rep, Radio Prague	5930va	11600va	
2000	2027		Iran, Voice of the Islamic Rep	6205eu	7205eu	
			7540af	9800af	9925af	
2000	2030	mtwhfa	Albania, Radio Tirana	7465eu		
2000	2030	mtwh	Italy, IRRS	5775eu		
2000	2030		Mongolia, Voice of	12015eu		
2000	2030		South Africa, AWR Africa	7180af		
2000	2030		Swaziland, TWR	3200af		
2000	2030	h	UK, Bible Voice	9605va		
2000	2030		USA, Voice of America	4940af	4940af	
			7405af	15410af	15445af	15580af

2000	2030		Vatican City, Vatican Radio	9755af	11625af	13765af
2000	2045		USA, WYFR/Family R Okeechobee FL	13690va	17750va	
2000	2059		Canada, Radio Canada Intl	5850eu	7235eu	11765eu
2000	2059	mtwhf	Spain, Radio Exterior Espana	9595af	15290eu	
2000	2100		Anguilla, University Network	11775am		
2000	2100		Australia, ABC NT Alice Springs	2310do	4835irr	
2000	2100		Australia, ABC NT Katherine	2485do		
2000	2100		Australia, ABC NT Tennant Creek	2325do		
2000	2100		Australia, Radio	9500as	11650pa	11660pa
			11880pa	12080pa		
2000	2100	DRM	Bulgaria, World Radio Network	9310eu		
2000	2100		Canada, CFRX Toronto ON	6070na		
2000	2100		Canada, CFVP Calgary AB	6030na		
2000	2100		Canada, CKZN St John's NF	6160na		
2000	2100		Canada, CKZU Vancouver BC	6160na		
2000	2100		Canada, Radio Canada Intl	15325am	17765am	
2000	2100		China, China Radio Intl	7295as	9440va	
			9800eu	11640af	11790eu	13630af
2000	2100		Costa Rica, University Network	13750va		
2000	2100		Egypt, Radio Cairo	15375af		
2000	2100		Eqt Guinea, Radio Africa	15190af		
2000	2100		Germany, CVC The Voice Africa	9765af		
2000	2100		Germany, Deutsche Welle	7130af	11795af	
			13780af	15205af		
2000	2100	vl	Ghana, Ghana BC Corp	3366do	4915do	
2000	2100		Indonesia, Voice of	9525as	11785pa	
			15150al			
2000	2100	fas	Italy, IRRS	5775eu		
2000	2100		Liberia, ELWA	4760do		
2000	2100		Malaysia, RTM/Trax FM	7295as		
2000	2100	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
2000	2100	as	Netherlands, Radio	15315af	17735na	
			17660af			
2000	2100		Netherlands, Radio	5905af	7120af	
			11665af	17810af		
2000	2100		New Zealand, Radio NZ Intl	15720pa		
2000	2100	DRM	New Zealand, Radio NZ Intl	13730pa		
2000	2100		Nigeria, Radio/Ibadan	6050do		
2000	2100		Nigeria, Radio/Kaduna	4770do	6090do	
2000	2100		Nigeria, Radio/Lagos	3326do	4990do	
2000	2100		Nigeria, Voice of	15120af		
2000	2100		Papua New Guinea, Catholic Radio	4960do		
2000	2100		Papua New Guinea, NBC	4890do		
2000	2100	vl	Papua New Guinea, Wantok R.Light	7120va		
2000	2100		Russia, Voice of	7310eu	9890eu	15735sa
2000	2100	vl	Solomon Islands, SIBC	5020do	9545do	
2000	2100		South Africa, Channel Africa	3345af		
2000	2100	vl	Uganda, Radio	4976do	5026do	7196do
2000	2100		UK, BBC World Service	3255af	6005af	
			6190af	6195eu	9410eu	9630af
			12095af	15400af	17830af	
2000	2100		UK, Bible Voice	9405af		
2000	2100		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
2000	2100		USA, KAIJ Dallas TX	13815na		
2000	2100		USA, KJES Vado NM	15385na		
2000	2100		USA, KTBN Salt Lake City UT	15590na		
2000	2100		USA, WBCQ Kennebunk ME	7415na	9330na	
			18910na			
2000	2100		USA, WBOH Newport NC	5920am		
2000	2100		USA, WEWN Birmingham AL	13615va	15220va	
2000	2100		USA, WHRA Greenbush ME	13710na		
2000	2100		USA, WHRI Noblesville IN	13760am	15285am	
			15665am	15785am		
2000	2100		USA, WINB Red Lion PA	13570am		
2000	2100		USA, WTJC Newport NC	9370na		
2000	2100		USA, WWCR Nashville TN	9975na	12160na	
			13845na	15825na		
2000	2100		USA, WWRB Manchester TN	9385na	11915na	
			15250na			
2000	2100		USA, WYFR/Family R Okeechobee FL	3230va		
			13800va	17725va	17795va	17845va
			18980va			
2000	2100		Zambia, Christian Voice	4965af		
2000	2100	vl	Zimbabwe, ZBC Corp	5975do		
2005	2100		Syria, Radio Damascus	9330eu	12085eu	
			13610al			
2025	2045		Italy, RAI Intl	5970af	11875af	
2030	2045		Thailand, Radio	9680eu		
2030	2058		Vietnam, Voice of	7280va	9550va	9730va
			13860va			
2030	2100	mthf	Belarus, Radio	7125eu	7340eu	7440eu
2030	2100		Cuba, Radio Havana	9505va	11760va	
2030	2100		Turkey, Voice of	7170as		
2030	2100		USA, Voice of America	4930af	7555as	
			15410af	15445af	15580af	
2030	2100	as	USA, Voice of America	4940af		
2045	2100		India, All India Radio	7410eu	9445eu	
			9910oc	9950eu	11620va	11715oc
2055	2100	DRM	Vatican City, Vatican Radio	9800na		

2100 UTC - 5PM EDT / 4PM CDT / 2PM PDT

2100	2120		Turkey, Voice of	7180as		
2100	2123		Serbia, International Radio Serbia	6185eu		
2100	2130		Australia, ABC NT Katherine	2485do		
2100	2130		Australia, ABC NT Tennant Creek	2325do		
2100	2130		Austria, AWR Europe	11955af		
2100	2130	a	Canada, CBC NQ SW Service	9625na		
2100	2130		China, China Radio Intl	11640af	13630af	
2100	2130		Cuba, Radio Havana	9505va	11760va	
2100	2130		Egypt, Radio Cairo	15375af		
2100	2130		Hungary, Radio Budapest	6025eu	9525eu	
2100	2130		South Korea, KBS World Radio	3955eu		
2100	2130		UK, BBC World Service	11675va	15390va	
2100	2130	DRM	Vatican City, Vatican Radio	9800na		
2100	2145		Nigeria, Radio/Ibadan	6050do		
2100	2145		USA, WYFR/Family R Okeechobee FL	13690va		
			13800va	17795va	18980va	
2100	2159		Canada, Radio Canada Intl	9800na	17765na	
2100	2159	as	Spain, Radio Exterior Espana	9595af	9840eu	
2100	2200		Anguilla, University Network	11775am		
2100	2200		Australia, ABC NT Alice Springs	2310do	4835irr	
2100	2200		Australia, Radio	7240pa	9660pa	11650pa
			11660pa	11695pa	12080pa	13630pa
2100	2200		Bulgaria, Radio	5800eu	7500eu	
2100	2200		Canada, CFRX Toronto ON	6070na		
2100	2200		Canada, CFVP Calgary AB	6030na		
2100	2200		Canada, CKZN St John's NF	6160na		
2100	2200		Canada, CKZU Vancouver BC	6160na		
2100	2200		China, China Radio Intl	9600eu	9800eu	
			11790eu			
2100	2200		Costa Rica, University Network	13750va		
2100	2200		Eqt Guinea, Radio Africa	15190af		
2100	2200		Germany, Deutsche Welle	9440af	11865af	
			15210af			
2100	2200	vl	Ghana, Ghana BC Corp	3366do	4915do	
2100	2200		Guyana, Voice of	3291do	5950do	
2100	2200		India, All India Radio	9910oc	11620oc	
			11715oc			
2100	2200	fas	Italy, IRRS	5775eu		
2100	2200		Japan, Radio Japan/NHK World	6035va		
			6055eu	6180eu	11855af	17825va
			21670oc			
2100	2200		Liberia, ELWA	4760do		
2100	2200		Malaysia, RTM/Trax FM	7295as		
2100	2200	vl	Namibia, Namibian BC Corp	3270do	3290do	
			6060do	6175do		
2100	2200		New Zealand, Radio NZ Intl	15720pa		
2100	2200	DRM	New Zealand, Radio NZ Intl	13730pa		
2100	2200		Nigeria, Radio/Kaduna	4770do	6090do	
2100	2200		Nigeria, Radio/Lagos	3326do	4990do	
2100	2200		North Korea, Voice of Korea	7570eu	12015eu	
			13760eu	15245eu		
2100	2200		Papua New Guinea, Catholic Radio	4960do		
2100	2200		Papua New Guinea, NBC	4890do		
2100	2200	vl	Papua New Guinea, Wantok R.Light	7120va		
2100	2200		Russia, Voice of	15735sa		
2100	2200	vl	Rwanda, Radio	6055do		
2100	2200	irreg/ vl	Sierra Leone, SLBS	3316do		
2100	2200		South Africa, Channel Africa	3345af		
2100	2200		Syria, Radio Damascus	9330eu	12085eu	
			13610al			
2100	2200		UK, BBC World Service	3255af	3915as	
			5965as	6005af	6190af	6195as
			11675sa	11945as	12095af	13765sa
			15400af			
2100	2200		Ukraine, Radio Ukraine Intl	7490eu		
2100	2200		USA, American Forces Radio	4319usb	5446usb	
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
2100	2200		USA, KAIJ Dallas TX	13815na		
2100	2200		USA, KTBN Salt Lake City UT	15590na		
2100	2200		USA, Voice of America	6080as	15580af	
2100	2200		USA, WBCQ Kennebunk ME	7415na	9330na	
			18910na			
2100	2200		USA, WBOH Newport NC	5920am		
2100	2200		USA, WEWN Birmingham AL	13615va	15220va	
2100	2200		USA, WHRA Greenbush ME	11610na	11765na	
2100	2200		USA, WHRI Noblesville IN	13760am	15285am	
			15665am	15785am		
2100	2200		USA, WINB Red Lion PA	13570am		
2100	2200		USA, WRMI Miami FL	7385am		
2100	2200		USA, WTJC Newport NC	9370na		
2100	2200		USA, WWCR Nashville TN	9975na	12160na	
			13845na	15825na		
2100	2200		USA, WWRB Manchester TN	9385na	11915na	
			15250na			

2100	2200		USA, WYFR/Family R Okeechobee FL			6045va
			11565va	17725va	17845va	
2100	2200		Zambia, Christian Voice		4965af	
2100	2200	vl	Zimbabwe, ZBC Corp		5975do	
2115	2200		Egypt, Radio Cairo	9990eu		
2130	2156		Romania, Radio Romania Intl		7210va	9535va
			11940va	15465va		
2130	2157		Czech Rep, Radio Prague		9410na	11600af
2130	2200	mtwhfa	Albania, Radio Tirana		7465eu	
2130	2200		Australia, ABC NT Katherine		5025do	
2130	2200		Australia, ABC NT Tennant Creek			4910do
2130	2200	mtwhfa	Canada, CBC NQ SW Service		9625na	
2130	2200	DRM	Netherlands, Radio		9800na	
2130	2200		Sweden, Radio	6065va	7420va	
2130	2200		UK, BBC World Service		15390va	

2200 UTC - 6PM EDT / 5PM CDT / 3PM PDT

2200	2210		Syria, Radio Damascus		9330eu	12085eu
2200	2230		Belarus, Radio	7125eu	7340eu	7440eu
2200	2230	s	Belarus, Radio	7125eu	7340eu	7440eu
2200	2230		Cuba, Radio Havana		9505va	11760va
2200	2230	DRM	Germany, Deutsche Welle		9800na	
2200	2230		India, All India Radio		9910oc	11620oc
			11715oc	9950eu	11620va	11715oc
2200	2230		Papua New Guinea, NBC		4890do	
2200	2235		New Zealand, Radio NZ Intl		15720pa	
2200	2235	DRM	New Zealand, Radio NZ Intl		13730pa	
2200	2245		Egypt, Radio Cairo	9990eu		
2200	2245		USA, WYFR/Family R Okeechobee FL			15770va
2200	2250		Turkey, Voice of	9830eu		
2200	2259		Canada, Radio Canada Intl		6100na	
2200	2300		Anguilla, University Network		6090am	
2200	2300		Australia, ABC NT Alice Springs			2310do
			4835irr			
2200	2300		Australia, ABC NT Katherine		5025do	
2200	2300		Australia, ABC NT Tennant Creek			4910do
2200	2300		Australia, Radio	12010va	13620as	13630pa
			15515pa	15230as	15240pa	17785pa
			17795pa			
2200	2300	smtwhf	Canada, CBC NQ SW Service		9625na	
2200	2300		Canada, CFRX Toronto ON		6070na	
2200	2300		Canada, CFVP Calgary AB		6030na	
2200	2300		Canada, CKZN St John's NF		6160na	
2200	2300		Canada, CKZU Vancouver BC		6160na	
2200	2300	DRM	Canada, Radio Canada Intl		9800na	
2200	2300		China, China Radio Intl		7170eu	
2200	2300		Costa Rica, University Network		13750va	
2200	2300		Eqt Guinea, Radio Africa		15190af	
2200	2300		Germany, Deutsche Welle		7115as	9720na
2200	2300	vl	Ghana, Ghana BC Corp		3366do	4915do
2200	2300		Guyana, Voice of	3291do		
2200	2300		Italy, IRRS	5785va		
2200	2300	f	Italy, IRRS	5775va		
2200	2300		Malaysia, RTM/Trax FM		7295as	
2200	2300	vl	Namibia, Namibian BC Corp		3270do	3290do
			6060do	6175do		
2200	2300		Nigeria, Radio/Ibadan		6050do	
2200	2300		Nigeria, Radio/Kaduna		4770do	6090do
2200	2300		Nigeria, Radio/Lagos		3326do	4990do
2200	2300		Papua New Guinea, Catholic Radio			4960do
2200	2300	vl	Papua New Guinea, Wantok R.Light			7120va
2200	2300	irreg/ vl	Sierra Leone, SLBS	3316do		
2200	2300	vl	Solomon Islands, SIBC		5020do	9545do
2200	2300		Taiwan, Radio Taiwan Intl		15600eu	
2200	2300		UK, BBC World Service		5955af	5965as
			5975va	6195as	7105as	9740as
			12095af	13765sa	15400af	
2200	2300		USA, American Forces Radio		4319usb	5446usb
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
2200	2300		USA, KAIJ Dallas TX		13815na	
2200	2300		USA, KTBN Salt Lake City UT		15590na	
2200	2300		USA, Voice of America		7215va	7555as
			11725va	15185va	15290va	
2200	2300	mtwhf	USA, WBCQ Kennebunk ME		5110na	18910na
2200	2300		USA, WBCQ Kennebunk ME		7415na	9330na
2200	2300		USA, WBOH Newport NC		5920am	
2200	2300		USA, WEWN Birmingham AL		9975va	15745va
2200	2300		USA, WHRA Greenbush ME		11610na	11765na
2200	2300	m	USA, WHRI Noblesville IN		7490am	
2200	2300		USA, WHRI Noblesville IN		9840am	13760am
			15285am			
2200	2300		USA, WINB Red Lion PA		13570am	
2200	2300	mtwhf	USA, WRMI Miami FL		7385am	
2200	2300	as	USA, WRMI Miami FL		9955am	
2200	2300		USA, WTJC Newport NC		9370na	
2200	2300		USA, WWCR Nashville TN		7465na	9985na
			12160na	13845na		
2200	2300		USA, WWRB Manchester TN		9385na	11915na
			15250na			
2200	2300		USA, WYFR/Family R Okeechobee FL			11740va
			15195va			
2200	2300		Zambia, Christian Voice		4965af	
2205	2230		Italy, RAI Intl	11895as		
2215	2230		Croatia, Croatian Radio		9925sa	
2230	2257		Czech Rep, Radio Prague		7345na	9415af
2230	2300		Papua New Guinea, NBC		9675do	
2230	2300		USA, Voice of America		9570va	13755va
			15145va			
2236	2300		New Zealand, Radio NZ Intl		13730pa	
2236	2300	DRM	New Zealand, Radio NZ Intl		15720pa	
2245	2300		India, All India Radio		9705as	9950as
			11620as	11645as	13605as	

2300 UTC - 7PM EDT / 6PM CDT / 4PM PDT

2300	0000		Anguilla, University Network		6090am	
2300	0000		Australia, ABC NT Alice Springs			2310do
			4835irr			
2300	0000		Australia, ABC NT Katherine		5025do	
2300	0000		Australia, ABC NT Tennant Creek			4910do
2300	0000		Bulgaria, Radio	9700na	11700na	
2300	0000	smtwhf	Canada, CBC NQ SW Service		9625na	
2300	0000		Canada, CFRX Toronto ON		6070na	
2300	0000		Canada, CFVP Calgary AB		6030na	
2300	0000		Canada, CKZN St John's NF		6160na	
2300	0000		Canada, CKZU Vancouver BC		6160na	
2300	0000		China, China Radio Intl		5990am	6145na
			13680na			
2300	0000		Costa Rica, University Network		13750va	
2300	0000		Egypt, Radio Cairo	11950na		
2300	0000		Germany, Deutsche Welle		5955as	9890as
			15135as	17860as		
2300	0000		Guyana, Voice of	3291do		
2300	0000		India, All India Radio		9705as	9950as
			11620as	11645as	13605as	
2300	0000		Malaysia, RTM/Trax FM		7295as	
2300	0000	vl	Namibia, Namibian BC Corp		3270do	3290do
			6060do	6175do		
2300	0000		New Zealand, Radio NZ Intl		13730pa	
2300	0000	DRM	New Zealand, Radio NZ Intl		15720pa	
2300	0000		Papua New Guinea, Catholic Radio			4960do
2300	0000		Papua New Guinea, NBC		9675do	
2300	0000	vl	Papua New Guinea, Wantok R.Light			7120va
2300	0000		Romania, Radio Romania Intl		6140va	7265va
			9645va	11940va		
2300	0000	irreg/ vl	Sierra Leone, SLBS	3316do		
2300	0000		Singapore, MediaCorp Radio		6150do	
2300	0000	vl	Solomon Islands, SIBC		5020do	9545do
2300	0000		UK, BBC World Service		3915as	5965as
			6195as	9580as	9740as	11850as
			11945as	11955as		
2300	0000		USA, American Forces Radio		4319usb	5446usb
			5765usb	6350usb	7812usb	10320usb
			12133usb	12579usb	12579usb	
2300	0000		USA, KAIJ Dallas TX		13815na	
2300	0000		USA, KTBN Salt Lake City UT		15590na	
2300	0000		USA, Voice of America		7215va	7555as
			11725va	15185va		
2300	0000		USA, WBCQ Kennebunk ME		5110na	7415na
			9330na	18910na		
2300	0000		USA, WBOH Newport NC		5920am	
2300	0000		USA, WEWN Birmingham AL		9975va	15745va
2300	0000		USA, WHRA Greenbush ME		7520na	
2300	0000	m	USA, WHRI Noblesville IN		7490am	
2300	0000		USA, WHRI Noblesville IN		7555am	9840am
			13760am			
2300	0000		USA, WINB Red Lion PA		13570am	
2300	0000	mtwhf	USA, WRMI Miami FL		7385am	
2300	0000		USA, WTJC Newport NC		9370na	
2300	0000		USA, WWCR Nashville TN		5070na	7465na
			9985na	13845na		
2300	0000		USA, WWRB Manchester TN		6890na	
2300	0000		USA, WYFR/Family R Okeechobee FL			15255am
			17750am			
2300	0000		Zambia, Christian Voice		4965af	
2300	2315		Nigeria, Radio/Kaduna		4770do	6090do
2300	2315		Nigeria, Radio/Lagos		3326do	
2300	2330		Australia, Radio	9660pa	12010pa	12080pa
			13670va	15230va	15240va	17785va
			17795va			
2300	2330	DRM	Germany, Deutsche Welle		9800na	
2300	2330		USA, Voice of America		9570va	13755va
			15145va	17740va		
2300	2345		USA, WYFR/Family R Okeechobee FL			11740va
2330	0000		Australia, HCJB	15390as		
2330	0000		Australia, Radio	9660pa	12010pa	12080pa
			13670va	15230va	15415va	17750as
			17785pa	17795va		
2330	0000		Burma, Dem Voice of Burma		5955eu	
2330	0000		Lithuania, Radio Vilnius		9875na	
2330	0000	DRM	Sweden, Radio		9800na	
2330	0000		USA, Voice of America		7260va	9570va
			13725va	13755va	15145va	
2330	0000	s	USA, WRMI Miami FL		9955am	
2330	2358		Vietnam, Voice of	9840as	12020as	

Larry Van Horn, N5FPW
larryvanhorn@monitoringtimes.com

Monitoring Satellites 101

For some radio hobbyists, the mere mention of monitoring frequencies transmitted from space by an orbiting satellite creates an atmosphere of fear and trepidation. For others, the idea of filling their speakers with all sorts of exotic communications and unique communications from a wide variety of satellites is an enjoyable prospect. As I have written in pages past in *Monitoring Times* and in our (now defunct) sister publication, *Satellite Times*, "if satellite reception was easy, then everyone would be doing it."

It's true: this aspect of the radio hobby is not easy or for the faint of heart. It will require some study on your part, the purchase of some good quality receiving equipment, and in some cases, even designing and building your own antennas for the various bands you want to monitor. Depending on the equipment and antennas you have at hand right now, satellite monitoring can be either a snap or nearly a "mission impossible."

Unlike conventional scanner monitoring, where you put up a wideband type antenna and you can then receive signals across the entire tuning range of your scanner, satellite monitoring is an entirely different animal and doesn't work this way.

Two factors are in play here. Satellite downlink frequencies have weaker transmit powers than their terrestrial counterparts in the VHF/UHF spectrum, so gain antennas are needed to pull in these weaker signals.

Secondly, satellites are always on the move as they orbit above the earth's surface. The higher gain antennas needed for satellite reception have both narrower frequency response and antenna beam widths. So we are going to have to steer the antenna and track the satellite for proper reception. This is especially critical on faster moving, lower earth orbiting satellites. You are going to have to accurately point the antenna array at the satellite as it moves across the sky to get a quality signal to the receiver. In most applications, high gain style antennas are needed to monitor most of the military satellites of interest.

The bottom line here is that one satellite set-up does not fit all. You will have to have a different antenna and possibly a separate receiver/external amplification set-up for each satellite band you want to monitor.

For example, a weather satellite enthusiast needs a gain antenna system to get the best quality weather images from polar orbiting weather satellites. The goal is to monitor the facsimile downlink as the satellite moves from horizon to horizon with the strongest signal possible to get the best quality image. Any fading of the downlink signal will result in data loss and therefore lines of imagery lost in the picture. The antenna not only needs to receive signals from the hobbyist's local horizon, but maintain strong signal strength as the satellite moves away from the horizon and higher in elevation along its orbit. A high gain antenna that follows the satellite along its path is the best solution for such radio enthusiasts.

❖ Easiest Satellites to Hear

The International Space Station and the U.S. Space Shuttle are the easiest space platforms to monitor from an equipment and antenna standpoint. When amateur operations are conducted from these low flyers, they have even been heard on handheld transceivers using rubber duck antennas.

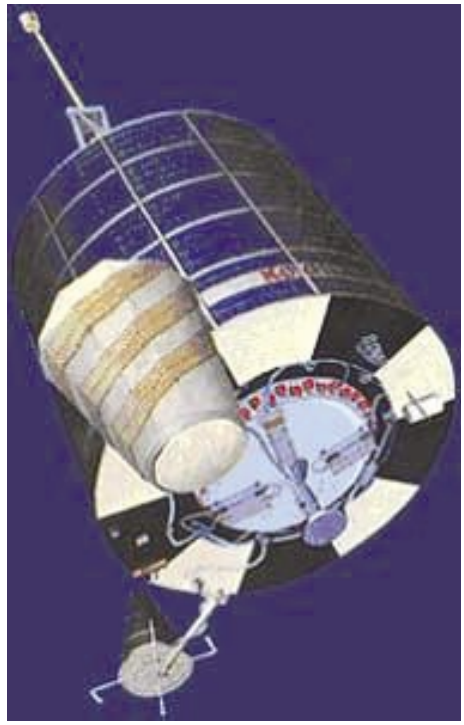
The next set of satellites up the monitoring scale is a series of military satellites that have been launched by Russia. These are the Parus military navigation satellites that transmit in the radio spectrum around 150 and 400 MHz. Longtime *MT* subscribers may have heard of these satellites thanks to an article that John David Corby wrote in the pages of *MT* in February/March 2000. You can read Corby's two part series online at **www.hearsat.org/navsat-1.html** and **www.hearsat.org/navsat-2.html.**

These satellites are very easy to hear. We have caught their 50 baud FSK (Frequency Shift Keying) downlinks on even the simplest of set-ups. Recently, while conducting our monitoring survey for this column, several of the better overhead passes from some of the satellites in this constellation were monitored using just a Uniden BR-330 handheld and the supplied rubber duck antenna.

The Musson Navsat Constellation

The Russian low earth orbit (LEO) navigation satellite system has been operation for well over 30 years and is similar, in many respects, to a system once operated by the U.S. Navy, known as the NNSS (Navy Navigation Satellite System). The NNSS is no longer used for navigation purposes since the Department of Defense NAVSTAR GPS system has become fully operational. NNSS was retired in 1996 and turned over to the University of Texas in Austin for ionospheric research.

The Russian LEO navigation system,



often referred to as "Musson" in some space related publications, consisted of two subsystems: "Parus" or "Vela" operated by the Russian military and "Tisikada" operated as a civilian system.

It appears that the Tsikada part of the Musson constellation is no longer operational. These satellites transmitted their FSK downlinks on 150.000 MHz and carrier tracking beacons on 400.000 MHz. The last reported signals from a satellite in this subsystem was in 2004, and we can confirm from monitoring that no signals on either frequency were heard during our recent listening survey which covered a 24 hour period. The Tsikada subsystem used to consist of four satellites organized in orbital planes spaced 45 degrees apart.

Parus Military Navsats

The second subsystem appears to still be active at some level. Parus currently consists of five satellites organized into orbital "planes" spaced 30 degrees apart in Right Ascension. When these two navigation subsystems were both operational, coverage of a complete hemisphere of 180 degrees was achieved. Since these satellites were launched into orbits inclined at 83 degrees, that means that their orbital plane is tilted 83 degrees with respect to the equator; this orbit brings

these satellites above the north and south polar regions and provides global navigation support.

When the entire Musson navigation constellation was fully operational, there were six satellites active in the Parus subsystem. As mentioned above, during our recent survey of this spectrum, we only found five satellites transmitting FSK downlinks and this would suggest that these satellites may no longer be used for navigation purposes.

So, if these satellites are no longer used for navigation purposes, what mission are they currently performing? One tantalizing theory is that they are being used as relays for data from Russian US-P (EORSAT) ocean surveillance satellites and for store-dump communication services. With the advent of the Russian GLONASS navigation satellite constellation, the navigation mission is not as important, and the main mission may now be to act as data relay satellites.

This would imply that there may be some additional, undiscovered downlink frequencies on which these satellites might be transmitting. We will continue to search the VHF/UHF spectrum for these downlinks in future satellite spectrum surveys.

Meanwhile, here is the list of active satellites we have recently observed, that are part of the Parus satellite subsystem.

PARUS NAVIGATIONAL SATELLITES

Frequency (MHz)	International Designator	SSC #	Name	Orbital Plane
149.910/399.760	2003-023A	27818	Cosmos 2398	2
149.940/399.840	2001-023A	26818	Cosmos 2378	6
149.970/399.920	2004-028A	28380	Cosmos 2407	1
149.970/399.920	2005-002A	28521	Cosmos 2414	4
150.030//400.080	1998-076A	25590	Cosmos 2361	5

So, turn on those receivers, plug in the frequencies above, and see what you can hear. If you are interested in decoding the signals from these satellites, I highly recommend reading Part Two of the previously mentioned article by John Colby. And if you would like a sample of what these satellite signals sound like, stop by the *MT* website and check out our audio library webpage.

❖ West Point Update

Recently, my *MT* colleague Chris Parris had an opportunity to monitor the new West Point Military Academy VHF trunk system. Chris reports the system is very active and has discovered that it is split into two sites as follows:

System Type: Project 25 Standard
System ID: 00f WACN: 580A0
Base Frequency: 136.000 MHz; Spacing: 12.5 kHz; Offset: 380
Site 1 138.0375 138.1875 138.3375 138.5125 138.6875 139.0375 139.1875
Site 2 138.1125c 139.3375 139.4875c 139.6375 140.6625c

Thanks, Chris, for passing along that valuable update. I am sure our readers in the area will enjoy the communications from this fabled institution, thanks to your efforts.

❖ More Milair Frequency Changes

More aeronautical communication frequencies continue to be moved out of the new DoD 380-400 MHz LMR subband. Jack NeSmith reports that the Dallas-Fort Worth, Texas, approach control frequency of 397.850 has changed to 308.400 MHz.

Some other frequency changes recently noted by Jack include:

Sheppard AFB, Texas
269.025 Approach Control (ex-308.600)

Tinker AFB, Oklahoma
305.600 ACC Command Post Primary (Raymond 24)
355.200 ACC Command Post Primary (Raymond 24)

Tyndall AFB, Florida
136.400/338.350 Approach Control
124.150/341.700 Approach Control
125.200/392.100 Approach Control
119.100/379.300 Approach Control

Whiteman AFB, Missouri
119.250 Radar arrival frequency (ex-120.250)

Wright AAF, Georgia
68.225 Tac Tower at Taro Drop Zone Primary
87.475 Tac Tower at Taro Drop Zone Secondary
142.600 Tac Tower at Taro Drop Zone Primary
148.800 Tac Tower at Taro Drop Zone Secondary
364.000 Tac Tower at Taro Drop Zone Primary
372.100 Tac Tower at Taro Drop Zone Secondary

❖ HF Civil Air Patrol Frequencies

I have had several requests from readers looking for the current frequencies used by the Civil Air Patrol. Here is the latest list I have in my database.

2371.0 2374.0 4466.0 4469.0 4477.0 4506.0 4509.0 4522.0* 4582.0 4585.0 4601.0 4604.0 4627.0 4630.0 5006.0* 5711.0* 6806.0* 7341.0 7602.0* 7635.0 (National Calling Frequency) 7920.0 8012.0* 9047.0* 10162.0* 11402.0* 12081.0* 13415.0* 14357.0* 14902.0 17412.0* 18205.0 19814.0* 20873.0 kHz

Most the CAP HF communications are voice in the upper sideband (USB) mode, but this group is starting to use more of the automatic link establishment (ALE) protocol; those frequencies are indicated by an asterisk.

❖ U.S. Coast Guard Air-to-Ground Frequencies

Another frequent question from readers of this column is "Where in the HF spectrum can I hear Coast Guard aircraft?" Put your shortwave receiver in the USB mode and keep an eye on the frequency list below:

3053.0 3056.0 3119.0 3122.0 4730.0 4733.0 5693.0 5696.0 5699.0 8980.0 8983.0 11196.0 11199.0 11202.0 13218.0 13221.0 15082.0 15085.0 15088.0 17988.0 17991.0 kHz

The most commonly heard shore stations on these frequencies include CAMSLANT Chesapeake, Virginia, and CAMSPAC Point Reyes, California

❖ And Finally...

Remember, there are always a lot of things happening in the world of Milcom communications. You can check for additional material and late breaking news 24/7 on our new blog page at **http://mt-milcom.blogspot.com**. So until next time, 73 and good hunting.

Doug Smith, W9WI
dougsmith@monitoringtimes.com

Alaska, Hawaii, and Beyond

We've finished our AM band tour of the United States. I know when I stake out a particular frequency, looking for a particular station, I usually hear *something* new – even if it isn't always (or even usually) the station I was looking for. I hope these "state-by-state" articles helped you log a few new stations, if not a few new states.

You may have noticed we only toured 48 states. Unfortunately, the two newest states are nearly impossible to log from the mainland, unless you live right on the Pacific Coast. Hawaii may actually be easier to log on TV than it is on AM, if you live east of the Rockies...

The good news for those trying to log our two newest states is that directional antennas are rare in the 49th and 50th states. There are only three directional stations in Alaska and only one in Hawaii. Because of the extreme distance between these states and the mainland, directional antennas are almost never necessary to protect mainland stations from interference. One of the directional stations in Alaska isn't protecting anyone from interference – they use it to get a stronger signal into eastern Russia for certain religious programming.

The bad news is that these Alaskan and Hawaiian stations use the same frequencies as mainland stations. Since the mainland stations are of course much closer, it is nearly impossible to hear the Alaska/Hawaii DX through the local interference. There are no expanded-band stations in these states; interference doesn't limit the coverage of regular-band stations, so there is no need for the expanded-band. Less power is required to achieve a given amount of coverage on a lower frequency, making expanded-band operation relatively inefficient.

Alaska:

Anchorage's two most powerful stations are both 50,000-watt news/talk outlets. KENI-650 and KFQD-750 are two of your best bets for logging the 49th State in the lower 48. Other good shots are Juneau's full-service KINY-800, North Pole religious station KJNP-1170, and Valdez NPR/community station KCHU-770. (North Pole is hundreds of miles from the actual Pole; it's a suburb of Fairbanks...)

There are many public radio stations on AM in Alaska. In general, community radio is much more popular up there; in more isolated areas, it's often the only radio on the air.

Hawaii:

In the Aloha State, probably your best shot is Hilo news/talk station KPUA-670. Other Hawaiians occasionally heard on the mainland include Honolulu's KRTR-650 (easy listening), KGU-760 (religious), and KHVH-830 (talk). Another station that should put a signal into the West Coast is Honolulu's KORL-690. This station may be difficult for many DXers to identify, though, as it broadcasts in Japanese to the large Japanese community in Hawaii.

Since directional antennas and nighttime power reductions are rare in these states, sunrise/sunset techniques will not help strengthen the distant signals. They will, however, knock down interference on the mainland end. These stations are probably best DXed in the morning, right around your local sunrise – after interfering stations to your east have are in sunlight but before the rising sun makes the long path across the Pacific unusable for the DX signals.

Don't hold your breath: Alaska and Hawaii are tough. If you're on the coast, give them a try – and if you hear them, please let us know!

US Territories:

The U.S. also has some offshore territories that aren't states. The U.S. Virgin Islands are probably the easiest to log. There's an expanded-band station on 1620 on St. Croix, which has been widely heard on the mainland. WDHP simulcasts WRRA-1290 and WAXJ-FM 103.5 with a wide variety of programming in English. DXers have also reported hearing Radio Marti (the U.S.-government-operated anti-Castro station, in Spanish) on 1620. It's generally believed the government is leasing airtime from WDHP to carry this broadcast. News-talk station WVWI-1000, Charlotte Amalie, is also occasionally heard on the mainland.

Puerto Rico also has an expanded band station. In their case, it's WGIT-1660, broadcasting in Spanish. The language barrier is probably the reason this station is not widely reported. Other Puerto Rican stations in the regular band are occasionally heard, probably most often news/talk WAPA-680. An English-language station (WOSO-1030) operates in San Juan, but with a directional antenna beaming it away from the mainland.

Three U.S. territories in the Pacific have AM stations. Guam's three stations are KGUM-567, KUAM-612, and religious KTWG-801. Two stations on American Samoa are KJAL-585 and WVUV-648. KCNM-1080 operates from Saipan in the Northern Marianas. (Long-time KSAI-936 there is now off the air.)

Yes, these strange frequencies are for real, though three of them will likely change soon. While AM stations in the Americas are on even multiples of 10 kHz, in other areas of the world 9 kHz steps are used instead (531, 540, 549, 558, etc.). In order to avoid interference to and from other stations in nearby countries, American stations in nearby overseas territories must also operate on 9 kHz channels.

WHEW-1380, Franklin, Tennessee

LOGGING U.S. OVERSEAS TERRITORIES

Alaska:	KENI-650, KFQD-750
Hawaii:	KPUA-670, KGU-760, KHVH-830
U.S. VI;	WDHP-1620
Puerto Rico:	WGIT-1660, WAPA-680

When radios still had continuous tuning dials, this was strictly an administrative difference. A continuous-dial radio sold in Los Angeles and tuned to 570 could also be sold on Guam and just as easily tuned to 567. More recently, however, many radios have digital tuning. A digitally-tuned radio set up for 10 kHz steps cannot be tuned to 567 kHz. This is getting to be a problem for stations in these territories.

Two stations in American Samoa and one on Guam have found a way to solve this problem. Note that the 9 kHz channels and the 10 kHz channels line up every 90 kHz. 540, 630, 720, 810, 900, etc. are all frequencies valid in both plans. KUAM on Guam has filed to move from 612 to 630. In American Samoa, KJAL has filed to move from 585 to 630, and WVUV has filed to move from 648 to 720. In the third affected territory, the Northern Mariana Islands, KCNM is already on one of the "common" frequencies, 1080 kHz.

Anyway, that detour aside... none of these stations is particularly easy to log. I can't recall the last time any of them was reported heard in the mainland US. If you hear one, you've got a great catch!

❖ IBOC (and other digital radio) news

"Rumors were flying, suggesting that the FCC Commissioners had on their desks a final proposal for IBOC rules, including permission for AM IBOC operation at night." That's what I wrote in August, expecting nighttime AM IBOC to be permitted in April. Rules allowing nighttime AM IBOC still haven't been approved.

The FCC put an IBOC report on their agenda for a July 13th open meeting. Again, most observers expected nighttime AM IBOC to be approved on that date. Early on the morning of the 13th, I checked the FCC website again – and found a notice that IBOC had been removed from the agenda. Rumor has it that Ibiquity made a last-minute submission of additional data that caused the Commission to take pause.

The other IBOC rumor that keeps flying is the one that the Radiosophy HD radio will ship soon... Digital radio is never going to fly until listeners can actually buy receivers!

❖ FM translators & AM stations (and, yes, IBOC)

FM translators are low-powered relay stations. They were originally authorized to fill in gaps in the coverage of the main transmitter (for example, on the wrong side of a mountain) or to extend FM service to rural areas too small to support their own station. In the US, translators can only be used to extend the coverage of FM stations; you cannot use a low-powered FM translator to extend the coverage of an AM station.

The National Association of Broadcasters (NAB) would like to change that. In mid-July, a petition was filed to allow FM relays of AM stations. The coverage of the FM relay would be restricted to within 25 miles of the AM transmitter or the "2mV/m daytime contour," whichever is closer.

The "2mV/m daytime contour" means the area where a 2-millivolt signal would be induced in a 1-meter (~3-ft) antenna. This is a reasonably strong signal that would probably be considered "entertainment quality" by most non-DXer listeners. DXers will listen to something much weaker <grin>! Note that it says daytime contour; this proposal would vastly improve the nighttime coverage of many AM stations – especially stations required to make large nighttime power reductions.

I find the timing of this proposal suspicious. A recent "filing window" for new FM translators resulted in the filing of thousands of applications – overwhelming the FCC, threatening to make any future LPFM filings impossible, and forcing the Commission to put translator applications "on hold." Any move to authorize more translators would only exacerbate the problem.

While the NAB is asking for more translators, they're complaining that allowing LPFM stations 600 kHz away from full-power stations will cause too much interference. But translators are more likely to cause interference – they can operate closer in frequency to full-power stations and can run more than twice the power!

I strongly suspect this proposal is intended only to bolster support for IBOC among smaller AM operators and the Congressmen who represent them. Widespread deployment of AM-IBOC will wreak havoc with these smaller stations, especially at night. Small-station operators are not sold on the benefits of IBOC; the expense of purchasing additional equipment and Ibiquity patent licenses, and of reworking directional antennas, is pretty steep for a small market. It's these small AM operators who would benefit most from a proposal to allow translators of AM stations.

❖ More LPFMs?

Around the same time the NAB proposed to allow FM translators of AM stations, legislation was introduced in Congress that would lift restrictions on the use of third-adjacent channels by LPFMs. Right now, a LPFM cannot operate within 0.6 MHz of a nearby full-license station. For example, WRFN-LP near Nashville cannot use 103.9 MHz, because it's too close to WKDF-103.3 and WGFX-104.5.

The same legislation that set these restrictions in the first place also ordered a technical study to determine whether the restrictions were necessary. The study said "no." Now, Senators John McCain and Maria Cantwell have introduced legislation that would lift them. The National Association of Broadcasters has opposed the LPFM project from the start, and they still believe these limits are necessary. An audio recording has been prepared which proports to demonstrate what the FM dial would sound like with LPFMs 600 kHz from full-power stations. You can listen: **www.nab.org/xert/corpcomm/pressrel/mixdown.mp3**.

There are some things that bother me about this recording:

- It doesn't say which stations were involved or where the receiver was located. The classical station sounds awfully weak to me; were they trying to DX a station 50 miles away?
- The first set of recordings simply doesn't sound like adjacent-channel interference to me. It sounds like the desired station is simply weak. Either that, or the interfering station was running IBOC, which would have the same effect...
- In my experience, personal stereos ("Walkmans" – "Walkmen"?) are the worst possible receivers for interference rejection. Just about any other radio would have done much better.
- Due to low average modulation levels, classical music is far more susceptible to interference than any other type of programming.

But their tactic may well be effective. There are only two radio amateurs in Congress, and to my knowledge no broadcast engineers; nobody will know enough to ask the right questions.

❖ More exotic Pacific DX

Ken Brown N4SO is serving in the Navy in the Philippine Sea. One might think DX out there would all involve exotic Asian languages, and to a large degree one would be right. However, the U.S. military operates a number of stations out there as well, and Ken has DXed some of them.

On 650, Ken is hearing the Armed Forces Net station from Okinawa. Programming includes National Public Radio, sports, and a variety of other English-language programming from the States. And on 1575, the "Power Station" in Sasebo, Japan, carries rock music and Navy news. The website **http://iinodot.com/country/country.htm** (in Japanese) suggests another frequency, 810 kHz, is also used from Tokyo. This site also suggests the Okinawa frequency is 648 instead of 650, though I'm sure on many radios you couldn't tell the difference! Again, note the use of "strange" frequencies outside the Americas.

❖ Old radio in the Gem State

Several Idahoans have formed the History of Idaho Broadcasting Foundation. They're looking for any airchecks, photos, or QSLs from Idaho stations; copies would end up on their website and/or in their muesum. See **www.historyofidahobroadcasting.org/** for more information.

❖ Till next month

Have you tried DXing IBOC yet? Write me at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to dougsmith@monitoringtimes.com. Good DX!

Ernest H. Robl
ernestrobl@monitoringtimes.com

Ships, Signals and Submissions

"Island Star, Island Star, here is the Island Belle, on 12."
"Island Belle, go ahead."
"Lee, do you want me to check down or go past you?"
"Go ahead, Ron, we will wait and follow you through at Whisky Island."
"Roger, Lee. Island Belle out and back to 16."

It feels good to be back on the marine VHF radio as well as monitoring it. I have made several trips as Captain on the *MV Island Belle*, a 150 passenger tour boat, in Kingston harbor. I shudder to think how many people I have carried in the past 40 years of working on the Thousand Island tour boats.

Channel 13 is reserved for bridge to bridge communications by commercial vessels. It is a good channel to monitor on a busy waterway.

The summer season in the Thousand Island area is busy, and there is always interesting traffic on the VHF radio. For instance, this weekend, we have a Poker Run taking place from our harbor. The Coast Guard, Police, and other security vessels will be using channel 73 to co-ordinate their activities. Standard ship to ship channels will be used to stage the boats. Some of these vessels are capable of well over 100 miles per hour. One is actually powered by two turbine helicopter engines.

One of my other activities is to teach some marine courses. I am helping the CORK (Canadian Olympic Regatta Kingston) organization certify their people. I have a marine radio license course in the morning and a Pleasure Craft Operator Card course in the afternoon. I certainly try to teach proper radio procedure and safe boat operating.

Marine radio is a valuable asset when sailing the Great Lakes or any body of water. I can't stress enough how much it provides a valuable safety lifeline when help is needed. On a recent holiday Monday, I monitored a call for help in a jet ski accident off Sacketts Harbor, New York; two assistance calls for the Kingston, Ont. Coast Guard; a call to the Alexandria Bay, New York, Coast Guard; and a report of an accident involving a water skier on the Rideau Canal. I always monitor channel 16 in case I hear a call.

We have also had several severe thunder storm warnings in this area as well as two tornado warnings. The weather warnings on the marine radio and weather radio channels alerted many people and certainly saved some damage. Tornados touched down about 50 miles north of our city. It is a rare day that some form of distress is not heard in this area. As I write, a mayday relay for an overturned catamaran has just come through on channel 16.

The classic laker Saginaw entering lock 1 of the Welland Canal

❖ Ships

I was able to use the VHF radio and Internet sites to follow the last trip of the *D. C. Everest* – the last ship ever built at the Kingston Ontario shipyards. She is also the last intact, pre-Seaway, canal-size vessel on the Great Lakes. Over the past few years, her role was that of a lightering vessel for a tug company. (Lightering is the act of transporting cargoes from ship to shore via a lighter vessel.) However, when that role came to an end, she was towed up the St. Lawrence Seaway to be scrapped at Port Colborne, Ontario. I was able to monitor her progress and add some pictures to my collection.

A trip to the Welland Canal area also allowed me to use marine radio, channels 14 or 11, to get some interesting pictures and information. I heard that a small Coastal freighter called the *Trieste* was tied up in Port Colborne. When I asked a crewman about the vessel he told me his brother-in-law had bought the vessel in Norway, loaded 80 tons of gravel on it and sailed it across the Atlantic. She is the ex-*Vegsund* from Norway and was built in 1946. Her new role will be as a private yacht in Muskegan, Michigan.

Radio communications were useful so I could photograph several other vessels, which I wanted for my collection and for use in this column. There is a gathering of ship enthusiasts (called Boatnerds) in October at the Welland Canal. You can be sure that there will be many people monitoring the radio.

Monitoring marine channels has also allowed me to follow the Seaway season. We have had several breakdowns, accidents and delays for weather, pilots, etc.

❖ Amateur Radio

The amateur radio frequencies have also produced some very interesting marine related contacts. The Maritime Mobile Service Net on 14.300 USB always provides interesting marine contacts. The best example was KA5AAO/mm. David was aboard the 220 foot long supply vessel, *Gulf Service*. However, when contacted he was 40 miles up the Congo River, in Angola!

Some other stations heard were KK7QQ/mm, the *Naia*, sailing from St. Thomas to Norfolk; KK4UKY/mm 50 miles off the Portuguese coast sailing to Ireland; KA9ATR, *MV Eagle*, in Alligator River, NC. VE0SWP was also heard on 14.300,

D. C. Everest under tow for scrap. Tugs are the Evans McKeil and Point Vigour. It was the Point Vigour's first job on the Great Lakes since she was purchased from the east coast.

Triest at Port Colborne

while 550 miles North of Bermuda.

WB6UQA was net control and he thanked *Monitoring Times* for the publicity the net received. I also appreciated that he said he read and enjoyed this column. Conditions on this frequency also allow you to hear the Pacific Seafarers net which starts at 0300Z. I had contact with Tom, K4XV, who was in Hawaii.

3755 LSB is a good spot to hear Ron, VA3RJB on the lake freighter *Algosteel*.

Some of you may not be aware that Canada is the only country that issues distinct calls to maritime mobile amateur stations. If you hear a VE0 call, it is a Canadian vessel outside of Canadian waters.

Even the 2 meter amateur band provides some interesting marine contacts. VA3BLQ, Murray was in Prinyer's Cove when he called me, while Darius, VE3KVV, was anchored in the Thousand Islands. Darius also told me about the damage to the Erie Canal in New York State. He said some dams were destroyed and there was a huge amount of debris in the system as a result of some severe storms that went through upper New York this summer. The canal is expected to be closed for most of this season. VE3WAX was at Main Duck Islands and I was able to provide him with weather information from internet radar sites, during a severe storm warning, so he could plan his trip.

The Islands on the Air (IOTA) organization was active in late July. I worked several North American Islands, including VC2W on the Magdalen islands in the Gulf of St. Lawrence, AA4V on the Isle of Palms near Charleston, SC., VE3ZZ/VY2 in Hudson Bay, and CO8LY in Cuba. I also worked some European Islands including EI7M on Europe 115.

The Amateur Radio Lighthouse Society (ARLHS) was also active in late July and early August. I had a nice QSO with CJ, N4AUG,at the St. Augustine, Florida, lighthouse as well as W5DTK, Barry, at the Point Bolivar, Texas, lighthouse. CU8F at Flores Island lighthouse (lh0947) was the best DX contact.

On Aug. 7, K4CG, Keith, at the USCG base, Alexandria, Virginia, provided a very interesting contact. This is a telecommunications station for the US Coast Guard. I am also a racing enthusiast and worked W9IMS at the Indianapolis Motorspeedway. You never know what will pop up.

❖ Submissions

I am very pleased to receive submissions about marine radio frequencies from column readers. This adds so much to the column as it provides reference areas I might never be in or hear over the air. I would appreciate frequencies for outside North America.

Charles Hargrove sent some listings for New York Harbor. In fact, I will sail from there in August aboard the *Norwegian Crown*. This listing will also help me when I am aboard. Again, VHF channels 11, 12 and 14 are used for traffic control. They are a good bet in any busy harbor area.

David Smith, Clarkesville, Indiana, sent an extensive list of frequencies to listen to around the McAlpine Dam, at Louisville, Kentucky.

Tom Carroll, KC0NVS, said that he liked the column and tried some of the HF marine frequencies listed, with success, using an Icom R-71. During the summer 8983 kHz USB is a good Coast Guard frequency to monitor. He also reminded me that channel 22A, 157.1 MHz, is used for marine broadcasts along the Mississippi River. He stated that they use linked repeaters to cover the river. Again, this is a good source of weather warnings as well.

Table 1: Frequencies from our readers

New York Harbor

Ch	Use
8	Intership commercial vessels
10	Intership commercial vessels
11	VTS (Vessel Traffic Services) Initial calling and sailplans
12	VTS Raritan Bay and East River
13	Commercial vessels bridge to bridge
14	VTS Upper and Lower New York Harbor
17	Police launches
19A	Staten Island Ferry

USCG channels:
21A, 22A, 23A, 73A, 81A, 82A, 83A
Port Operations channels:
1A, 5A, 20A, 61A, 63A, 64A, 66A, 73, 74

McAlpine Dam area, Louisville, Kentucky

Ch	Use
7A, 10, 11, 67	McBride Fleet
7A, 9, 71, 72	Jeff Fleet
13	Lock and dam
14	Lock
16, 80A, 21A, 81A, 22A, 82A, 23A, 83A	Coast Guard
72, 82	Power Plant
84, 85, 86, 87	Ship to shore
88	Commercial traffic

❖ Marine Radio Historical Society

Richard Dillman, W6AWO, keeps me posted on the activities of this organization. In late May they were arranging contacts with the *SS Matsonia*, KHRC, which runs from California to Hawaii. The radio operator is Reese Jones and he is one of the few remaining radio operators on US registered ships. KSM was to try a contact on 500 and 426 kHz. They also simultaneously keyed their 6474 and 12993 transmitters when contact was made. KLB was also active on 6411 kHz. All of this is CW (Morse code), of course.

On July 12th, MRHS had their "Night of Nights." This was the date of the last commercial Morse message in the US. Contacts were made with the *SS Matsonia, SS Kauai, SS Columbine Maersk* and *SS Red Oak Victory*. Unfortunately, I was away and could not monitor. Often, K6KPH is active on the amateur bands at the same time and I have had the pleasure of contacting the station. I have heard KPH here and hope to again.

Tom McKee of the Inland Marine Radio History Archive (**www.imradioha.org**) contacted me again. They have been in existence for one year and have a very interesting website. They would like any info, memorabilia, etc. for their archive. I do have some radio tapes of some Great Lakes radio stations which have now been sent.

❖ Personal Activity

I will be sailing to Bermuda on the *Norwegian Crown*, near the end of August. (Bermuda Harbor radio broadcasts can be heard on 2582 kHz USB at 0035, 0435, 0835, 1235, 1635 and 2035 UTC.) I have received permission from Mr. Tom Ogg, Duty Officer, to visit Bermuda Harbor Radio while I am there and will see what I can gather for the column. My monitoring equipment will be my R-2 scanner and Grundig YB 400 portable. I am also looking to work some 2m while in VP9 land. I will have to visit their Dept. of Telecommunications office for a visitor license.

My new antennas are up and I have had some success. I actually worked FM5JC, for my first 6m CW DX contact. New cable has been installed and the station is back in business just in time for the winter HF season.

Again, I thank the readers who have responded with information and comments. I look forward to receiving information from *your* maritime channels for the column.

Table 2: Frequencies listed in this article

1A ...156.025	16 .... 156.800	73 .... 156.675
5A ..156.250	17 .... 156.850	74 .... 156.725
7A ..156.350	19A.. 156.950	81A .. 157.075
8 .....156.400	20A.. 157.000	82A .. 157.125
9 .....156.450	21A.. 157.050	83A .. 157.175
10 ...156.500	22A.. 157.100	84 .... 161.825
11 ...156.550	23A.. 157.150	85 .... 161.875
12 ...156.600	61A.. 156.075	86 .... 161.925
13 ...156.650	63A.. 156.175	87 .... 161.975
14 ...156.700	64A.. 156.775	88 .... 157.425

Kevin Carey, WB2QMY
kevincarey@monitoringtimes.com

Season Opener

My son Bryan (KC2MRD) standing next to Old Betsy, a longwave spark transmitter originally used by ARRL Founder Hiram P. Maxim

Fall is here, and most North American listeners should begin noticing improved conditions on longwave. Natural static (QRN) levels are much lower now than during the summer, when thunderstorms can ruin longwave reception. So, are you ready for the upcoming season? This month, we'll look at some things you can do to improve your chances for pulling in "the big ones" this winter.

❖ Antenna Once-over

Antennas take a beating because they are constantly exposed to the sun, wind, and rain. They are also the most important part of any receiving setup, so it pays to watch for any problems that might be developing. Antenna troubles will be much easier to fix now than in the middle of a winter storm!

Besides the antenna itself, be sure to check the insulators, supports, ropes, and feedlines for signs of weather damage or wear. This is also a good time to check all grounding connections at your station. For active whips and loops, look for signs of deterioration that might allow moisture to get inside and harm the amplifying circuitry. Don't like climbing? Try using a good pair of binoculars to inspect your antenna(s) from the ground.

❖ Receiver Checks

Some LW receivers sit idle through the summer months and should be checked for frequency calibration and sensitivity. I keep a list of five local beacons (less than 50 miles distant) to use as "reference stations" for checking the basic performance of my receiver. If two or more of these stations are weaker than normal or appear to be off-frequency, I check my own gear for possible problems.

Modern gear should not present any problems when left idle for extended periods, but vintage gear (commonly used on longwave) is a different story. It might be time to give the switches and variable controls a shot of contact cleaner/lubricant to restore proper operation. My favorite cleaner is DeoxIT™ D5 manufactured by CAIG Laboratories (**www.caig.com**). Used sparingly, it can correct problems such as "scratchy" potentiometers and switches. This chemical is available from many electronics distributors.

❖ Publications

While there are many excellent resources on the Web, a well-stocked bookshelf is still important for the serious LW listener. This includes magazines, aviation maps, beacon directories, technical books, and recordings. For an extensive list of longwave-related books and resources, check out Alan Gale's Beacon & Utility Datafile at **http://beaconworld.org.uk/datafile.htm** and the Longwave Club of America's site at **www.lwca.org**. While you're at the LWCA site, be sure to also read about their excellent monthly publication, *The Lowdown*. It's a must for any serious DXer.

The importance of a logbook cannot be overemphasized for beacon hunting. It allows you to compare the band to last year's catches and spot any changes right away. You can make up your own logsheets with ruled paper, or go the "fancy" route and compose it on a computer. Either way, you'll want to have a record of your hard-earned catches. While you're at it, send some of those loggings in to *Below 500 kHz*!

❖ Online Resources

A disclaimer needs to be made about online resources: Web site addresses (URLs) are subject to frequent change. More often than not, when a list of LF-related websites is published, some of the addresses will be out of date by the time you receive the printed copy. I verified each of the URLs below at press time, but no guarantee is made that all of the sites are still active. Should you discover a "dead" link, the best recourse is to use your favorite search engine to search for keywords covering the terms of interest to you.

The following websites are a small sample of what exists on the web for longwave enthusiasts. You will undoubtedly discover more sites as you search the web on your own or follow the links given on many of the sites below. Have a favorite LF site that we've missed? Just send me the details and I'll cover it in a future issue.

1. Longwave Club of America *(highly recommended)*: **www.lwca.org**
2. Stephen P. McGreevy's Natural Radio Site *(highly recommended)*: **www.auroralchorus.com/natradio.htm**
3. Lyle Koehler's Lowfer Page *(highly recommended)*: **www.mlecmn.net/~lyle/**
4. Alan Gale's Beaconworld website *(highly recommended)*: **http://beaconworld.org.uk/**
5. History of aviation beacons: **www.navfltsm.addr.com/ndb-nav-history.htm?**
6. Airnav online listing of many N. American beacons (note: does not list 2-letter "compass locator" beacons): **www.airnav.com/navaids/**
7. World Aeronautical Database: a very complete listing of LF and non-LF navaids: **http://worldaerodata.com/**
8. NDBs Received in North America (NDBRNA): a sophisticated database of LW signals actually heard by North American listeners; May be sorted in multiple ways: **www.classaxe.com/dx/ndb/rna/**
9. Altair's Natural Radio Projects: **www.altair.org/natradio.htm**
10. LF Engineering Co. Homepage: **www.lfengineering.com/**

❖ Longwave in New England

During a recent trip to New England, I managed to get in some time tuning the LF bands and seeing some of the radio sites in that part of the country. Table 1 shows a list of loggings made using my Sony 2010 with its internal ferrite antenna. All loggings were made from Orleans, Massachusetts, on Cape Cod.

Table 1. Cape Cod Loggings

FREQ.	ID	LOCATION
216	CLB	Carolina Beach, NC
216	LWBC	Allouis, France
248	AC	Nantucket, MA
252	LWBC	County Trim, Ireland
276	YHR	Chevery, QC
276	CQX	Nauset, MA
278	NM	Mantagami, QC
280	QX	Gander NL
326	FC	Fredericton, NB
351	YKQ	Waskaganish, QC
355	YWP	Webequie, ON
362	FMH	Falmouth, MA
366	YMW	Maniwaki, QC
368	IMR	Marshfield, MA
382	LQ	Boston, MA
382	YPL	Pickle Lake, ON
390	JT	Stephenville, NL
389	PVC	Provincetown, MA
392	ML	Charlevoix, QC
396	JC	Rigolet, NL
414	BC	Baie Comeau, QC

While in Cape Cod, I also visited Marconi Beach, where the first two-way wireless communication took place between the United States and England in 1903. The site has a commemorative display and an intricate model showing how the original station looked. There are a few remnants (very few) of the original station lying in the sand, such as timbers, concrete, and a short section of brick wall.

On my past visit to the site, I saw a bust of Marconi mounted on a pedestal, but it was nowhere to be found on this visit. I asked a Park Ranger about its absence, but he did not have any answers, as he was new to the post. Do any Cape Cod readers have further information?

My travels also took me by the ARRL Headquarters in Newington, CT. There, I had an interesting tour of the facilities, and also visited the W1AW building. On display in the lobby of the W1AW building was Hiram P. Maxim's personal longwave spark transmitter, affectionately known today as "Old Betsy."

George Zeller
georgezeller@monitoringtimes.

FM Pirate Radio Operator Charged with Homicide in Florida

The pirate radio movement suffered a massive blow in late July when police in Dade County, Florida, arrested Darnen Fabian Watson on charges that he allegedly murdered Miami pirate disk jockey Albert "Uncle Al" Moss in 2001. Watson was charged in Miami with first degree murder. The case still has loose ends at press time for *MT*, but this ugly circumstance dealt yet one more blow to the robust FM pirate scene in Florida.

No other state has traditionally had as many active pirates on the FM band as Florida. In response, the Florida state legislature passed a law classifying the operation of a pirate transmitter within Florida as a felony.

The new homicide case is complex. Watson had already changed his residence to the Coleman Federal Prison as a result of a ten year sentence on drug charges, so he was no longer an active pirate operator. Apparently law enforcement in South Florida heard Watson bragging about this murder to other inmates while in his prison cell. The altercation between Watson and Moss allegedly involved an argument about who was entitled to use a pirate FM frequency within the Miami area. Miami police also claim that Watson mistakenly thought that Moss had stolen his pirate transmitter, which he allegedly used to broadcast a Jamaican music format.


Darnen Watson

We thank veteran DX author Harry Helms of High Text Publications for information on this breaking story.

New Pirate Blog

An anonymous new blog has appeared on the internet that is hosted by somebody named UK DXer. Thanks go to Ralph Brandi for pointing this one out. The site is worth checking out if you are interested in Europirate reception, since it lists continually updated Europirate loggings. This new blog is at the **http://shortwavedx.blogspot.com/** URL.

Oldest Pirate QSL

We continue to receive many wonderful nominations for the oldest pirate radio QSL in the collection of *MT* readers. One of the most impressive lists comes from Andy Robbins. While in the Republic of Ireland in 1977 he heard and QSLed a healthy list of pirates on his Barlow-Wadley XCR-30, including **Radio Valleri** 6202 kHz (4/11/77), **Radio Solent City International** 6280 kHz (1/30/77), **Radio Zodiac International** 6235 kHz (4/10/77), **Radio Maniac** 6210 kHz (3/13/77), **ABC England** 6270 kHz (2/6/77), **Radio Gemini** 6238 kHz (3/20/77), and **European Music Radio** 6265 kHz (2/20/77). Two years later, from London, England, he heard **Radio Jackie 227** 6250 kHz (3/25/79), **North London Radio** (mediumwave) (3/79), and **Radio City 238** (mediumwave) (3/79).

Andy's oldest North American pirate QSL was from the **Voice of Venus** 7490 kHz (1/30/79).

But, Andy reports that his *best* QSL by far is **Radio Enoch** (48 meters) (3/25/79). They were an ultra-right wing quasi-clandestine pirate who very rarely responded to correspondence from listeners. This one certainly is among the best pirate QSLs of all time. We thank Andy for sharing this wonderful pirate DXing memory with all of us.

In future months we plan to continue this march down memory lane. Do you have an old pirate radio QSL in your own collection? Let us know.

What We Are Hearing

Despite high static levels prior to the fall DX season, *Monitoring Times* readers heard nineteen different North American pirates this month. You can hear them, too, if you use some simple techniques. Pirate radio stations never use regularly announced schedules, but shortwave pirate broadcasting increases noticeably on weekends and major holidays. In the United States, Halloween will be the next upcoming major holiday under this definition.

You sometimes have to tune your dial up and down through the pirate radio band to find the stations, but more than 95% of all North American shortwave pirate broadcasts are heard on **6925 kHz**, plus or minus 30 or 40 kHz.

Grasscutter Radio- Rock music remains the staple of this station's programs. (Uses *grasscutterradio@yahoo.com* e-mail)

Ground Zero Radio- Dave Gunn's pirate shows are allegedly transmitted from an old ICBM missile silo, but he has expanded his frequencies to include 6955, 13900, and 15070 kHz. A recent contest offered a pirate transmitter as a prize. (Used to use Elkhorn but also uses *gzrsw@yahoo.com e-mail)*

James Bond Radio- They are a tribute to the various James Bond movies. Most of their shows are tunes from the famous spy's movie soundtracks. (None)

KIPM- Alan Maxwell long ago announced the demise of his existential drama programming, but these complex dramas remain on the air. (Formerly used Elkhorn)

Kracker Radio- Humor dominates their shows, and they are genuinely funny. (Merlin and uses *crackerradio@pmoll.com* e-mail)

MAC Shortwave- Paul Star's oldies rock with genuine antique radio station jingles still wanders around frequencies that are plus or minus 1000 kHz around 6950 kHz. At times they omit the "shortwave" part of their ID's. (Uses *macshortwave@yahoo.com* e-mail)

Mystery Science Radio- Their computer generated voice sometimes discusses pirate radio history. (Used to use Elkhorn)

North Woods Radio- "Broadcasting from the Great Lakes," their rock music, comedy, and animal sound effects are distinctive. (Uses *northwoodsradio@yahoo.com* e-mail)

Pirate Radio Boston- Local New England rock from Charlie Loudenboomer is still their normal format. (Stoneham)

Radio First Termer- This old documentary about rock music broadcasts to American troops during the Vietnam war often gets relayed on the pirate bands, recently with added segments from the current war in the middle east. (None)

Radio Free Speech- Bill O. Rights combines pirate radio advocacy with advocacy for freedom and the USA constitution, as well as comedy features. (Belfast)

Radio Moshiach and Redemption- Sometimes inaccurately called Lubavitcher Radio, this orthodox Jewish advocacy station on 1710 kHz above the medium wave X Band airs programming similar to their streaming internet service on the *www.radiomoshiach.org/* web site. (Brooklyn and uses *radiomoshiach@erols.com* e-mail)

Random Radio- Robert Random combines classic rock with wisecracks about how Rush Limbaugh's Viagra powers the rockets in North Korea. (None; requests logs posted on the Free Radio Network web site)

Sunshine Radio- This is one of the few pirates on the air today from North America with a female announcer. Their address is the same one used by **Grasscutter Radio**. (Uses *grasscutterradio@yahoo.com* e-mail)

The Crystal Ship- The "Voice of the Blue States Republic" with The Poet's classic rock and leftist political commentary uses highly variable frequencies such as 6875 kHz and 1710, 3320, 6854, 6925, and 9057 kHz. (Belfast and uses *tcsshortwave@yahoo.com* e-mail)

Undercover Radio- Dr. Benway broadcasts "from the middle of nowhere," combining rock music and documentaries on pirate radio history. Walt Salmaniw heard them from the Canadian west coast. (Merlin and uses *undercoverradio@mail.com* e-mail)

WBNY- Commander Bunny from the rodent revolution still parodies political clandestine broadcasting with both audio shows and slow scan TV broadcasts. (Belfast and uses *rodentrevolutionhq@yahoo.com*)

WMPR- Their "dance party" techno rock music format is still a common presence on the pirate bands. (None; has QSL'ed only at the Winter SWL Festival)

WSUC- This new one has call letters that stand for "We're Stand Up Comedy," not alternative acronyms that some have suggested. (None, asks for loggings on the Free Radio Network)

QSLing Pirates

Reception reports to pirate stations require three first class stamps for USA maildrops or $2 US to foreign locations, especially in Europe where the value of the US dollar has plunged considerably. The cash defrays postage for mail forwarding and a souvenir QSL to your mailbox. Letters go to these addresses, identified above in

Continued on page 61

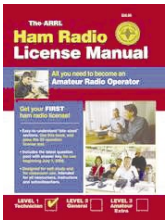
T.J. "Skip" Arey, N2EI
tjarey@monitoringtimes.com

Another New Tech Guide and HOPE6

Last month I talked about the new Federal Communications Commission question pool for the Technician Class License Exam (FCC Element E2), the "Entry Level" ticket to play ham radio. I also took a look at Gordon West's study guide for the new question pool.

In a variation on Murphy's Law, right after I put the September column to bed, another important Technician Class study guide showed up in the mailbox here at N2EI.

The ARRL Ham Radio License Manual
Level 1 - Technician
By Ward Silver, N0AX, et al
283 Pages, $25.95
ISBN 0-87259-963-9
The American Radio Relay League
225 Main Street
Newington, CT 06111-1494
www.arrl.org



I have said it many times in this column: Most of what got me started in amateur radio was found between the pages of the old black and red covered League publications from the late '60s and early '70s. I openly write from this bias, and I know many hams of my "Old School" wave the same flag. Since that time, the American Radio Relay League has continued to develop and improve its study guides to help folks become hams.

Back in the early '80s, a gentleman named Dick Bash KL7IHP almost single handedly forced the FCC into a position where they had to release the exam question pools. This was because Bash had developed a series of study guides based upon exit interviews from hams walking out of the test centers. Throughout that era of question memorization into today's environment where some folks go for their license after reading through the question pool a few times, the League has stood by its much-preferred way of helping folks become hams. In addition to giving you the information to study the exam question pool, they present full theory and practical information in support of the question pool study.

Yes, both techniques will probably have you walking out of the VE exam session smiling, but the ARRL way of doing things sets you out on the bands with a lot of information that will help you understand what is going on when you play radio. The League isn't just concerned with helping you pass the exam, they want to help you become the best amateur radio operator you can be.

The latest iteration of the ARRL *Ham Radio License Manual* is designed for use in either a classroom setting or for self study. I have no problem handing this book to a non-ham friend and saying, "Give it back to me when you get your license."

The League's training technique is to break down the question pool into easy to understand, bite-sized sections.

Chapter 1, "Welcome to Amateur Radio," covers what the Tech Class license is all about, how to study the information in the book, how to locate hams in your area, what makes ham radio special, and the whys and wherefores of FCC regulations.

Chapter 2 covers "Radio and Electronics Fundamentals," including the names and types of basic radio, fundamentals of electricity and electronics, common electronic components, the different kinds of radio signals and how they travel, and basic antenna and feed line concepts.

Chapter 3 is called "Operating Station Equipment," and goes over the basic operation of transmitters and receivers, how repeater systems work, the basics of data transmission, power sources, basic test equipment, and more on antennas and feed lines. The chapter also covers the basic features of handheld transceivers, as this type of rig is likely to be most new hams' first purchase. A section in this chapter also covers RF interference, its symptoms and cures.

Chapter 4 teaches you about "Communicating with other Hams." You learn the process of making a contact, the common practices of how to communicate in the ham radio world. You are also exposed to the nature of net operations, emergency communications, and special operating techniques and modes.

Chapter 5 gets down to the nitty gritty of "Licensing Regulations." Here you learn the rules and regulations that govern getting your license, as well as how the FCC rules guide proper amateur radio practice when you get on the air with that nice new license. This section helps you to become a responsible member of the amateur radio community.

Chapter 6 expands on the previous chapter to cover "Operating Regulations." You will learn the duties of a control operator, proper on air identification, third party communications, as well as remote and automatic control systems. Prohibited communications are also covered in this section.

Chapter 7 is the all important section covering "Electrical and RF Safety." You will learn basic ways to reduce electrical hazards as well as how to work safely with electricity. There are sections addressing proper grounding, lightning protection and RF exposure. There is also information on antenna and tower installation safety.

Chapter 8 is a glossary on practical and formal terms and definitions related to all the information covered in the book.

Chapter 9 finally gives you a peek at the full FCC question pool. Take a tip from a guy who has been through all the license tests and who has taught a lot of ham classes – Take a big rubber band and "lock out" this section of the book until you have read the rest of the book first. If you do this, I think you will discover that the first time you go through the question pool, you will discover that you are more than ready to head out to your nearest VE session. You will be walking into the test center as someone armed with the knowledge it takes to be a ham, and you will be all the prouder for passing the test in this manner.

And, once you pass that first exam, before you rush out to buy that first radio, place an order with the League for the Level 2 General study guide. You're on a roll!

❖ Hams at HOPE 6

Your humble columnist received an e-mail a few weeks back inviting me to be part of a panel discussion on amateur radio at the HOPE 6 conference in New York. HOPE stands for "Hackers on Planet Earth."

Now before you get your nose out of joint and start thinking Old Uncle Skip has gone over to the dark side, I will remind you that the name "hacker" predates most of the mischief that is called "hacking" in the popular press. Many of those original hackers were even in attendance at this gathering, including such luminaries as

Special Events Station N6H at H.O.P.E. 6

Your humble columnist with John "Captain Crunch" Draper ex-WB6EW at H.O.P.E. 6.

Richard Stallman formerly of M.I.T and father of the GNU Project, which is at the root (pardon the pun) of the open source computer movement that has spawned, among other things, LINUX. This was a gathering of curious folks with a lot of positive energy, and I was excited to be asked to be part of the show.

Anyway, as the group of hams that were invited to make presentations at the program began to congregate via e-mail, a number of additional projects sprang to mind. These included a Special Events station and a VE test session.

The Special Events station, like most such efforts, was a totally volunteer operation. Space was allotted by the conference planners. Quite good space, actually. Instead of being stuck in a corner where we could be easily ignored, our station location was directly in front of one of the main presentation halls, allowing for a great deal of traffic and many questions from curious folks. (And there is no bigger gathering of curious folks in the world than there was at this conference, I can assure you!)

Hams planning to attend volunteered their equipment and their time to manage and operate the station throughout the conference's three days. Permission was granted from the Hotel Pennsylvania to allow us access to the roof to install a number of antennas. Stringing wire high above the streets of New York City was one of the most exhilarating things I have ever done – and that is saying a lot, coming from a confessed adrenaline junky.

Finally, a Special Events callsign was applied for and the group was fortunate enough to get N6H, the perfect call to represent the HOPE 6 conference on the air. It has been a while since I was on the business end of a Special Events station. I had almost forgotten how much fun it was. Dozens of contacts were made, including many DX stations. Throughout the weekend the station was active on HF, VHF and UHF. Attempts were made to work the International Space Station on its identified passes, but the ISS was not active at those times.

Most importantly, literally hundreds of people came by to ask about ham radio. Many of these folks were unaware of how amateur radio had evolved to include digital communication modes. Once you tell a bunch of computer hobbyists about neat new ways to use their computing skills (in this case, via radio), we had a lot of folks asking for even more information. Since the conference was well wired with Internet access, we were able to show people many relevant Web sites to help them in their budding interest in ham radio.

Then, as they say, with the hook set, we started to reel them in. We let folks know that we had obtained the services of Carnegie Tech Radio Club W3VC, a group of hams qualified to perform a VE testing session. This was held Sunday morning in the main entry area to the conference to allow for non-participants to also take advantage of the testing session. I am happy to say that the efforts of the hams involved in the HOPE 6 conference made it possible for 12 people to pass their test and begin their journey in the ham radio world!

I was only a small part of the overall operation and presentation, but I can say I have never been more honored to work with a group of hams in my entire career. This group of dedicated hams included, among many others, Joe K2BAT, Ed N3KOW, Rich VE3ECM/W2 - KC2OSF, Dan KC2MXB, Lin N4YCI and of course Adam and the rest of the W3VC group. With dedicated folks like these, there is certainly hope for ham radio.

Another ham I ran into at the HOPE 6 conference was Ozzie N4SCY. Ozzie is one of the luckiest guys I know. He lives down in Florida where he can see all the launches from Cape Canaveral. Among other things we discussed, Ozzie reminded me that there are still many ham stations that retransmit the audio from the Space Shuttle when it is in orbit. A complete list can be found on the AMSAT web site at: **www.amsat.org/amsat/sarex/shutfreq.html**

Don't let the bottom of the Solar Cycle get you down. Get on the air and work anyone you can find. As my old friend Jon WB2KKS always says, "DX is any station you have never worked before."

I'll see you on the bottom end of 40 meters.

UNCLE SKIP'S CONTEST CALENDAR

RSGB 21/28 MHz Contest
Oct 1 0700 -1900 UTC

YLRL Anniversary Party (CW)
Oct 1400 UTC - Oct 7 0200 UTC

California QSO Party
Oct 7 1600 UTC - Oct 8 2200 UTC

10-10 International 10-10 Day Sprint
Oct 10 0001 - 2359 UTC

YLRL Anniversary Party (SSB)
Oct 10 1400 UTC - Oct 12 0200 UTC

Pennsylvania QSO Party
Oct 14 1600 UTC - Oct 15 0500 UTC
and Oct 15 1300 -2200 UTC

FISTS Fall Sprint
Oct 14 1700 - 2100 UTC

North American Sprint (RTTY)
Oct 15 0000 - 0400 UTC

ARCI Fall QSO Party
Oct 21 1200 UTC - Oct 22 2400 UTC

Illinois QSO Party
Oct 22 1700 UTC - Oct 23 0100 UTC

CQ Worldwide DX Contest SSB
Oct 28 0000 UTC - Oct 29 2400 UTC

10-10 Int. Fall Contest CW
Oct 28 0001 UTC - Oct 29 2359 UTC

Outer Limits continued from Page 59

parentheses: PO Box 1, Belfast, NY 14895; PO Box 109, Blue Ridge Summit, PA 17214; PO Box 69, Elkhorn, NE 68022; PO Box 146, Stoneham, MA 02180; 383 Kingston Avenue, Suite 94, Brooklyn NY 11213; and PO Box 293, Merlin, Ontario N0P 1W0. Unfortunately, PO Box 69, Elkhorn, NE 68022 is no longer a valid address.

Some pirates prefer e-mail, bulletin logs or internet web site reports instead of snail mail correspondence. The best bulletin for submitting pirate loggings with a hope that pirates might QSL is now the e-mailed *Free Radio Weekly* newsletter, still free to contributors via *yukon@tm.net*. A few pirates will sometimes QSL reports left on the Free Radio Network web site, at **www.frn.net** on the internet.

❖ Thanks

Your loggings and news about unlicensed broadcasting stations are always welcome via 7540 Highway 64 W, Brasstown, NC 28902, or via the e-mail address atop the column. We thank this month's valuable contributors**:** Kirk Baxter, North Canton, OH; Jerry Berg, Lexington, MA; Artie Bigley, Columbus, OH; Ralph Brandi, Middletown, NJ; Gerry Dexter, Lake Geneva, WI; Rich D'Angelo, Wyomissing, PA; John Figliozzi, Halfmoon, NY; Bill Finn, Philadelphia, PA; Harold Frodge, Midland, MI; Dave Gunn, Elkhorn, NE; William T. Hassig, Mt. Prospect, IL; Harry Helms, Smithville, TX; Ed Kusalik, Coaldale, Alberta; Chris Lobdell, Stoneham, MA; Greg Majewski, Oakdale, CT; A. J. Michaels, Blue Ridge Summit, PA; Joe Miller, Troy, MI; John Poet, Belfast, NY; Andy Robbins, Kalamazoo, MI; Jim Ronda, Tulsa, OK; Walt Salmaniw, Victoria, BC; Martin Schoech, Eisenach, Germany; Jan Schrader, Springfield, MO; John Sedlacek, Omaha, NE; Bryan Wade, Elizabethtown, KY; Bob Wilkner, Pompano Beach, FL; and Joe Wood, Greenback, TN.

Clem Small, KR6A
clemsmall@monitoringtimes.com

Emergency Communication Antenna Readiness

As we know, emergencies such as tornadoes, floods, or even terrorist attacks generally come without announcing themselves too far in advance. So, if we want to be able to have effective communications at our disposal during emergencies that may come our way, we need to plan ahead. Whether we plan simply to monitor emergency communications to stay informed of conditions, or whether we plan to provide volunteer, two-way communications during the emergency, there are things we can do to be ready if, or when an emergency arises. So, this month we discuss some antennas for emergency use.

❖ Emergency Antennas above HF

Antennas for emergency use of hand-held rigs (HTs) are generally the rubber ducks used in day-to-day, non-emergency service. However, commercially available telescoping antennas for HTs, such as the half-wavelength and 5/8 wavelength antennas, offer more gain than rubber duck antennas. Thus they might give extra range to your HT in some emergencies if it is needed.

Base station antennas are often larger and mounted on tall masts with long cables and even rotators for the antenna. If you are setting up a remote emergency communication post, how much antenna and mast equipment you can transport to the site will be determined primarily by the vehicles you have at your disposal. Sections of antenna mast and large antenna elements can be tied on luggage racks on top of most vehicles. Vehicles also can be fitted with attachments that can hold modest-sized antenna masts erect. These attachments allow antenna masts to be quickly installed and anchored securely in position to the vehicle's body once you are parked at the emergency communication site.

Vertical antennas such as ground plane antennas and coaxial, collinear verticals are good for non-directional work. Beams are good for directional work: they offer gain in the direction of communication as well as the ability to reduce off-beam interference.

Figure 1A shows a simple, inexpensive, vertical, coaxial-dipole emergency VHF/UHF antenna. This easy-to-make antenna is small, light, fairly rugged, non-directional, and easy to install. You can have it on the air five minutes after you arrive at the emergency site. Simply use a thrown rock, sling shot and fishing weight, or bow and arrow to put a line over a high tree limb. Then pull the antenna up into position. At ground level you should tether the coax feed line hanging below the antenna to keep the antenna from swinging in the wind. Then you're ready to operate.

❖ Let's Build an Antenna

Trim the inner and outer insulation of the coax feed line to expose an inch or so of the inner conductor and also of the wires of the outer conductor. Cut four lengths of just about any kind of uninsulated wire to length given by the formula below. Then run these wires, evenly spaced, back down the outer insulation of the coax, and tape them in place (fig. 1B).

Make another element two inches longer than the length given by the formula below. (When installing the insulator on one end of this element, it will shorten the element.) Make sure that the total element length then becomes that given by the formula. Wrap the center conductor of the coax feed line around the other end of the element, and solder the conductor in place. Now tease the wires of the outer conductor apart, and wrap about one fourth of them around the upper end of each of the four elements running down the cable. Solder these in place. The total antenna length, including the upper element and the elements running down along the cable, is a half wavelength.

Generously weatherproof the end of the coax with coax sealant to prevent any water entering the end of the coax where the elements are attached. Be sure to use good quality coax for low loss at these frequencies.

For the elements:
Length (feet) = 234/frequency (MHz), or:
Length (meters) =71.3/frequency (MHz).

For example, elements for 147 MHz in the two-meter ham band could be: 234/147 MHz =1.59 ft, or 19.1 in.

❖ Emergency communications at HF or MF

Unless repeaters are utilized, emergency communication on VHF and higher frequencies is generally limited to somewhat beyond the visual horizon. However, on the HF band, both close-in and long-distance communications are possible. On HF, the type of antenna you use is very important in determining your geographical coverage. A horizontally-mounted antenna at a height of a half wavelength above earth will give decent long-distance communication. Mount the same antenna at a quarter wavelength above earth, and it becomes an NVIS (near vertical incidence skywave) antenna that favors close-in communications.

The physical length of a quarter wavelength in air is:
Length (ft)=246/frequency (MHz);
Length (m)=75/frequency (MHz).

For a half wavelength in air:
Length (ft)=492/frequency (MHz);
Length (m)=150/frequency (MHz).

NVIS antennas are useful over flat terrain or in hilly or mountainous areas because they radiate up almost vertically. This radiation is then reflected from the ionosphere where it "rains" back to earth. Because of this up-down signal propagation path, even mountains between stations do not block communication. NVIS propagation can

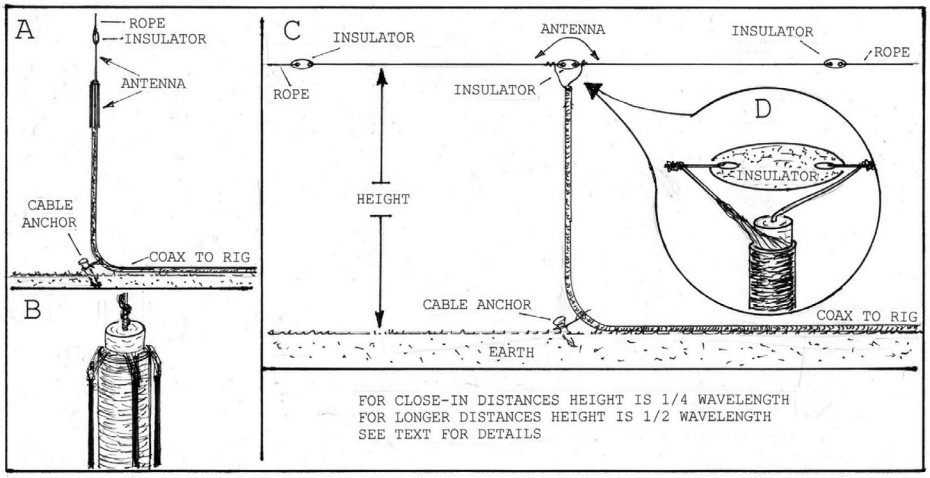


Fig. 1. A quick and easy emergency antenna for VHF or higher frequencies (A), Detail of connections of that antenna's elements to its feed line (B), an antenna that can be used for close-in, or longer-distance communication by changing its height above ground (C), and the detail of connecting that antenna's elements to its feed line (D).

This Month's Interesting Antenna-Related Web site:

For some ideas on emergency antennas:
www.dxzone.com/cgi-bin/dir/jump2.cgi?ID=5402

For a lot of info on emergency-communication preparedness and service:
www.arrl.org/FandES/field/emergency/

And, for a free video on emergency communications in action:
www.arrl.org/ARToday/

support communications up to around 300 miles when conditions are right for reflecting the signals back earthward. Although such dipoles do have shallow nulls off their ends, they are relatively non-directional.

Whip-type vehicular antennas that are normally oriented vertically can serve as field-expedient NVIS antennas if they are bent near the vehicle mount such that the antenna is roughly parallel to the earth.

For long-distance communication, vertical, grounded, quarter wavelength antennas are also useful. With above-ground radial systems, they are more quickly installed than with underground radials. These vertical antennas are non-directional; however, directional antennas, such as Yagi-Uda beams, may give better results at times due to reduction of noise and interference in off-beam directions.

❖ Let's Make another Antenna

An easy to make and install antenna that can be mounted either for NVIS use or for long distance communication is a horizontally-mounted, half wavelength dipole (fig. 1C). This antenna can be strung between any two convenient, high, tie points. As mentioned above, a thrown rock, bow and arrow, or sling shot and weight with cord attached is often useful for putting the antenna up.

This dipole is constructed by cutting two lengths of antenna wire 4 inches longer than the length given by the formula already given above for the vertical dipole. Connect the two lengths by a center insulator (fig. 1D). Looping the wire through insulators shortens the wire's overall length. Make sure that the finished element's length is that given by the formula. The total antenna length is then a half wavelength.

Wrap and solder the center conductor of the coax feed line to one element, and the outer conductor to the other as shown in fig. 1D. Generously seal the coax end with coax sealant.

RADIO RIDDLES

Last Month:

I asked: "You've probably heard of today's 'smart' antennas which can automatically adjust to changing conditions to maximize communication effectiveness. But have you heard of 'dummy' antennas? Yes, there are such things. What are they?"

Well, dummy antennas are electrically-shielded resistors. Although an unshielded resistor could inefficiently radiate and receive signals, the resistor's shield (a metal enclosure) prevents that. If signals are radiated while adjustments are being made to an operating transmitter, those signals may cause unnecessary interference to any ongoing communications on the transmitter's operating frequency. Dummy antennas convert the radio-frequency current from a transmitter into heat rather than allowing it to radiate as radio signals. This allows the radio operator or technician to make adjustments to the operating transmitter without risking causing interference.

This Month:

We now know what a dummy some antennas are. Now what is an "artificial antenna"?

You'll find an answer to this month's riddle, another riddle, another antenna-related web site or so, and much more, in next month's issue of *Monitoring Times*. 'Til then, Peace, DX, and 73.

Marc Ellis
marcellis@monitoringtimes.com

We Take on a Zenith Trans-Oceanic

Before we get started this month, I want to thank Gene Reed, WB7NGI, and Gordon Bell, WA2YQY, for responding to my request for information about volume control tapers (August issue). Gordon's interesting information isn't directly related to the taper problems we had been discussing, so I've filed it for future reference.

Gene sent some info – from Volume VII of *Hints and Kinks* (ARRL, 1965) – on how to convert a linear taper potentiometer to a logarithmic one. Just wire a fixed resistor of half the resistance of the pot from the wiper arm to the bottom end.

The "Universal Portable" of 1940

For many years the Zenith Trans-Oceanic was, without a doubt, the most sophisticated portable radio offered to the American public. We'll be working on a 600 Series Trans-Oceanic for our next project. Introduced in 1954, the 600 was the first model to have a slide-rule dial. It was also the last to use vacuum tubes and the last to have the traditional "suitcase" look.

Before we get into an examination of our 600, it will be interesting to look at some of the models that preceded it. There is no way we could describe here, even briefly, the various pre-Trans-Oceanic models and the several Trans-Oceanic variations that followed. That would require a complete book, and such a book is available. It's *The Zenith Trans-Oceanic, The Royalty of Radios* by John H. Bryant and Harold N. Cones, Schiffer Publishing Ltd, Atglen PA, 1995, ISBN 0-88740-708-0.

Actually, Zenith was offering a portable radio in a suitcase, which also housed the necessary batteries and a built-in antenna, as early as 1924. Called the "Radio Companion," it did not operate on household current.

Unrestored 1940 Universal Portable from author's collection. Wavemagnet at left.

The first radio that might be considered a direct ancestor of the Trans-Oceanic was the "Universal Portable" of 1940. It was called "Universal" because it would operate either from its built-in batteries or the a.c. (or d.c.) line. It received only the standard broadcast band.

The set was housed in a mini suitcase that was about the size and shape of a woman's small cosmetic case. It was typically covered in the striped "airplane fabric" so popular in the 1940s. However, other coverings, including leather and synthetic rawhide, were also available.

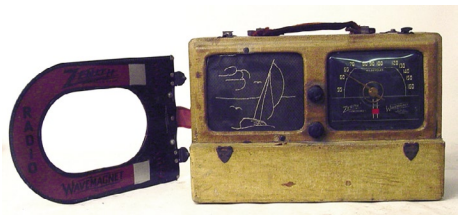
The five-tube circuit used four of the recently-developed low-drain, 1-volt filament tubes designed for dry battery operation. The fifth tube, a rectifier for a.c. operation, had a 117-volt filament. Except that it could be operated from either batteries or a.c./d.c. line current, the circuit of the little portable was fairly routine. However, it had one feature that added a lot of interest and romance: a removable loop antenna called the "Wavemagnet."

Equipped with a fabric-covered flexible lead-in about three feet long and a swivel suction-cup bracket, the wavemagnet could be mounted on one of the windows of a car or bus whose steel body would otherwise prevent good reception. The antenna could be similarly used in steel-framed buildings. Once on a window, its swivel construction allowed it to be positioned for maximum signal strength.

The 1942 "Universal Portable" and the "Trans-Ocean Clipper"

By 1942, a new enhanced "Universal Portable" had evolved from the 1940 model. It had an extra tube and a larger speaker, but still received only the standard broadcast band. It was housed in a longer suitcase-type cabinet having much more pleasing proportions. Like its predecessor, the new model was available in a variety of cabinet coverings.

The wavemagnet was much larger than its predecessor. Quite a flashy looking affair, it was decorated with a graphic that looked like a child's toy magnet. 1-volt filament tubes were used as before, with the exception of the 117-volt filament rectifier. Four of the 1-volt tubes had the newly-developed



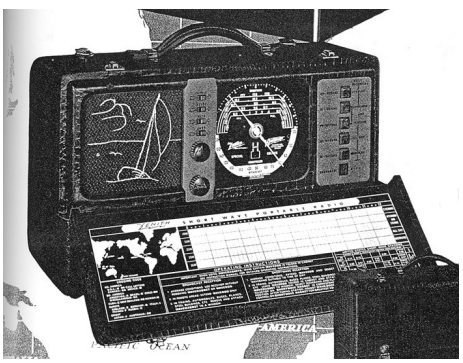
Unrestored 1942 Universal Portable from author's collection. Note "comic book" Wavemagnet design. This particular set was carried by a doctor uncle of mine in Europe during World War II.

"Loktal" base, designed to keep a tube firmly seated in applications where vibration might be a problem.

Also under development at this time, but not released until near the end of the model year, was another receiver that had evolved from the 1940 "Universal Portable." The creation of this new set was sparked by the public's growing interest in short wave radio – especially in view of our involvement in World War II. Named the "Trans-Ocean Clipper," It was, in fact, the first Trans-Oceanic.

Intended as a companion to the Universal Portable, the Clipper looked like a stretched-out version of that set. The family resemblance was enhanced by the fact that the new set had the same sailboat-design grille cloth. The extra length was required by two metal panels carrying the added tone control and band-change buttons and switches. The tone-control panel, dubbed the "Radiorgan," allowed the selection of 16 different tone colorations by manipulating four switches.

Like the Universal Portable, the Clipper operated from a.c./d.c. and batteries. And



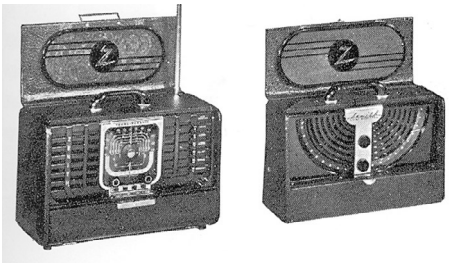
1942 Trans-Ocean Clipper. Tuning dial has five shortwave band scales at the top and broadcast band scale at bottom.

its 7-tube circuit also made use of 1-volt Loktal tubes plus a rectifier tube with a 117-volt filament. The removable Wavemagnet included an extra loop to enable shortwave – in addition to broadcast – reception. For enhanced shortwave reception when not in a car, bus or other metal-shielded interior, there was a telescopic whip antenna dubbed the "Waverod."

The Clipper's shortwave coverage was unusual for the era. While most radios compressed their coverage into one or two general coverage bands, the clipper had five "sliver" bands – each restricted to major international broadcasting frequencies. This bandspread effect made tuning much smoother and easier. Standard broadcast was covered in a sixth band.

After the U.S. entered World War II, Zenith changed the design on the Clipper's speaker grille from a sailboat to a four-engine bomber. However, soon after that, manufacture of all civilian radios was shut down as the company switched over to war production.

In 1946, with the resumption of civilian production, Zenith released the first of what would be a new series of top-of-the-line portable shortwave/broadcast radios and companion portable broadcast-band sets. The "Clipper Trans-Ocean" designation was dropped from the shortwave sets – which were now dubbed "Trans-Oceanic." The "Universal Portable" designation continued to be used for the broadcast-band companions.



Model 8G005Y Trans-Oceanic (left) with its Model 6G001Y Universal Portable companion.

The first postwar Trans-Oceanic (1946) was known as the Model 8G005Y. Variations of this set were released in 1948 and 1949. Brand new models were introduced in 1950 (the G500) and 1951 (the H500). A military "morale" variation, the R-520/URR came out in 1953. Though each new model incorporated electrical and cosmetic improvements, they retained a strong family resemblance – housed in suitcases – all with "Wavemagnets" and "Waverods" and similar dials, tone-control and band-change buttons.

❖ Our B600 Project Set

With the introduction of the 600 series in 1954, the Trans-Oceanic received a major physical and cosmetic change. The familiar suitcase and control buttons were still present, but the old tuning dial, with its pointer and curved scales, had been replaced by a large multi-band slide-rule dial that dominated the radio's front panel.

Originally released as the L600, the set evolved into various sub models with minor differences in 1955 (R600 and T600), 1956 (Y600), 1958 (A600) and 1959 (B600). In 1958, the first of the "Royal" transistorized models – significantly smaller and with a totally different modernized appearance – came on the market. So the model B600 that is our project set was the last of the classic tube "suitcases."

The 600 series incorporates some other significant changes, not yet mentioned, that were instituted in earlier models. The ingenuous comic-cartoon design of the wavemagnet in the 1942 "Clipper" and "Universal" sets disappeared with the first postwar set (Model 8G005Y) – to be replaced by a loop antenna enclosed in a plastic panel mounted in the radio's flip-up front cover.

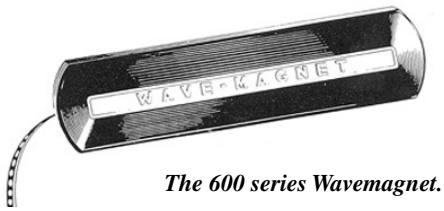
A 600 series Trans-Oceanic. The Waverod telescoping antenna is extended and the Wavemagnet has been removed from its slot at the top of the case. Its cord extends upwards at the top right.

In the 600 series this was replaced, in turn, by a slender plastic-enclosed ferrite bar recessed into the top of the radio. The spot on the cover formerly occupied by the loop antenna panel now held a compartment for radio charts and logs. Both antenna styles were removable for suction-cup attachment to a nearby window.

In the Model G500, the 1-volt tubes were changed from octals and Loktals to the new miniature series. At the same time, the 117-volt filament rectifier was replaced by a solid state (selenium) unit. The tube complement of the B300 includes a 1U4 r.f. amplifier, 1L6 oscillator/mixer, 1U4 i.f. amplifier, 1U5 detector/audio amplifier and 3V4 audio.

The H-500 saw the replacement of the 49-meter "sliver" band (6-6.5 MHz) by two new general coverage bands (2-4 and 4-8 MHz).

According to the Bryant and Cones book, these changes were made primarily because of the yachting interests of Zenith Company owner, Commander McDonald.



The 600 series Wavemagnet.

They made it possible to tune weather and navigational stations located around 2, 3 and 7 MHz. From then on, the Trans-Oceanic was widely accepted by yachtsmen.

Other B300 innovations were a spring-loaded take-up reel for retracting the a.c./d.c. power cord and the inclusion of a 50A1 current regulator tube to prevent variations in the 1L6 filament voltage with changes in line voltage. Previously such variations would occasionally cause the 1L6 to drop out of oscillation at higher frequencies.

See you next month, when we'll put our B600 project radio on the bench and take a good look at it!

This is your equipment page. Monitoring Times pays for projects, reviews, radio theory and hardware topics. Contact Rachel Baughn, 7540 Hwy 64 West, Brasstown, NC 28902; email editor@monitoringtimes.com.

Radio Direction Finding with the Adcock

By Greg

After many months of both monitoring and DFing the CW spy station (see cover feature), Fred and Howard (our newest team member) decided to take this activity one big step further by building an Adcock antenna, more suitable than the loop for DFing sky-wave (HF) signals.

Concurrently, Fred had some unique ideas of his own to construct a goniometer with two loop antennas that would be designed for mobile use. This antenna would be used at a later date when we refined our search area to a more specific location.

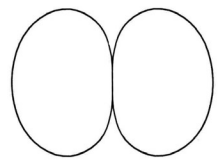
The Adcock Antenna

If you are not familiar with the Adcock antenna, I will give you a brief history along with short description. Mr. F. Adcock designed the antenna and was issued a patent in 1919. The antenna is classified as an end-fired array and, dependent upon design, can give two or more nulls. The two-null version has null points at precisely 180 degrees apart, giving some ambiguity to its operation. However, the nulls are not an operating issue if multiple bearings are taken.

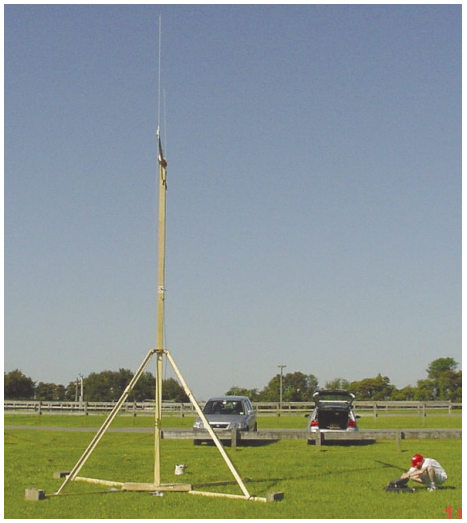
The array consists of four non-resonant vertical elements, equal in length and fed 180 degrees apart. Most designs incorporate elements that are shorter than the resonant frequency. Another useful feature of this antenna is that it may be used on many frequency band segments.

The Adcock and loop antennas respond similarly to vertically polarized waves, but the Adcock shows less response to horizontal waves, producing more accurate nulls than the loop. Results are best if non-conductive materials are used for constructing the boom, mast, and supports. Taking these precautions, pattern distortion will be minimal.

The two-null pattern is shown in illustration Fig. 1. These nulls occur in directions broadside to the array.



The Adcock antenna requires a matching coupler to match the balanced array to an unbalanced receiver antenna input. This circuit is described in the *ARRL Antenna Handbook* 20th Edition.



Adcock Antenna Construction:

Howard began sketching a design that would yield accurate results and also have the capability to be broken down for easy transport. The antenna would consist of a 12 ft. boom, four 7 ft. elements, and a 20 ft. two-section mast. The design needed to be reasonably light but maintain physical alignment.

The four 7 ft. elements were fabricated from aluminum screen framing stock; this material is light yet maintains rigidity. A laminate construction technique was used for the boom using two pieces of 1/4-inch plywood 4 inches wide by 6 ft. long. These were glued to the sides of 1-inch thick foam material. This construction provided excellent strength with minimum mechanical yield.

The mast was built in two sections that interlock with one another. Each section was 4 inches square by 10 ft. long using 1/4-inch plywood. Wood blocks glued strategically along each section provide strength and form.

The assembled antenna and mast fit onto a base assembly that uses a pivotal point at the base and a slip ring at a vertical height of about 10 feet. This design permits the antenna to be easily rotated. A calibrated dial and pointer are also built on the base. Long wood dowel pins and concrete blocks secure this Adcock Antenna to the ground.

Adcock Performance:

An open field was located to test the Adcock Antenna. We selected a specific day and time that would coincide with the spy's transmitting schedule. Using a compass we rotated the base so that it was pointing True North. The base was secured and the antenna assembled and placed onto the base. Then the antenna was connected to an Icom transceiver and again tuned to time standard station WWV at Ft Collins, Colorado, on 10.000 MHz. Using the appropriate null, a bearing was recorded. Next, we set the receiver for 10.125 MHz and rotated the antenna to receive the encrypted CW signal. Then, we used the reference bearing information from the initial loop antenna data to select the appropriate null with the Adcock. This bearing was also recorded.

The WWV data was entered into a Great Circle Map Software Program to verify the accuracy of the Adcock – the bearing was right on target. Next, the spy's bearing was entered and it concurred with all previous data taken with the DF Loop and Yagi. This again confirmed to us that the spy was transmitting from within the Continental United States! If proved, this would be a very rare occurrence indeed.

Goniometer Mobile Project

Government and commercial agencies have on occasion used a goniometer for DFing. In this design, the antenna arrays remain stationary at 90 degrees from one another. In early radio days this device came to be known as a Radiogoniometer, but this is usually shortened to goniometer. Goniometers are still being used today, though rarely.

The goniometer consists of two fixed posi-

tion air core coils positioned 90 degrees from one another. These coils are connected to the antenna elements – either fixed loops or an antenna array. A third, rotatable coil is mounted within the two fixed coils. The rotatable coil is coupled to a pointer and dial indicator. This dial is then calibrated in degrees of direction.

The goniometer works in the following manner: When the third coil is rotated within the two fixed coils, the signal amplitude and phase will be affected. This occurs because coupling increases to one coil while it decreases to the second coil. Two ambiguous nulls will be found while tuning through the entire range. One of the nulls will be the direction of the transmitted signal. This simulates antenna rotation and is applicable for use in DFing.

Goniometer construction:

Two stainless steel beakers were utilized as shielded housings. The first beaker served as a mount for the two 23-inch diameter loop antennas and provided weatherproof connections for the four coax cables. This beaker was secured to a

1/2-inch thick aluminum plate with stainless steel hardware that mounted to the roof rack.

The loops were mounted so that they were placed 90 degrees from one another. Four small coaxial cables exit the roof beaker and terminate at the other end to a second beaker mounted on the passenger's side window. The second beaker, window mounted, contains the three-coil circuit.

Testing the Goniometer:

Fred and I drove our vehicles to a very large commercial parking lot to test the operation of the goniometer. My vehicle had a Ten-Tec ham transceiver; this would be used to transmit a low level RF signal with station ID. Fred's vehicle was located about 4/10 of a mile away. Fred easily picked up my signal and identified my location using the bearing indicator. Fred was able to ascertain which of the two null points represented my location by visual contact. Both nulls were very sharp, in the order of 2 degrees.

Our next exercise will be to for me to hide my vehicle (be the "fox") and have Fred triangulate my location.

Ironically, the transmission has not reappeared on 10.125 MHz since August 7, but our search continues and we hope that you have enjoyed our DFing journey. It certainly was thrilling to us. We hope this article inspires you to continue to monitor the bands for unusual radio transmissions.

Source material and diagrams courtesy of *The ARRL Antenna Handbook* 20th Edition.

A Compact Adcock Array

By Bob Grove W8JHD

The Adcock array was an improvement over the loop antenna for direction finding in the high frequency spectrum, but they are big! While loops are smaller, they respond to mixed polarization and are thus vulnerable to providing false directivity bearings from distorted skywave signals. The Adcock, however, responds only to vertically-polarized ground wave signals.

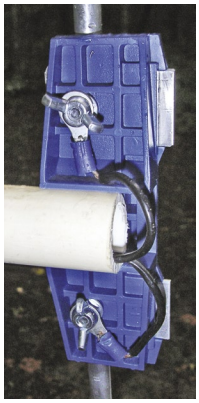
An Adcock may be mounted at any elevation, including close to the ground; however, as with any antenna, a clear view of the horizon without nearby signal-reflecting obstructions (buildings, power lines, close vehicles, surrounding hills) is mandatory. But can it be compacted for portability?

❖ Construction

A metal mast and boom can be used, but wood or PVC is preferred since it can't distort the pattern. Since the key to its accuracy is electrical balance, symmetry of construction is critical.

Standing alongside the antenna may distort bearings; for hand-held portability, hold the boom at arm's length, standing equally distant from each dipole. Some distortion may still occur from body conductivity.

Although 300-ohm TV twin lead or even wide-spaced ladder line are commonly used to interconnect the elements, zip cord (lamp or speaker wire) works equally well. The twin lead must be twisted 1/2 turn so that the opposing elements are connected 180 degrees out of phase, and



precisely center-fed by the balun transformer.

Spacing of the dipoles is typically between 1/10 and 3/4 wavelength for the lowest and highest frequencies; shorter than 1/10 wavelength the null begins to disappear, and wider than 3/4 wavelength additional nulls appear off the ends.

The length of the dipoles is not critical, but they must be equal; 8 feet or so is a common choice. For higher sensitivity, the array can be fed into a preamplifier.

As the array is rotated to find a null, a receiver with an S-meter or a portable spectrum analyzer with a visible trace is necessary to observe the subtle change in signal levels; listening to the signal disappear into the noise or viewing the signal-strength bars on a hand-held is not as accurate.

A GPS receiver is best to determine the bearing; a magnetic compass can be used with some awkwardness. Even an automotive floating compass can be glued to the center of the boom for casual bearing resolution. For distant signals plotted on a magnetic compass, don't forget to figure in magnetic declination.

❖ Experimental Model

Two 8-ft dipoles on their mounting insulators, along with the 4:1 TV balun transformer, were salvaged from VHF-TV antennas. The balun was tested on shortwave frequencies without modification, then with the DC blocking capacitors removed. There was only a 2-3 dB improvement with the modification. Eight different, unmodified, TV balun transformers were tested; all were within 2-3 dB of each other.

The ideal HF balun transformer should be custom-wound (a couple of turns for each winding – not critical) on a #43 ferrite-mix toroid (850 permeability for 1-1000 MHz).

The boom was a 5-ft length of 3/4-inch ID, schedule 40, PVC pipe; a 6-inch stub of smaller PVC was glued into a center hole in the boom as a hand grip. The grip could be slipped into, and secured in the top end of a mast for more stable measurements. Above the center grip, a 1-inch length of 1/2-inch ID PVC pipe was glued at right angles to the boom as a boresight.

Bob Grove with his portable Adcock raised to full height.

A broad, shallow null as low as 1 MHz was observed, gradually improving in depth and sharpness up to 170 MHz where additional nulls began to form. The five-foot dipole separation works best from roughly 7-160 MHz – more than 20:1 frequency ratio! This shorter length is easier to transport, erect and rotate. Greater separation improves lower-frequency nulls; a 10-ft spread would be better for 3.5-80 MHz applications, but would require a more substantial boom.

MT REVIEW

Build the Hidden Flex-Tenna for Wide-Frequency-Coverage Receivers

By Bob Grove W8JHD

Do you live in a home or apartment with restrictions against outdoor antennas? Do you have a shortwave receiver, scanner, or wide-frequency-coverage receiver with only one antenna connector? The Grove Hidden Flex-Tenna may be the answer. It takes only minutes to construct and requires less than 30 feet of wire; a connector is optional – you can solder the feedpoint directly to your coax feedline if you prefer.

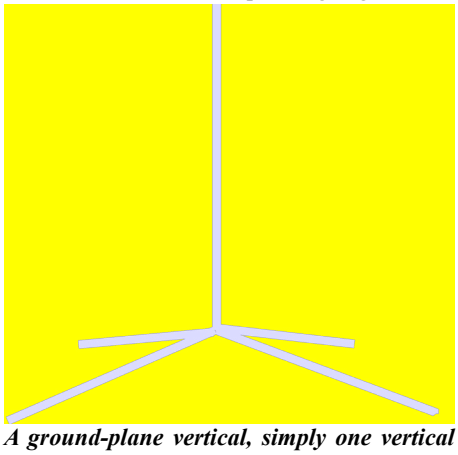
The frequency range for this antenna is quite remarkable; its cluster of three elements provides excellent signal response from the medium-wave AM broadcast band clear through 1000 MHz or more. While untested at 2400 MHz Wi-Fi frequencies, I suspect it will pick up signals there as well.

In a previous issue (March 2006), we showed how you can build the new Grove Flex-Tenna; this is a variant on that antenna with consideration of indoor suspension requirements. Ideally, the Hidden Flex-Tenna should be mounted in an attic or crawl space, along the apex of the roof line to keep it high and away from electrical lines, and up above metalized-Mylar insulation.

It can be fed to the radio by any gauge of coaxial cable. Keep in mind, however, that small-diameter coax like RG-174/U is very lossy in long lengths and at VHF/UHF frequencies. A much better choice would be RG-59/U (indoor TV coax) or RG-6/U (outdoor TV coax).

The Theory

Several elements operating together on different frequencies is known simply as a cluster; in this case, we have a horizontal wire for under-30 MHz reception, and two vertical elements of different lengths for continuous, 30-1000 MHz reception. No ground wire or counterpoise connection is necessary.



A ground-plane vertical, simply one vertical tubular element with four drooping tubular elements at its base.

Sharp-eyed readers will note the similarities between these wire lengths and those of the previously-mentioned Flex-Tenna. Purists may wish to add a second horizontal wire 19 feet in length alongside the 24-foot wire for a minor (but barely perceptible) improvement in shortwave signals, as is done in the Flex-Tenna.

A 25-foot horizontal wire with two short wires (18" and 48") dangling from the left end. The center wire of a coax cable is soldered at that mutual point.

Construction

Using any convenient wire (thick or thin, insulated or uninsulated), cut it into three lengths: 24 feet (any length from 20-40 feet is fine), 48 inches, and 18 inches. Twist together one common, bared end of each of the three wires and solder them, leaving the three far ends unconnected. You may wish to solder the three joined wires to the center pin of an RF connector like a TV-style F connector or UHF (SO-239) so that the mating coax cable can be easily connected and disconnected.

Note that there is no connection at the antenna feedpoint to the coax shield; only the center conductor is attached to the antenna. The coax shield is, however, attached at the receiver end in the normal manner by the antenna connector.

Run the 24-foot wire along the underside of the roof, the higher toward the apex the better. You can pass it through spaces in the roof joists, or even staple it or tack it at intervals to the wood.

At the feedpoint, let the two shorter wire elements dangle down, as straight as practical. Run the coax cable at least 2 feet away from the vertical wires before turning it down toward the radio room.

That's it! For listeners who don't have the time or tools to build the Hidden Flex-Tenna, it is available ready-made from Grove Enterprises (ANT49 $19.95; call 800-438-8155 or email *order@grove-ent.com*).

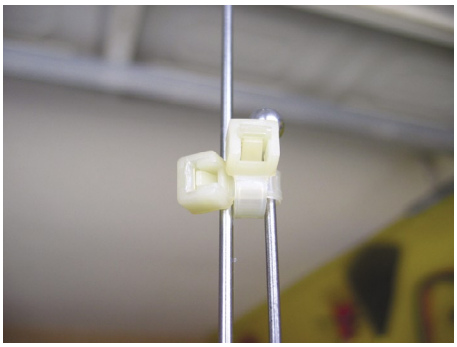
FlexTenna Follow-up

Dear Bob,

"I read your (March 2006) article with much enthusiasm as I have been wondering what to use for my Uniden 780XLT in my car. I used your design in the 'Build the FlexTenna..' article and came up with this.

"Using the whip from my mag mount 2-meter 5/8 Larsen, and the whip from my mag mount 2-meter 1/4 wave, I fashioned a mobile FlexTenna after your design (not so flex). See attached photos.

"I simply secured the 19-inch whip next to the ~49-inch whip with six non-conductive cable tie-wraps. The distance between the two rods is 3/16-inch, essentially, the width of the 'vertical' tie-wrap. The base of the short rod makes electrical contact with the base (i.e., the



metal collar containing the retaining set screw) of the larger rod merely by compression made with a few wraps of fusing electrical tape (tape stretches and fuses to itself when wrapped over) stretched very tightly around the base of the larger whip collar."

Questions:

1) [off-topic, but I want to know]: Where/how can I find a ball for the longer whip. Do I need it?
2) The lengths of the whips are 48-1/4" (including the metal receptacle for the longer whip) and 19" (the shorter one). Your design calls for 48" and 18". Will my lengths make a significant difference from yours? It will be easy for me to shorten the heights if need be. And does the separation between the rods need to be smaller like in the electrical zip cord version? If yes, I can use a smaller width tie-wrap for the vertical wraps.
3) I listen to all bands: from aircraft (120 - 135 MHz) to trunked police (800 - 900 MHz). I seem to hear more activity, a few more in the UHF milair band. I do not have any equipment to check things out quantitatively. Do you think that I need to adjust the separation and the heights?"

Thank you, Peter Leong, KE5YE

The description sounds like you've done everything right. I can't think of a thing to tell you to make it better since you have electrically duplicated everything from the original FlexTenna.

Incidentally, I've never tried transmitting on any VHF/UHF frequency with the antenna; all measurements were made referencing received signal strengths as shown on a spectrum analyzer. If you do any two-way comparison, please let me know! Good luck and....

73, Bob

94-Cent Hand-Held Radio Pouch!

By Bob Grove

While perusing the camera department at Wal-Mart recently, I came across a bargain: a canvas camera pouch with belt strap and Velcro lid for $.94! Happily, it was a perfect fit for my Radio Shack PRO-83 and Uniden BR330T. Even my trusty, old Uniden BC3000XLT slipped into it as well, although it was pretty darn tall!

The newer, compact scanners and hand-held transceivers nestle into these camera cases neatly, but the older, taller radios stick out the top. This is an advantage, however, for Velcro-sticking it to a dash where you can see the display.

Whether you plan to wear the pouch on your belt or stick it to your automobile dash, bring your hand-held radio next time you're going to a super store, and check out the low-cost camera cases. The one shown for $.94 at Wal-Mart is branded *Targus*, and measures 3-1/2"W x 4-1/2"H x 1-3/4"D.

The Receiving Side of the Icom IC-7000

By Jim Clarke, NR2G

The IC-7000 is a mobile amateur radio transceiver covering 30 kHz to 199.999 MHz, and 400 to 470 MHz in AM, FM, WFM, USB, LSB, CW, and RTTY modes.

First Thoughts and Impressions

In the May 2005 issue of *MT*, where I reviewed the Icom IC-746Pro, I made reference to an animated discussion where I tried to hold the position that the number of people purchasing amateur radio transceivers just to be used as communications receivers was very small, or non-existent. While I don't believe we can accurately quantify either of our positions, I think the stage is certainly being set for such a paradigm to take form.

While doing this review, I did a quick check of the communications receivers that are offered – those over $900 – and found that most of them are many years old; the majority of these receivers have little or no DSP (digital signal processing) capabilities.

I don't see the big players such as Icom, Yaesu, Kenwood, etc., coming out with new communications receivers anytime soon. However, their amateur transceivers have excellent receivers with flexible DSP filtering and many "bells and whistles" that actually help signal reception, as opposed to just providing knobs to twiddle. Thankfully, these new features are starting to trickle down from the "big rigs" into the smaller "mobile rigs," and hopefully soon, into "portable rigs."

Case in point: the new Icom IC-7000. After experiencing the performance of my IC-756ProIII for a year, I was anxious to see how the new 7000 would stack up. Because Icom touted the ProIII as containing many of the performance producing components used in the nearly $11 thousand dollar IC-7800, I was curious to see how much of the ProIII would make it into the less-expensive 7000.

What I found was that the 7000 has some things I like over the ProIII, and some things I don't like as much as the ProIII. That may seem logical to many, but, typically, as you go down in the tiers of a radio manufacturer's product line, the majority of features are downgraded, with the rest staying the same, not being upgraded; that's where I see the difference in the 7000.

No, the 7000 doesn't perform as well as the ProIII, but they have made some excellent improvements in feature operation that I found a pleasant surprise. It's encouraging to see continued improvements in operator interfaces as manufacturers deal with an increasing number of features and options that are implemented through the radio's software. It's not enough to just add more and more, while providing switches and knobs to enable, disable, and adjust – it requires an understanding of how these features will be used and designing their controls accordingly.

Ergonomics

The 7000 measures in at about 6.5"W X 2.25"H X 7"D, with a nice 2.5" (diagonal) color LCD front-panel display. The front panel is also occupied by two pairs of concentric knobs, a 1.75" diameter tuning knob with a spinning finger dimple, 14 flush-faced buttons, and three discreet buttons. There is a small speaker in the top cover and a bottom-front fold-down bail-wire providing about 1" of front-panel tilt. The rear panel holds two antenna jacks – one for HF/50 MHz, and the other for 144/430/440 MHz – as well as microphone, power, external speaker, and others.

Icom decided to place four fixed-use function buttons on each side of the display, with a menu-key defined row of four buttons at the bottom. I think they could have gone one step further and allowed the user to define which functions are assigned to those buttons, depending on which menu-key group is selected.

I believe some additional comments on the tuning knob are in order. While many of the amateur radio manufacturers include a mechanism for providing friction – and hence resistance – to its rotation, Icom has embellished on the idea by providing a lever (to the right of the knob) that has four positions: minimum, medium, maximum, and detented. The first three positions provide progressively increased degrees of resistance to smooth rotation, and the fourth switches from smooth to detented rotation. While tuning through the shortwave broadcast bands, I preferred the detented setting, as it allowed me to move quickly, stopping precisely on each 5 kHz channel to listen for an English language station.

The front-panel can be disconnected from the radio, allowing remote operation from up to either 11 or 16 feet away, depending on which optional cable is purchased.

Tuning

While the 7000 doesn't have a numeric keypad on the front-panel for frequency entry, there is one on the microphone – kind of a remote keypad. The front panel does have a button, though, that switches between fast or slow tuning rates. The slow tuning rate is a function of what the user has set for the step size, and the fast is 1 MHz.

There are four scanning options available: programmed scan, memory scan, selected-memory scan, and priority watch. Programmed scan sweeps from one defined frequency to another, or visa versa. Memory scan checks all memories, while selected-memory scan checks only those specified by the user. Priority watch checks for signals on an operator-designated memory channel. Scan initiation can be set for a squelch-open condition, or squelch-closed condition; resuming scan after a signal is detected can be enabled or disabled.

Filtering

This is one of the things that I love most about the 7000 – the DSP filters. No more determining which filters you want to order, or how many the radio can hold – Icom has included 41 passband widths for SSB, 32 for RTTY, 50 for AM, 3 for FM, and 1 for WFM! Combine these bandwidths with twin passband tuning and there shouldn't be many, if any, situations where one of the combinations won't give you the desired signal rejection you're

Mode	Passband width range
SSB	50–500Hz; 50Hz step 600Hz–3.6kHz; 100Hz step
CW	50–500Hz; 50Hz step 600Hz–3.6kHz; 100Hz step
RTTY	50–500Hz; 50Hz step 600Hz–2.7kHz; 100Hz step
AM	200Hz–10kHz; 200Hz step
FM	7/10/15kHz; fixed step
WFM	280kHz; fixed

Sensitivity (Pre-amp: ON)

	0.5-1.8MHz	1.8-29.9MHz	50-54MHz	144/440MHz
SSB/CW	—	0.15μV	0.12μV	0.11μV
AM	4.0μV	2.0μV	1.0μV	1.0μV
FM	—	0.5μV(28-29.7)	0.25μV	0.18μV
WFM	—	—	10.0μV (76-108MHz)	

SSB/CW, AM : 10dB S/N, FM, WFM : 12dB SINAD

looking for. According to the brochure, it's the incorporation of twin DSP chips that provide the horsepower to accomplish the task. See Figure 1 for more filter details.

As you're adjusting the filter widths and positions in the passband, the 7000 shows a small graphic to help you see just what those changes are doing to the IF.

Another bonus of the advanced DSP used in the IF is the elimination of the typical problems encountered with the AGC, no more "pumping" or "blocking." And speaking of AGC, there are the typical Fast, Medium, Slow, and Manual settings, but the operator also has the ability to modify each of the three level's time constants.

❖ Other Anti-Interference Tools

On top of the filter flexibility, the 7000 has an automatic notch filter capable of tracking up to three moving tones. If that's not enough, there are two (yes, *two*) manual notches. The operator can control the frequency of each notch, the width of each notch, and whether or not each of the notches is active. Talk about flexibility!

Noise reduction is commonly found in DSP equipped radios, and the 7000 is no exception. With 15 levels of reduction, I found this feature – coupled with proper use of the attenuator – very useful in reducing background noise caused by summertime lightning storms, as well as the noise commonly heard even on quiet days.

If pulse-type noise is your problem, the noise blanker in the 7000 allows a blanking-level adjustment from 1% to 100% and also provides control over the width of the blanking.

❖ Cool Stuff

Something I'm certainly not used to seeing on a radio is a video-output jack. Yup, you can go down to your local electronics gadget store, pick up an automobile head-rest monitor, and plug it into the back of the 7000 to increase your display size to whatever you can afford. I personally have not tried it, but I would imagine that, due to the resolution, there is a practical limit to the size of the screen you can employ. However, at least to some point, it should provide an improvement over the small – albeit clean and clear – front-panel screen.

If you're into "watching" signal activity, you'll enjoy the band scope in the 7000 which can be set to display either "fixed mode" or "center mode." In "fixed mode," signals within a specified frequency range are displayed; in "center mode," signals surrounding the displayed frequency are shown. The band scope does cause some audio disruption, but by changing settings the disruption can be minimized. Icom provides a decent range of flexibility for a band scope on a radio with a small display.

How many times have you wished you had a recorder hooked up to your radio when you intercepted a signal you'd like to play back later? Well, according to Icom, the 7000 can record up to 25 minutes of incoming audio with the touch of a button.

Ever wonder what Hams are sending back and forth using RTTY? Now you have a built-in decoder so you can eavesdrop and have the decoded text print to the screen. Unfortunately, Icom locks the decoder settings at a mark of 2125 Hz, a shift of 170 Hz, and 45 bits per second.

❖ How Does It Play?

Well, where do I start? This is a great little radio. The majority of my listening was on HF, but I did "take it for a spin" on the other bands.

Let's start in radio's "basement," 30 kHz to 500 kHz. I found sensitivity to be quite usable, with all of the usual beacons being heard. The noise blanker worked very well on some local fluorescent-light type interference. Surprisingly, the preamp is available in this frequency range, though I didn't use it.

I've tended in the past to skip too quickly over AM broadcast reception. While I'm not a broadcast band DXer, it seems to me the 7000 provides very good performance on the AM band. The 4 uV sensitivity filled the band with signals, and the 9 kHz filter provided excellent audio with virtually no increase in adjacent channel interference. In fact, I could tune to 904 kHz and clearly hear the top-end of one channel, then go up to 906 kHz and clearly hear the low-end of the next-higher channel.

I would have to say that this radio is second only to my 756ProIII, at least with respect to the selection of radios that I have had the pleasure of using. Apart from size, I think it may actually be a better value than the 746Pro, which, until now, I had considered to be the best radio for the money on the market today. I love the DSP filter/passband flexibility, and find the noise blanker, noise reduction, and notches very useful tools in the crowded HF bands.

The audio is clear, but I did notice what seemed to be a little too much audio on the high side – on all bands, not just on HF. Maybe it's just me, or the fact that I like using as wide a filter as possible, but there was a high frequency element of the audio that took some getting used to. FM broadcast stations are heard just fine, but this is probably not the radio to be using if you are an audiophile. However, if you are looking for a little background music while you're typing out your article for *MT*, it certainly "fits the bill."

Television audio was clearly heard, as well as fire dispatchers, Ham repeaters and so on. It's too bad Icom didn't make this radio receive continuously from 30 kHz to 470 MHz, or even better to, say, 1300 MHz – now that would be a nice little mobile.

❖ Final Thoughts

At $1500, this is an expensive mobile, but I would prefer to refer to it as a mini-base. I believe the feature/performance mix to be excellent, with the user interface much better than many I've seen in the past.

There is so much more to this radio than I've been able to describe here, there's just not enough space. If you want to learn more, go to the Icom website at **www.icomamerica.com** and download the instruction manual, and give it a read. If you're thinking of getting a new radio – to use as just a communications receiver or for Amateur Radio use – I think you'll find this little radio very worthy of consideration.

John Catalano, PhD
johncatalano@monitoringtimes.com

Log Analyser: An ACARS Must-Have

In the past few months we have looked at some pretty interesting ACARS decoders. If you are monitoring VHF ACARS on your receiver, then the free program ACARSD **(www.acarsd.org)** will do a great job decoding the squeaky-sounding audio. (Donations greatly appreciated.) The decoded ACARS messages can then be displayed on your PC. Since ACARSD uses the PC soundcard, no additional interface hardware is required.

If you are monitoring transoceanic aircraft traffic on your shortwave receiver, then the $35 program PC-HFD, **(www.chbrain.dircon.co.uk/pchfdl.html)** will decode HF ACARS messages. In fact, PC-HFDL will decode both VHF and HF ACARS. Here again, the PC's soundcard is used. See the June 06 and September 06 *Computers & Radio* column for details of these programs.

But, decoding the ACARS signal is only part of the story. PC-HFDL does a great job of decoding but is light on logging, data manipulation and presentation. ACARSD could also use a bit of help in these areas.

❖ Enter ACARS Log Analyser

ACARS Log Analyser version 1.7.6 is a freeware program available on the Internet **(www.acarsonline.co.uk)**. As its name suggests, the program logs ACARS decoded messages and then presents them in a variety of useful and user friendly formats. Log Analyser works with several ACARS decoders including PC-HFDL, ACARSD, SkySpy, Airmaster, and AirNav, to name a few. It can handle both live feeds from these decoders as well as their log files.

As any ACARS monitor knows, decoded messages can still be a bit cryptic in nature. With ACARS' special formats and abbreviations, reading decodes are not always in plain language. Log Analyser helps by providing some translation. With all these features, and our recent interest in ACARS decoder programs, it seemed like a no-brainer to try Log Analyser.

Although a simple process, downloading, installing, and interfacing to a decoder program is not necessarily straightforward. Let's walk through it.

❖ Download Finesse

A minimum of two separate files are required to be downloaded. First download the 7.5 Meg demo file at **www.acarsonline.co.uk**. If you're using dial-up access to the Internet, prepare for a wait. Now unzip and install the demo using something similar to Pkunzip or WinZip.

Once installed, run it to make sure it downloaded and unzipped correctly. If you get to the Main Screen, Figure 1, without problems, exit the program.

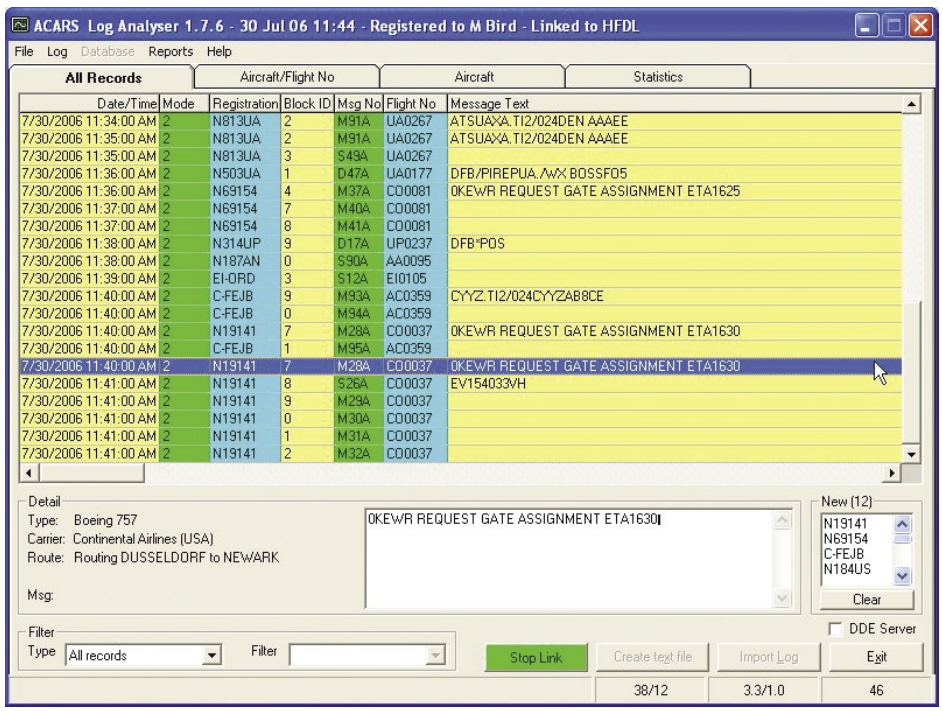


Figure 1 ACARS Log Analyser's Main Screen

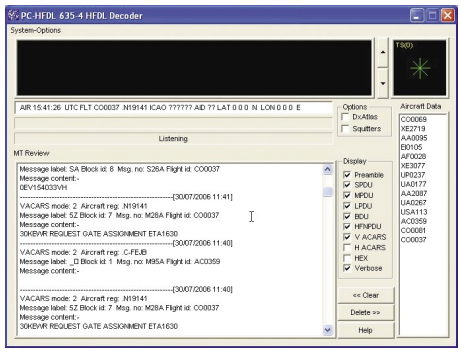


Figure 2 – PC-HFDL displaying the initial message from aircraft n19141 highlighted row. See Figure 1 for this ACARS message in Log Analyser.

Next, download the registration file from the same website. This is a smaller file that will essentially replace the main executable demo file. The new file allows unlimited time usage, as compared to the ten minutes allowed by the demo. Make sure you unzip the registration file into same directory where the demo program is installed. Allow it to overwrite any files. Now run the program.

❖ Going "Live"

From the main screen under the "File" menu at top left, select "Options." If we are going to log and analyze "live" signals from a decoder, we must tell the Log Analyser which decoder program to communicate with. Choose the "DDE Type" tab and check your decoder, then click "OK." Finally, put a check in the DDE Serve box at the lower right of the main screen.

Start your decoder program (for example, ACARSD), making sure that it is receiving and displaying ACARS messages. Now click the "Live data" at the bottom center of the main screen of Log Analyser. In Figure 1 this button is labeled "Stop Link," since the program is already in the "live" mode. As messages appear on the decoder display, you should now see them as entries on the Log Analyser screen as seen in Figure 1.

No joy? OK. So you've checked that Log Analyser is correctly configured and running. And your ACARS decoder is cranking out decodes. But nothing is being displayed on Log Analyser! You may need to do some more downloading.

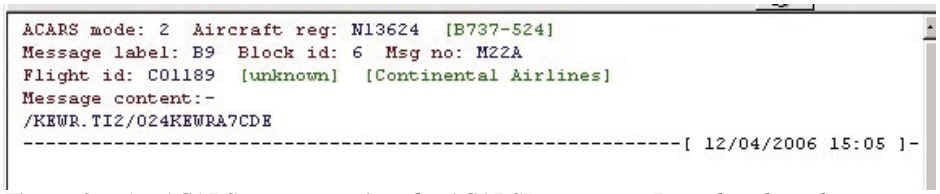


Figure 3 – An ACARS message using the ACARSD program. But what does the message mean?

If you are using Windows 95 or 98, you may need to download and install DCOM95 or DCOM98, respectively. These are also available at the Log Analyser website along with Microsoft Data Access Objects, another file your system may require.

I ran Log Analyser on a Windows 98SE system and a Windows XP system. My Win98 system required both DCOM98 and Microsoft Data Access Objects before Log Analyser would operate. The Windows XP system worked first time after the registration file was installed without any additional downloads. This may be a function of the "freshness" of my Windows system files. I regularly update my XP system from the Microsoft Download Center at **www.microsoft.com/downloads/**

❖ Analyzing a Log

Decoder program log files are another source of data for Log Analyser. One method to load, or import, an ACARS decoder program file is to select the "Log file type" from the "Options" menu. Then direct the Log Analyser to the directory containing the ACARS decoder log file of interest, using the "Log" and then "Import" menus.

The bottom of the main screen will show the number of messages in the file as they are imported into Log Analyser. When the file is completely loaded, it will be displayed in the same manner as "live" ACARS messages seen in Figure 1. But that's just the beginning of this program's capabilities.

❖ Gained in Translation

Take a look at Figure 2, which is showing PC-HFDL decoding ACARS intercepts. Notice the ACARS decode at the bottom of the screen is from flight CO0037.

Now look at Figure 1. The highlighted line shows the same message analyzed and logged in Log Analyser. Here we can see that Log Analyser has displayed the type of aircraft (Boeing 757), the company (Continental) and the routing (Dusseldorf to Newark). This information is not immediately obvious from the PC-HFDL display. The fact that the message is requesting a gate assignment and giving an estimated time of arrival is easily discerned in both programs. However, this is not always the case.

Figure 3 is an ACARS decode using ACARSD. Its message content looks like gibberish! But, when imported into Log Analyser in Figure 4, it translates the message to "Request ATIS Information." ATIS or Automatic Terminal Information Service provides pilots with current weather conditions at airports. This request is for weather conditions at the airport designated as KEWR (Newark Liberty International Airport in Newark, New Jersey), the flight's final destination.

Log Analyser will also translate ACARS forms such as Airline Designated Downlink, Link Test, Delay Message and others. This feature really allows for quick scanning hours of ACARS intercepts and sorting the "interesting" from the routine.

❖ Don't Miss It!

If you are particularly interested in a word, phrase, aircraft, airport or just about anything that might be contained in an ACARS message, the "Alert" function is for you.

Accessed under the "Log" menu, the Alert feature lets the user enter text (for example "emergency") or a specific aircraft registration number. The program then scans all incoming "live" decodes for a match to your requested text. If it finds the text, it "alerts" the user by opening a new window with the detected text and the details of the ACARS intercept containing the text. This is a very useful and powerful monitoring feature.

Log Analyser can also save you time and file size by removing duplicate loggings. In the words of the program's basic Help file, "This will scan through the database and remove all records where there is more than (one) Registration Number/Flight Number combination." The "Database" menu contains this and other useful features. Deleting invalid or corrupted data is another space saving feature of the program.

❖ Choices are Good

We have only viewed the ACARS intercepts in the chronological order in which they were received in the "All Records" format. But by clicking on any column heading, we can sort the table by that column – very easy, flexible and useful. And if that isn't enough, we can choose from two other table formats: Aircraft and Aircraft/Flight Number.

In the Aircraft screen, for each aircraft registration number, both the first date and time of contact and the most recent contact, are displayed along with the number of times the aircraft was heard. After a few weeks of ACARS monitoring, this "times heard" column allows you to determine which flights are routinely monitored from your location.

The other format is similar but also includes the flight number. Again, for either of these tables, clicking on a column re-sorts the whole table by that column.

In addition, Log Analyser has more than eight different ways of presenting its database in report forms.

❖ Seeing the Intercept

Left clicking on an aircraft-logging row opens the Aircraft Detail box. This is a simple seven-sectioned box that displays a data summary of the aircraft. This includes registration number, flight number, IATA (International Air Transport Association) company Id, ICAO (International Civil Aviation Organization) airport code, serial number, carrier and type of aircraft.

A right click on any aircraft in the table will automatically download a picture of that aircraft from **www.airliners.net**, if available. Figure 5 displays the actual aircraft whose ACARS transmissions we have been monitoring. This adds another dimension to ACARS monitoring.

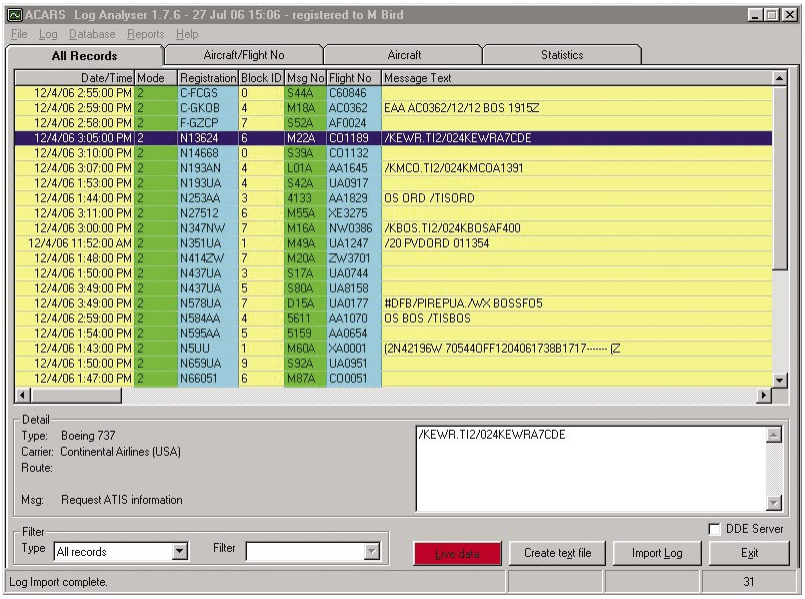


Figure 4 - Log Analyser screen showing translating the message seen in Figure 3.

❖ My User Testimonial

Log Analyser version 1.7.6 is a worthy partner to PC-HFDL and ACARSD decoder programs. Although free, "donations are greatly appreciated." The program was perfectly behaved and gave me no surprises. Although the Help file is limited, its website **www.acarsonline.co.uk** contains useful program information not found in the Help file.

For me, Log Analyser provides some critical functions which enhance other ACARS decoder programs. Now, whenever I'm monitoring ACARS, either VHF or HF, I *always* have ACARS Log Analyser running. That's a real testimonial!

What's NEW

Tell them you saw it in Monitoring Times

DD-103 Universal Digital Dial

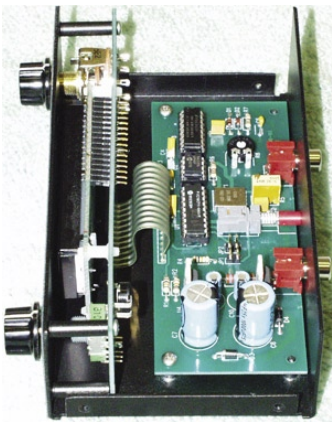
Are you tired of guessing at the frequency on your analog or antique radio? The Model DD-103 Universal Digital Dial works with any receiver and most transmitters by counting only the VFO signal. It even works with receivers that have some reverse tuning bands like the R388 or Drake 2B.

All of the VFO and band information for many receivers and transmitters is pre-programmed into the display's memory. This allows the operating frequency to be displayed by counting only the VFO signal. There is also a manual program mode that lets you program the dial for any receiver or transmitter (up to 32 bands) that is not pre-programmed.

You can even use the 32 bands to manually program the unit for multiple receivers or transmitters. For example, two 16 band, four 8 band, or any other combination totaling 32 or less can be programmed.

Each band can be individually calibrated to allow for crystals that have aged or compensate for any other error, no matter where it comes from, to 10Hz accuracy. The calibration information is also stored in memory, so that any time you return to that band, the display is automatically calibrated. You only calibrate each band one time.

There is also a BAND CTR (counter) that has no offset and is available any time, so the unit can double as a bench frequency counter up to 40MHz.



The DD-103 has two operating controls, BAND and MODE/CAL, on the front panel, and a CALIBRATE switch on the rear. Both controls have dual functions as determined by the CALIBRATE button.

The DD-103 Universal Digital Dial sells for $125 fully assembled, or $100 in kit form, plus $10 shipping. Electronic Specialty Products, LLC, 3054 Moore Drive, Oviedo, FL 32765; Phone 407-366-4856

QSL-Card Calendar for 2007

In 2006, the Rhein-Main-Radio-Club, one of the leading DX-clubs of Germany, published their first QSL card calendar. Now they are working on QSL Calendar 2007, again with colorful and rare QSL cards from all over. This fine wall calendar will be printed in English.

Orders and enquiries can be placed directly to the club via their website **www.rmrc.de** or via Rhein-Main-Radio-Club e.V., Postfach 700849, 60558 Frankfurt, Germany.

At the Homepage you will find other useful things like the new beta-version of the RMRC online DX-logbook. You will find also CDs with rare jingles and tunes, receiver software, weekly DX shortwave broadcasts, special receiver offers from RMRC's radio-engineering service, and many more interesting things like "DX-Who-is-Who" where you can win a QSL calendar every month.

(Price 14,80 Euro incl. Postage prepaid inside Europe. Special offers are available for bulk orders from DX Clubs, DX-publishers and DX-broadcasters.)

Dry DC-500 MHz "Handy" Dummy Load

This month's "Radio Riddle" in *Antenna Topics* answered the question about dummy antennas. MFJ has a new dry dummy load which connects directly to the transmitter or to your MFJ SWR Analyzer with a PL-259 connector – no patch cable is used, so it reduces SWR. It is finely constructed accessory with a finned aluminum, air-cooled heatsink.

The MFJ-261 handles 100 Watts PEP SSB, 15 Watts average, 50 Ohms impedance. Covers DC to 500 MHz with less than 1.15:1 SWR. Measures a tiny 15/8 round by 3 inches long. A second version, MFJ-261N, is the same as MFJ-261 but has N-male connector. Both dummy loads sell for $37.95 plus shipping and are protected by a one year limited warranty.

To order, get a free catalog, or for your nearest dealer, call 1-800-647-1800, or write to: MFJ, 300 Industrial Park Road, Starkville, MS 39759; or go online: **www.mfjenterprises.com**

All Those Tempting (but Illegal) Products ...

We recently viewed a new product announcement for GSM spyphones for sale from the Netherlands. These phones look just like normal cellular phones of various makes and models, but they have a feature of which their users may or may not be aware – they can act as a silent bugging device. When the phone is called using a special access number, it does not ring, light up, or otherwise indicate it is in use. However, anything said in the vicinity of its carrier can be heard by the caller.

Is this phone legal for use within the United States? Of course not, and there is the following warning on the **www.spyphones.com** website: *Using surveillance devices, intercepting and/or recording audio conversations, without the consent of all the parties involved might be illegal in your country. Check local laws before or purchasing and/or using any of our products.*

This is more warning than many vendors provide. It doesn't hurt to remind readers, especially in this day of ordering online, that in the United States, it is illegal to sell radio equipment to the public which has not been certified by the Federal Communications Commission. When you order equipment from an overseas source, you do so at your own risk, if it is not a model which has been approved by the FCC.

It is also illegal to sell to the public a lot of other tempting equipment – unblocked radios capable of receiving cellular or PCS phones or pagers, and hardware or software capable of decoding paging modes like GOLAG and PCSAG. Also illegal is equipment capable of interfering with radio signals like cellphone or GPS jammers; linear amplifiers or transmitters which operate above their legal power limits, and so forth.

Even if your proposed use of the product is benign, a US vendor could get into serious legal trouble by selling such equipment to any US resident other than a government or law enforcement agency. Because a number of such agencies read *Monitoring Times* and purchase from our publisher, Grove Enterprises, we do occasionally review non-certified equipment (such as the Wavecom product mentioned in this issue). Just don't get mad when Grove can't sell you the product; they are protecting you as well as themselves from potential legal consequences.

Books and Equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC, 28902. Press releases may be faxed to 828-837-2216 or emailed to Rachel Baughn, editor@monitoringtimes.com.

AOR SR2000 Frequency Monitor

Seeing is Believing!

The SR2000 is an ultra-fast spectrum display monitor with a high quality triple-conversion receiver

AOR puts the power of FFT (Fast Fourier Transform) algorithms to work in tandem with a powerful receiver covering 25 MHz ~ 3 GHz continuous. The result is a compact color spectrum display monitor that's ultra-sensitive, incredibly fast, yet easy to use. The SR2000 is perfect for base, mobile or field use and can also be used in combination with a personal computer. It's another example of why so many Federal and State law enforcement, military units, surveillance agencies, government users, hospitals, RF labs, News Media and monitoring professionals rely on AOR, the Serious Choice in Advanced Technology Receivers.

High Speed FFT Search – Scans 10 MHz in as little as 0.2 seconds! Instantly detects, captures and displays transmitted signals.

- **FFT (Fast Fourier Transform) high speed display**
- **Displays up to 10MHz of spectrum bandwidth**
- **5 inch TFT color LCD display**
- **Waterfall (time) display function**
- **High speed FFT search** quickly captures new signal transmissions
- **Versatile color display** uses state of the art digital signal processing
- **Average or peak value readings**
- **Frequency coverage:** 25MHz ~ 3GHz (no gaps)
- **Ultra-stable, high-sensitivity triple-conversion receiver**
- **AM/NFM/WFM/SFM receive modes**
- **1000 memory settings** (100ch x 10 memory banks)
- **Easy menu-driven operation**
- **PC control** through serial port (or optional USB interface)

SR2000

Standard Accessories:
AC adapter, control cables

AOR®
Authority on Radio Communications

AOR U.S.A., Inc.
20655 S. Western Ave., Suite 112, Torrance, CA 90501, USA
Tel: 310-787-8615 Fax: 310-787-8619
info@aorusa.com http://www.aorusa.com

Stock Exchange

LINE ADS
NON-COMMERCIAL SUBSCRIBER RATES: $.25 per word. All merchandise must be personal and radio-related.
COMMERCIAL, NON-SUBSCRIBER, AND MULTIPLE SALES RATES: $1.00 per word. Commercial line ads printed in bold type.

Ads for Stock Exchange must be received 45 days prior to publication date. All ads must be paid in advance to Monitoring Times.
Ad copy must be typed for legibility.

1-3/4" SQUARE DISPLAY AD:
$50 per issue if camera-ready copy or, $85 if copy to be typeset. Photo-reduction $5 additional charge. For more information on commercial ads, contact Beth Leinbach, 828-389-4007.

Subscribe to *MT for as little as $15.50 (U.S. Second Class Mail)*

7540 Hwy. 64 W.; Brasstown, NC 28902
1-800-438-8155 US and Can.; 828-837-9200; Fax 828- 837-2216
e-mail order@grove-ent.com

	6 months	One Year	Two Years	Three Years
US Rates	❒ $15.50	❒ $28.95	❒ $51.95	❒ $76.95
US 1st Class	❒ $30.00	❒ $57.95	❒ $112.00	❒ $168.00
Canada Surface*	❒ $20.50*	❒ $39.50*	❒ $75.95*	❒ $112.95*
Foreign International*	❒ $30.75*	❒ $58.50*	❒ $114.95*	❒ $171.50*
Electronic Subscription		❒ $19.95	❒ $38.90	❒ $57.85

*All payments must be in U.S. Funds drawn on a U.S. Bank!

Time to Renew? Your label will tell you how many issues remain in your subscription. When it's time to renew, your MT will arrive with a bright yellow cover sheet with the renewal form. Renew by the second notice to avoid missing an issue!

Attention all those wanting to know what's going on with ham radio in the New Orleans area, check out: **http://groups.yahoo.com/group/GNOAmateurRadio/**

Want some GREAT deals on used equipment? Check out Bob's Bargain Bin on the web at www.grove-ent.com/hmpgbbb.html, or go to grove-ent.com and click the Bob's Bargain Bin link. Check back often as we're constantly getting new inventory!

INDEX OF ADVERTISERS

GROVE

www.grove-ent.com

Your Source for Radio Scanners, Receivers, Accessories, and Publications

Established in 1979 by well-known communications expert Bob Grove, Grove Enterprises has become a world leader in radio monitoring equipment, accessories, and publications.

If you decide you don't like a product, Grove Enterprises doesn't penalize you for it. There is NO restocking fee so long as you call our toll free number for a return authorization within fifteen days of shipment and the item is returned in new condition. Once the item is received we will give you credit toward another item or issue a full refund (less shipping charges). Software cannot be returned if opened.

That's it! No hassle! No negotiations! Just call 1-800-438-8155 and our friendly staff will assist you with a return authorization number.

Grove means service and quality. You won't find better customer service anywhere.

GRUNDIG			
G4000A		RCV23	$149.95
JRC	NRD-545	RCV21DS	$1799.95
AOR			
AR-5000A Plus 3		RCV44P	$2569.95
AR-8600II		RCV11	$889.95
GE	SUPERADIO III	RCV5	$59.95
SANGEAN			
ATS-505P		RCV7	$109.95
ATS-909		RCV8	$239.95
ATS-818Acs		RCV18	$199.95
KAITO	KA1102	RCV2	$79.95
ICOM			
R75		RCV32	$609.95
PCR1500		RCV15	$579.95
R1500		RCV25	$699.95
PCR2500		RCV35	$849.95
R2500		RCV52	$999.95
ETON	E1XM	RCV34	$499.95
	S350 DELUXE	RCV4	$99.95
	E5	RCV10	$149.95

WiNRADiO

WR-G303e	RCV46E	$599.95
WR-G303e w/pro demodulator	RCV46EP	$699.95
WR-G303i	RCV46	$499.95
WR-G303i w/ pro demodulator	RCV46-P	$599.95
WR-G313 (Internal)	RCV31	$949.95
WR-G313 (External)	RCV31-E	$1149.95
WR-1550 (External)	RCV47-E	$549.95
WR-1550 (Internal)	RCV47-I	$499.95
WR-3150 (External)	RCV48-E	$1849.95
WR-3150 (Internal)	RCV48-I	$1849.95
WR-3500 (External)	RCV49-E	$2395.95
WR-3500 (Internal)	RCV49-I	$2395.95
WR-3700 (External)	RCV50-E	$2895.95
WR-3700 (Internal)	RCV50-I	$2895.95
WR-G305i	RCV53	$519.95
WR-G305i w/pro demodulator	RCV53P	$619.95
WR-G305e	RCV53E	$619.95
WR-G305e w/pro demodulator	RCV53EP	$719.95

WiNRADiO Accessories

AX-07B flexible VHF/UHF antenna	ANT47	$24.95
AX-37A wide-band log-periodic antenna	ANT28	$389.95
AX-71C discone antenna	ANT01	$89.95
AX31-B Antenna	ANT 4	$119.95
AX-91M magnetic antenna base	ANT48	$24.95
Mounting Clamps for AX-71C	ACC71	$12.95
USB Adaptor	ACC 2	$49.95
Client Server Option-1000/1500 Series	ACC 14C	$99.00
Client Server Option-3000 Series	ACC14B	$399.00
Client Server Option-G313 Series	ACC14D	$149.95
G303 Professional Demodulator	SFT20	$179.95
PCMCIA PC Card	ACC 28	$89.95
Data Cable for 1500/3000 receiver	CBL 3	$9.95
FSK Decoder	DEC 1	$349.95
Portable Power Supply (external units only)	PWR 5	$189.95
Digital Suite	SFT 15	$85.00
Advanced Digital Suite Upgrade	SFT 15U	$85.00
Advanced Digital Suite	SFT 15A	$179.95
World Radio Database Manager	SFT 16	$85.00
Trunking Software	SFT 23	$89.95

Shipping/ Handling Charges

Total Order	Shipping Charges
$1-$29.99	$3.00
$30-$49.99	$6.95
$50-$99.99	$8.95
$100-$399.99	$12.95
$400-$899.99	$16.95
$900-$1499.99	$20.95
$1500-$1999.99	$24.95
$2000-$2499.99	$28.95
$2500+	$32.95

Make sure to visit us on the web to get the latest and greatest deals!

GROVE

(800) 438-8155

Grove Enterprises, Inc. - www.grove-ent.com

(800) 438-8155; (828) 837-9200; fax: (828) 837-2216

7540 Hwy 64 W; Brasstown, NC 28902 - email: order@grove-ent.com

0.01 to 3299.999 MHz** Coverage • Record and Save Audio in WAV Format • USB Cable Connection

WHO SAYS THE WORLD IS ROUND?

*

NEW IC-PCR1500

PC Controlled Wideband Receiver

NOW AVAILABLE

Also now available: **IC-R1500**

A remote control head allows you to take the radio mobile. Cable included. No PC required, but you may connect the R1500 to a PC when not using the control head. Your choice. Visit your authorized Icom dealer today.

For free literature:
425.450.6088 or
www.icomamerica.com

* Neat, look huh? It's just advertising. The radio is actually black. Very attractive, yes. But black. If we had put a black radio on this ad, the headline would not have been as quick to read. So we made up this look. Black is nice. Think of it as seeing the world from the night side. It's still there. You just can't see it. Can't get over it? If you send us $5000.00 USD, we'll make up the radio look just like this for you. Is it worth it? Not to most people. But you're not most people. Are you? E-mail icom@icomamerica.com with "worldPCR" in the subject line for more info. ** Cellular frequencies blocked.

ICOM®