

HAM RAG

Rockford Amateur Radio Association, Inc.

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in the Rockford area at <http://rara.tripod.com>

April 2004

FEMA APPEARS TO BACKPEDAL IN BPL "CLARIFICATION" LETTER

After expressing "grave concerns" to the FCC last fall about the interference potential of Broadband over Power Line (BPL) systems, the Federal Emergency Management Agency (FEMA) now appears to be backing away from that strong stance. Now a part of the Department of Homeland Security, FEMA filed comments December 4 in response to the FCC's April 2003 Notice of Inquiry in ET Docket 03-104.

Many have cited those remarks in their own comments opposing BPL deployment. In a January 8 letter that's now part of the BPL Notice of Proposed Rule Making (NPRM) in ET Docket 04-37, Michael D. Brown, the US Department of Homeland Security's under secretary for emergency preparedness and response, told FCC Chairman Michael K. Powell that FEMA wanted to "clarify the record" to ensure that its filing was not "misunderstood or misconstrued."

"We have become aware that certain distinct approaches to BPL may have the potential to cause interference to FEMA's high frequency radio communications system," Brown said in his January letter. "However, we continue to study the BPL proceeding and have not concluded that there is a material interference problem or that all of the distinct technological approaches to BPL pose a risk of interference."

(Continued on page 6)

**The next meeting is at
7:00 pm April 9, 2004**

The program for this month's meeting will be:

**Wayne Hansen, KA9IMX
Skywarn training**

*Saint Anthony Medical Center
5666 E. State Street Rockford, IL.*

To get to the meeting room go to the main entrance - turn right at desk - go to the end of hall to the meeting rooms.



A new antenna inspector has arrived in the Rockford area. Here Mr. Squirrel is pictured by Bob Davison, WA9NTT, as the inspection was being done on his HF Beam. It was reported that he works very cheap for just a few nuts or for an ear of corn. However, contacting him has been difficult being that his address and phone number is unknown. It appears that it's a word of mouth operation.

**Wayne Hansen, KA9IMX
will be doing the
Skywarn training at the April meeting.**



Presidents Log April 2004

Well, it is just about time to fix up those antennas now that the weather is starting to look a little more promising. I know I have my plans and after the last meeting where we had a great round table talking about all kinds of different antennas, I am sure you have your plans as well. Thanks to those that participated in the round table discussion! You know that everyone enjoyed the meeting when you find they will not leave at the end of the meeting.

The April meeting is going to be appropriate with Wayne, KA9IMX, doing his weather spotting meeting to get people prepared to assist with Skywarn. If you could not make the meeting at the airport, make sure you attend this meeting to keep your weather spotting skills up to date. Sorry that it is on Good Friday, but we were kind of locked into that date due to my not paying attention earlier when I set the dates. Come if you can and tell others that may not know.

I need to remember to ask at the meetings for you to volunteer and get your Ham Rag by email. It seems that it is going to be even more important in the future as it has been on the news that the postage may be going up by 14 cents! Now, this is unreal and we will have to wait and see. But we need to prepare and change as many as are willing over to email to save dollars so we can spend on other fun and worthwhile projects.

The snacks went over well again at the last meeting thanks to Nick Lager, KB9SKW, for picking them up. He has agreed to do this for now. If anyone wants to help, please let Nick know. If you would like to see something different for snacks, please let Nick know that as well. Thanks to those that threw a buck or more in the basket to help cover the cost of these snacks. What was collected did not even cover half the cost of the goodies; so keep this in mind at the next meeting.

Nick Lager, KB9SKW, has talked with the Rockford Public Library about getting up to date books for those that are interested in amateur radio. He had a return message the other day that they are going to purchase some copies (quantity unknown at this time) of the Now You're Talking book from the ARRL. The books they had were quite out of date.

As I mentioned at the last meeting, we need a person to head up the Waterfront committee, which is our one and only big fund raising event for the year. Scott Allshouse, KB9YRW, has accepted that position. He will be making lots of phone calls over the summer to ask you to volunteer. Please be thinking ahead of time what you will be doing over the Labor Day weekend. Some positions have already been filled as people had a good time last year. How about saving Scott the phone call and call him instead to get your favorite time to man the booth. If you can do more than one time period (usually four hours), please do. It is fun and you get the button for getting in free so you can come and go at any other time over the weekend so you can enjoy the food and music.

Field Day is coming soon and our Field Day Chairman is Dick Fleming, KC9BCB, Please let him know what bands you would like to operate. I am sure he will be asking at the upcoming meeting. I think I have already mentioned that we are at Alpine Park area 7 (large clear area close to the swimming pool) this year. It would be good if you and the people that are going to operate with you went to the park and plan a little as to how you might put up your antennas. I think Dick plans to have a map of the area so areas can be "reserved" for your band. Talk with him soon!

Don't forget to make your comments about BPL as mentioned elsewhere in this issue. Something so important should not be overlooked.

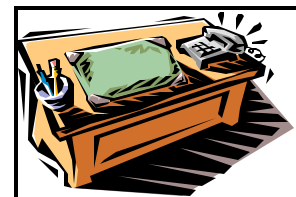
We will have a handout of the member's names and addresses and email addresses to pass out at this meeting. It won't be fancy, but will allow us to more easily communicate when not using a radio. I hope it will also help us to remember who is who as there have been many new hams and new members lately.

At this month's meeting, instead of a 50/50 raffle, we will have a drawing for something else. Come and be surprised.

A Fox Hunt will follow Breakfast in the Park on June 12th. I would suggest that we work in pairs so new hams can see what it is all about. It has been a long time since I have been on one, so it should be fun.

See you at the meeting.

Gene - WB9MMM



Special Service Club

March 6, 2004

Rockford ARA
P.O. Box 8465
Rockford, IL 61126

Dear Eugene:

We are pleased to report that the Rockford ARA has been officially renewed as a Special Service Club. The next renewal for the club will be in two years. Through the work of its members, this club is recognized for its continued efforts on behalf of Amateur Radio and services to its community.

You are to be commended for your work with the club in helping it realize and maintain its potential. Because you have been so closely associated with the club during the development of its SSC commitment, we want to give you the opportunity of informing the club directly of its success. The club will continue to receive periodic mails of materials and information from Headquarters. Please be sure to keep your contact information up to date and current.

Congratulations, and thanks for your good work! If we can be of further assistance, please do not hesitate to contact us.

`73

Linda Mullally, KB1HSV

Cc: Club
Director
Section Manager
ACC

Linda Mullally, KB1HSV
Educational Activities Assistant
(860) 594-0292
FAX (860) 594-0259
Lmullally@arrl.org

The RARA 2004 Membership Roster is being prepared for this year. It is going to be done as an handout which will be made available to the RARA membership at the April club meeting. It will also be made available per request after the April meeting.

Dates to Remember:

Breakfast in the Park - June 12
Field Day - June 26 and 27
The annual picnic - August 8
On the Riverfront - Labor Day Weekend

Northern Illinois Volunteer Examiners will be holding the next Amateur Radio exam session in Rockford, IL
on
Saturday, April 17, 2004.

Location:
St. Anthony Hospital
5666 E. State Street
Rockford, IL

Exams will be held in the St Francis Room (just right of the front entrance after you enter).

Check-in is from 9:00 AM til 10:30 AM. We require two ID's with your signature on them (one must be a photo ID).

If you are a licensed amateur radio operator bring your original current license and a copy. If you are using a CSCE for an element credit bring the original and a copy. (We need to see the originals & keep a photocopy of each document used for element credit.)

The test fee for 2004 is \$12.00. Walk-ins welcome.

Contact Information
Randy Scott, W9HL
W9HL@arrl.net
815-877-4328

**Rockford Amateur Radio Association
Monthly meeting of the membership**

March 12, 2004

St. Anthony Hospital

Members present: 38 present.

RARA President Gene Harlan called the meeting to order at 7:07 pm.

Minutes: The minutes from the February meeting were read by Secretary Wendy Owano, KC9BCF. Gary Hilker, K9LJN moved to accept the minutes as read, second by Larry Snyder, K0HNM motion carried.

Treasurer's Report: Treasurer Carl Cacciatore, W9TQ reported a balance of \$5,715.61 as of February 29, 2004. John Lawrence, N9OTC moved to accept the report as presented, second by Larry Snyder, K0HNM motion carried.

Old Business

Chairman Harlan reported the following:

1. RARA has been reinstated as a SSC, Special Service Club through ARRL.
2. The Field Day Chairman is Dick Fleming, KC9BCB.
3. The snacks at the meetings have been well received but donations of money will help defray the cost to the club.
4. Please remember to wear a name tag to the meetings.
5. Breakfast in the Park will be June 12, Alpine Park, shelter 2.
6. Field Day will be June 26 and 27, Alpine Park, areas 6 and 7.
7. The annual picnic will be August 8, Alpine Park, shelter 1.

New Business

ARES: Sue Peters, KA9GNR reported that the Thursday night net will be on the 147.255 repeater until the 147.195 repeater is operating again. An ARES organizational meeting will be held at 7 pm on March 25 at the Red Cross located at 727 N. Church. Pat Ryan will be speaking. A weather spotting classes will be held at the Rockford Airport on March 20. Freeport will have a weather spotting class on April 15. Contact Sue for other details if interested.

The monthly Board of Directors Meeting are held at Saint Anthony Medical Center 5666 E. State St. Rockford, IL on the last Tuesday of each month at 7:00 PM. *Except for December.*

On The Waterfront: Chairman Harlan asked everyone to consider being chairman of this important RARA event. The chairman will coordinate volunteers to fill the shifts at the ticket booth. This is a major fundraiser for the club and a great time to get together with other hams.

PIO: Steve James, KA9NPT announced the following events:

1. Sterling/Rock Falls Ham Fest on March 14.
2. North Shore Radio Club at Gray's Lake on March 28.
3. Toledo Ham Fest on March 28.
4. Weather spotting class in McHenry County April 1.
5. Tom Skilling at Fermi Lab on April 3.
6. Dayton Ham Fest on May 14, 15, and 16.

Chairman Harlan announced that a membership directory will be available at the next meeting. If you prefer not to have some of your information distributed, contact Gene before April 1.

ARRL: Shari Harlan, N9SH has been re-elected to the section manager position for the ARRL.

Shari Harlan, N9SH moved to adjourn the meeting, second by Nicholas Lager, KB9SKW motion carried. The remainder of the meeting was a panel discussion on antennas. The panel was Dave Bond W9MG, Jim Miller W4JR, Gary Hilker K9LJN, Larry Snyder K0HNM, and Bob Davidson WA9NTT.

Respectfully submitted,

Wendy Owano,
RARA Secretary



SCHEDULED DXPEDITIONS By K9LJN & W9GD

CALLSIGN	QTH	WHEN	QSL VIA
JW/F8DVD	SVALBARD	NOW TO APRIL 10	F8DVD
3B9C	RODRIGUEZ IS.	NOW TO APRIL 12	SEE BELOW
T33C	BANABA	NOW TO APRIL 15	F5CWU
5H3/SM1TDE	TANZANIA	NOW TO APRIL 18	SM1TDE
D4B	CAPE VERDE	NOW TO MAY 30	K1BV
SV8/KE2SP	GREECE	NOW TO JUNE 15	KE2SP
EM1HO	ANTARCTICA	NOW TO DEC 31	I2PJA
8Q7QQ	MALDIVES	APRIL 13-27	HB9QQ
7Q7??	MALAWI	APRIL 18 TO MAY 1	G3LQP
OX/DL2SWW	GREENLAND	APRIL 23 TO MAY 5	DL2SWW
OX/DL2VFR	GREENLAND	APRIL 23 TO MAY 5	DL2VFR

**QSL 3B9C VIA: FSDXA, P O BOX 73, CHURCH STRETTON, SY6 6WF,
UNITED KINGDOM OR VIA "G" BURO**

Recently Heard/Worked DX From the Rockford Area By K9LJN & W9GD

CALLSIGN	QTH	QSL VIA
3B9C	RODRIGUEZ ISLAND	SEE ABOVE
5R8GZ	MADAGASCAR	G3SWH
9Q0AR	ZAIRE (CENTRAL REP. OF CONGO)	SM5BFJ
AP2IA	PAKISTAN	DIRECT
CN2R	MOROCCO	W7EJ
FK8GJ	NEW CALEDONIA	F6CXJ
JY9QJ	JORDAN	DL5MBY
OH0I	ALAND ISLAND	OH3BHL
OX2KAN	GREENLAND	"OX" BURO
R1FJ	FRANZ JOSEF LAND	DL6ZFG
T30ZF	WEST KIRIBATI	DK2ZF
TJ3G	CAMEROON	G3TXF
TU8/F5LPY	IVORY COAST	F5LPY
V8JIM	BRUNEI	G3SWH
VK0DX	ANTARCTICA	QRZ.com
VQ9GB	CHAGOS	K7GB
YA8G	AFGHANISTAN	LA4YW
ZC4TS	UK SOV. BASES ON CYPRUS	QRZ.com

(Continued from page 1)

The FEMA official said his agency expects that there may be ways to provide BPL's benefits "without compromising the emergency communications capabilities available to FEMA."

The January letter stands in stark contrast to FEMA's predictions last December that "the introduction of unwanted interference from the implementation of BPL technology into the high frequency radio spectrum will result in significant detriment to the operation of FEMA radio systems." Saying such interference could "directly impair the safety of life and property," the agency also had recommended the FCC beef up its Part 15 rules to ensure no increase in interference levels to existing FCC or NTIA-licensed communication systems.

"The purported benefits of BPL in terms of expanded services in certain communications sectors do not appear to outweigh the benefit to the overall public of HF radio capability as presently used by government, broadcasting and public safety users," FEMA asserted last December in comments filed on the agency's behalf by Chief Information Officer Barry C. West.

BPL also could render such "essential communications services" as the Radio Amateur Civil Emergency Service (RACES), the Military Affiliate Radio System (MARS) and the Civil Air Patrol (CAP) useless, FEMA said. FEMA and ARRL are signatories to a Memorandum of Understanding that focuses on how Amateur Radio personnel may coordinate with the agency to support emergency communications functions. FEMA's December comments also referenced ARRL's "Interference to PLC systems from Amateur Radio Operation."

Brown's January letter conveys a much milder, conciliatory tone. "We know that the FCC shares our appreciation for the importance of reliable communications in the context of disaster recovery and are confident that the Office of Engineering and Technology's technical assessment, as well as the Commission's regulations implementing BPL, will be sensitive to this issue," he concluded. "FEMA stands ready to assist in any way the Commission might find helpful."

The deadline to file comments in response to the FCC BPL NPRM is Monday, May 3. Reply comments are due Tuesday, June 1. Interested individuals and organizations may file comments via the Internet using the FCC's Electronic Comment Filing System (ECFS) <<http://www.fcc.gov/cgb/ecfs/>>. The FCC asks that anyone filing comments do so "only in the newly established ET Docket No 04-37."

BPL HANDOUT AVAILABLE FROM ARRL

ARRL has posted a two-page document <<http://www.arrl.org/tis/info/HTML/plc/BPL-leave-behind.pdf>> that discusses Broadband over Power Line (BPL) in lay terms. "Broadband over Power Line: Why Amateur Radio is Concerned about its Deployment" is available for reprinting and use as a handout when, for example, dealing with members of Congress, municipal officials, power utilities and the news media.

While emphasizing that hams do not oppose broadband services per se and tend to be "early adopters" of new technology, the information sheet outlines Amateur Radio's concern about BPL's potential to create interference. Other broadband delivery methods "do not pollute the radio spectrum as BPL does," the paper states.

It also defines BPL, outlines its current deployment status, discusses FCC regulations already in place and explains that BPL's interference potential is real, not just theoretical. Finally, it lists "Others at risk," including short-wave listeners, public safety agencies and federal government radio systems.

Operating Tips

One of the problems I have noticed while chasing DX on SSB is that some operator's manage to slow down the QSO rate of a DX station by using non-standard phonetics, requiring several callsign repeats before the QSO is completed. If enough operator's do this, you might lose your chance for a QSO when ionospheric conditions change and the band goes dead, or the DX station goes QRT because he only has a limited amount of time to operate.

The reason for using non-standard phonetics might be because the operator is inexperienced and doesn't know better, is trying to be humorous, or is just plain stubborn headed (about them) because he has used the same phonetics for forty years. An example would be: Kangaroo Nine Loving Just Nonsense. These phonetics are difficult to understand even under the best conditions.

We should remember that even though English is the standard scientific language, not all Foreign operators are as fluent with it as we are and may misunderstand what we are trying to say or may even be offended by our (attempt at) humor. When a DX station is having trouble understanding part of my callsign, only then will I switch to: Kilowatt Niner London Japan Norway.

The International Telecommunications Union (ITU) adopted the following phonetic alphabet several years ago:

A ALPHA	G GOLF	N NOVEMBER	U UNIFORM
B BRAVO	H HOTEL	O OSCAR	V VICTOR
C CHARLIE	I INDIA	P PAPA	W WHISKEY
D DELTA	J JULIET	Q QUEBEC	X X-RAY
E ECHO	K KILO	R ROMEO	Y YANKEE
F FOXTROT	L LIMA	S SIERRA	Z ZULU
	M MIKE	T TANGO	

This phonetic alphabet is listed in the back of your ARRL logbook and should be indelibly burned into your memory.

73 and DX, Gary – K9LJN

RARA Officers for 2004

President: Gene Harlan WB9MMM
Vice President: Scott Allshouse KB9YRW
Secretary: Wendy Owano KC9BCF
Treasurer: Carl Cacciatore W9TQ
Director: Dan Hunt KC9ATR
Director: Gary Hilker K9LJN
Director: Nicolas Lager KB9SKW
Director: Larry Snyder K0HNM
Newsletter and Web Site:
John Auerswald KA9SOG

**Have anything or would like to submit an article to be put in the Ham Rag or the website?
Contact me by e-mail at ka9sog@arrl.net and visit <http://rara.tripod.com> for any late breaking news and information.
Please submit any articles before the 1st of each month.**

The 100-Million-Mile Network

February 6, 2004 By David F. Carr, Baseline

Eighteen days after landing on Mars, the robotic explorer named Spirit squawked in distress and went silent for nearly 24 hours.

Listening anxiously for any sign of life were navigators at the Jet Propulsion Laboratory (JPL) in Pasadena, Calif. They had to fix a broken interplanetary communications link that reached more than 100 million miles (and counting-the distance keeps growing as the orbits of Earth and Mars draw apart).

"The most difficult thing is to know how to talk to the spacecraft when you're getting no response from it," says Douglas J. Mudgway, a former National Aeronautics and Space Administration (NASA) engineer who managed communications with the Viking landers in the 1970s and helped save the Galileo mission in the early 1990s.

Spirit was exploring the Gusev crater on Mars on Jan. 21, and was already sending back spectacular photographic images. The wandering robot had rolled out of its landing nets and had approached a rock to take measurements using an appendage called the Rock Abrasion Tool.

Diagnosing what was wrong with Spirit depended on interpreting squawks, tones and other sounds traveling along a conduit dubbed the Deep Space Network.

Operators of this interplanetary signaling system send commands to and listen for data from "nodes" such as Spirit and its twin rover, Opportunity, using three facilities spaced roughly one-third of the way around Earth apart from each other. These communications complexes are in Goldstone, Calif.; near Madrid, Spain; and near Canberra, Australia.

This geographic separation means that, as the Earth rotates, at least one of these listening posts will be able to point its antennae toward the spacecraft being tracked at any given moment. Designed much like radio telescopes, the antennae are parabolic dishes as large as 70 meters in diameter (although the trend for the future is to use arrays of smaller antennas).

During normal operations, the rovers communicate directly with Earth when receiving instructions or sending back diagnostic information. They send back the bulk of their scientific data and photographs by using NASA's Mars Odyssey and Mars Global Surveyor probes as relay stations. These unmanned craft orbit the red planet carrying cameras, high-gain and ultra-high-frequency (UHF) antennae along with other scientific instruments.

The omnidirectional mast antenna sticking up from each rover's top like a dorsal fin knows when to transmit by listening for a signal that one of the orbiters is passing overhead. The orbiter then uses its more-powerful antenna to send as many as one million bits of data per second back to Earth. While fairly fast for an attenuated radio connection, that's only about a tenth of the speed of a cable-modem connection for the average home-computer user.

The rover-to-orbiter link uses UHF radio-the same basic technology used for broadcasting channels 14 and higher to television sets in the United States-while long-haul communications to Earth use X-band radio, which is a higher frequency (about 8 gigahertz) and easier to focus into a tight beam.

For critical commands, the rovers do communicate directly with Earth over X-band. Each rover has directional antennae that provide relatively strong signals that make it easier for the ground stations on Earth to filter out space noise and terrestrial interference. The omnidirectional antenna can also send and receive X-band when the directional one is not aimed properly.

Despite all this radio power, it's not unusual for a connection to be lost, at least temporarily. When Spirit landed the night of Jan. 3, the cheering in the JPL control room-over a series of simple radio tones indicating the lander had survived its fiery descent and dropped to the surface within a protective cluster of airbags-abruptly ended with the announcement, "We currently do not have signal from the spacecraft."

Cosmic cheering resumes.

For 15 nail-biting minutes, everyone from NASA Administrator Sean O'Keefe to the most junior member of the Mars Exploration Rover project waited for the signal indicating the lander was still alive. The cheering resumed when the signal came.

Spirit's outage weeks after that brief silence left engineers guessing. JPL engineers could keep sending new commands to the rover, but they had no way of knowing whether it was listening or whether new instructions might do more harm than good.

Often, a communications breakdown spells the end of a mission, as appears to be the case for the European Space Agency's Beagle 2 Mars lander, which failed to radio back after touchdown in December. On the other hand, the rovers are designed to be as autonomous and resilient as possible, meaning that they will try to debug their own problems and radio diagnostic information back to Earth even if they are not receiving commands.

For Joseph Wackley, the Deep Space Network's mission system operations manager, the silence meant he had to fortify the network to make sure Spirit's signal would not be missed when-or if-it came. NASA brought on additional staff and powered up onsite generators to guarantee that antennae would be up and running.

"That's exactly the nightmare," says Wackley, who was at a Pasadena facility of subcontractor ITT Industries the night Spirit landed. "We have to make sure it's not us contributing to why they are not seeing the signals."

When trying to regain a connection, the Deep Space Network puts its reception equipment in a "closed-loop" mode, continually scanning a range of frequencies around the expected one, looking for some kind of signal that it could "lock on" to. The closed-loop mode kicked in for the 15 silent minutes during Spirit's landing and again in the latest communications crisis.

JPL finally caught a break Jan. 23. After several rounds of sending instructions that were not acknowledged, JPL received a transmission Spirit sent on its own initiative. But engineers still had trouble getting Spirit to respond to commands or send back intelligible data. One communications session relayed via the Surveyor orbiter picked up static, as if the UHF antenna had been left on but wasn't controlled by Spirit's computer.

Gradually, JPL was able to rebuild the communications link through trial and error.

Where project manager Pete Theisinger originally told a press conference some electrical or mechanical failure was suspected, the investigation subsequently indicated a software-only problem.

It turned out the rover had become trapped in a cycle of continual reboots, crashing each time it tried to access the two flash-memory devices it uses for storage of images and other data. The cycle of some 60 reboots over 30 hours also prevented Spirit from going to sleep overnight when no solar power was available, causing it to run down its batteries.

To get the robot's software to work normally, JPL had to disable the flash-memory devices so the onboard computer would boot using only Random Access Memory (RAM), which stores information for active use by a computer only when power is present.

But this left Spirit operating in a crippled state, since data held in RAM evaporates when a computer is powered down. Like a digital camera, the rover uses flash memory for temporary storage of data to be sent to Earth later. But apparently the scientists had hoarded data too aggressively, filling flash storage with data collected during the cruise between Earth and Mars as well as data from the surface exploration. Eventually, just keeping track of all those files consumed so much memory that Spirit's software was unable to function normally.

Solving Spirit's crippled state of operations.

The solution: Delete excess files and send a patch instructing the rovers how to use their flash and random memories more conservatively.

This patch was also sent to the second rover, Opportunity, which had meanwhile experienced a flawless landing on Jan. 24. That mobile explorer maintained communications with Earth even while it was bouncing to a stop. Then it flipped itself upright and began sending back images from its 20-megapixel stereo cameras.

By the end of January, the Mars exploration program's head scientist, Steve Squyres, said he was optimistic both rovers ultimately will work well beyond the three months originally planned. "We built margin [of error] on top of margin [of error], specifically to allow for the fact that things go wrong on a place like Mars," he says.

The resuscitation of Spirit continued a record of long-distance network recoveries for the space program. In 1990, the Galileo spacecraft sent to Jupiter suffered what could have been a mission-ending failure when its umbrella-like main antenna failed to unfold properly, but JPL managed to reprogram the spacecraft in flight. In that case, mission managers sent compression software that allowed Galileo to transmit data and high-resolution images over a backup antenna.

The rehabilitation of Spirit also came as explorations of Mars were putting unprecedented demands on the Deep Space Network. If Beagle 2 had remained in contact, NASA also would have assisted the Europeans with communications for that lander.

To accommodate Spirit and Opportunity, the Deep Space Network has to maintain 'round-the-clock communication. Because they are on opposite sides of the planet, the two rovers operate on roughly opposite shifts. When one is in daylight, it gathers power through its solar panels, while the other powers down for the night.

For the \$860-million mission to be completely successful, scientists wanted both rovers actively searching for signs that liquid water existed on Mars.

But, in any event, sending twin rovers to Mars served as insurance for NASA in case one robot was lost -redundant outposts of the 100-million-mile network.

What you should do to run a space network.

- **Automate processes.**
Encode many operations in a remote device, so it can solve its own problems.
- **Bulletproof your gear.**
Refine systems under your direct control, like Deep Space Network antennas, to make sure they aren't the cause of an outage.
- **Be persistent.**
Analyze any shred of communication. Build theories. Exploit small wins.
Simulate potential problems.
Test theories on duplicate devices, under your control, even if conditions aren't alike.



This issue of the HAMRAG was made possible by their article or photo submissions:
Gary Hilker, K9LJN, Gene Duncan, W9GD, ARRL, Gene Harlan, WB9MMM, Ziff Davis Media Inc., Bob Davison, WA9NTT, Wendy Owano, KC9BCF, Randy Scott, W9HL

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Mailing
Address
Goes Here

April 2004

ROCKFORD AMATEUR RADIO
ASSOCIATION MEMBERSHIP
APPLICATION

Single \$30.00 Family \$35.00
Senior \$15.00 Senior Family \$20.00
Student \$15.00 HamRag Only \$10.00

NAME _____ CALL SIGN _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____
HOME PHONE _____
WORK PHONE _____
EMAIL _____
RENEWAL _____ NEW _____ RETIRED _____
RADIO INTEREST _____
OTHER INTERESTS _____
SUGGESTIONS _____

RETURN COMPLETED FORM TO:
ROCKFORD AMATEUR RADIO ASSOCIATION
P.O. BOX 8465
ROCKFORD, ILLINOIS 61126

