

Backscatter Journal

800MHz REBANDING UPDATE: Forecast Calls for Pain.

The FCC-prescribed three-year implementation period for 800MHz rebanding has come and gone. While progress is being made, the nation's more complex trunked public safety radio systems are taking an unbelievably long time to secure Frequency Reconfiguration Agreements (FRAs) and, once approved, the process of getting vendors to complete their Schedule D Equipment List filings is akin to pushing a rope.

Frankly, it just doesn't appear that anyone really gives a damn. Yet, Sprint has every incentive in the World to expedite rebanding. These include:

Recovering a cellular user base that is shrinking by the minute due in part to service disruptions associated with rebanding;

Stopping their internal cost hemorrhage. The longer rebanding takes, the longer committed staff is sucking down financial resources that could be better spent on supporting their prime function: cellular telephony;

Cutting loose the TA, as this cost is likewise one borne by Sprint;

Gain access to what they originally coveted – spectrum;

Get folks to like them again, because few directly affected by 800MHz rebanding would throw any Sprint

Rebanding Negotiator a bottle of water if found lost, wandering in the desert.

While the stock market, today, is certainly in decline, Sprint's share costs have been plummeting for many, many months. If those trends continue, folks will be able to buy and trade Sprint shares via the barbershop gumball machine. So, all of the above would suggest that rebanding negotiations should be expedited rather than delayed. Sadly, that is anything but the case. Every negotiation engagement is as dreaded and welcome as a root canal.

If these negotiation traumas weren't bad enough, further pain is in store for system-owner licensees. That would be the TA's required "True Up" process once each retune is completed. No matter that Planning Funding Agreements and FRAs have been negotiated to pennies for times allocated in minutes and seconds, system owners as well as consultants and equipment vendors will be audited and required to provide information that is different from that even required by Sprint to pay invoices.

Most importantly, the TA requires piece unit documentation, such as serial number data (list) from the retune vendor. They additionally

TCS SECURES GSA CONTRACT; LEE WARD JOINS FIRM

In uncertain economic times, it is important for federal, state and municipal agencies to secure the best goods and services for the most attractive price. So, it is with radio consulting services and now you can get the very best ... TCS ... through GSA Advantage.

Contracting us through GSA provides the services you want, quickly, and at a price to meet today's challenges. Please visit our website for complete details on TCS services and capabilities now available through GSA Advantage.

But, the good news isn't over yet! We are pleased to announce the addition of Lee Ward to the TCS Team. With over 30 years in the design and implementation of both commercial and public safety radio systems, Lee brings added depth and experience to ongoing projects throughout the States of Kansas, Illinois and Missouri.

We have a few other surprises planned for 2009, so stay tuned and watch us grow!

THIS ISSUE

800MHz Rebanding Update

**Looking Back at Radio
in the 1950's**

Another Hurricane Season

The TCS Hall of Shame!

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require time sheet data that is specific and to a degree not traditionally used by owners in the conduct of their normal business practice. Documents depicting ranges of dates worked, and technician and internal personnel time may not be acceptable. What now appears to be required are travel and performance logs that are cross referenced to classes of activities performed during rebanding tasks. And these must be “easily” cross referenced, whatever that means.

Process requirements, as outlined by the TA, will require additional resources (that means hugely unanticipated costs to owner incumbents or their consultants/vendors) to docu-

ment all of these activities, enter the supportive information into a database spreadsheet, generate monthly summaries by categories, etc.

Additionally, there will be incumbent and consultant resources required to photocopy all of that paper documentation developed in the field, correlate data between the various affected agencies, and eventually get it distilled into that “easily cross referenced” format now required. There will also be time and costs required to perform the audit process, itself, on the part of the licensee and their rebanding vendors.

All of this is sure to become a nightmare for system owners and certainly

will cause a new, unnecessary class of completion delays.

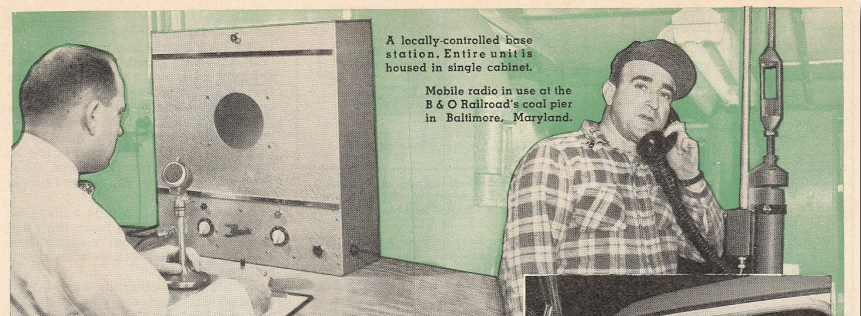
One word of advice to those embroiled in FRA negotiations is don't be bullied by Sprint's negotiators when they say suggest where indicated costs are out of line with “historical data”. Costs associated with audit exposure are just starting to appear on all of the newest deals out there. Additionally, don't think that just because your deal does not have these requirements stated in the FRA that they are not required. That would be wishful thinking as changing the rules along the way has not been a foreign concept here.

Looking Back at Radio in the 1950s

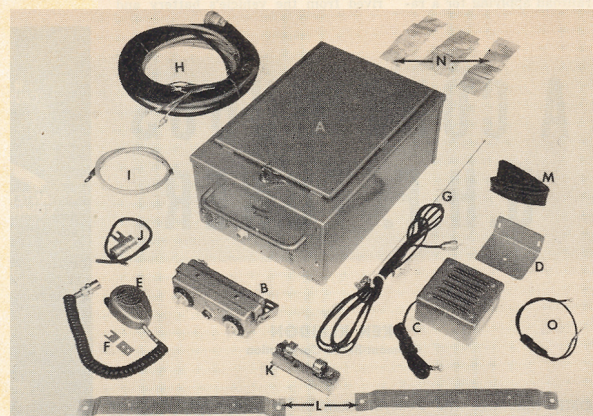
A good way to gain a better sense of where you're heading is to see where you've been and how you got there. Without a doubt, the concerns that have been voiced about the direction our Industry is heading and the debates spawned...analog versus digital; Project-25 versus proprietary networks; trunked versus conventional; 800MHz Rebanding, FCC Refarming and a host of others has been a wild ride. But, are the problems we face and work through today markedly different from those voiced in seemingly earlier and simpler times?

I like to collect and read old books and magazines involving electronic technology. My current collection of IRE Proceedings, the RCA Review, Bell System Technical Journal, Electronics Magazine, QST, Radio Electronics and others reaches back into the early 1930s. One finds amusement in looking over

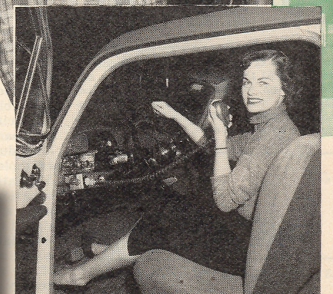
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MOBILE RADIO



Components comprising a single mobile radio unit. (A) The transmitter, receiver, and power supply. (B) Control unit for dash mounting—includes pilot lights, volume control, squelch control, and channel selector switch. (C) Loudspeaker. (D) Mounting bracket for speaker. (E) Microphone. (F) Microphone mounting clip. (G) Quarter-wave whip antenna for car-top mounting with flexible coaxial cable. (H) Multi-conductor cable to interconnect control unit and radio unit. (I) Wire for connecting hot side of battery to fuse. (J) Interference filter. (K) Fuse and mount. (L) Mounting brackets. (M) Loom for protecting cable from wear. (N) Screws and miscellaneous hardware. (O) Metering plug and cable for testing the operation of the entire unit.



Two-way radio equipment installed in car.

the old electronic component ads and the hype they brought, but interestingly enough, many of the problems we discuss today involving bandwidth, modulation and technical standards existed then, too.

In this Backscatter we take a look back at those times in the 1950s, often called the Golden Age of Radio Communications. Amateur radio operators may be surprised to learn that those 1950s amateurs were just as stressed about the “dumbing down” of licensing requirements as exists today. And that few thought the hobby would survive the changes of the time, yet it did and will continue to do so simply because people adapt and the foundation of the hobby is fun coupled with learning and self-improvement.

In the realm of land mobile radio, the technical advances of World War II brought vast improvements to the quality and reliability of two-way equipment. GIs having been exposed to the utility and life-safety aspects of good radio communications yearned for the equivalent in their civilian lives. Thus, the aspect of personal communications took root. And while the technology has evolved from electron tubes to Today’s digital processes, the fundamental aspect of humans communicating wirelessly and seemingly now without limits continues.

I hope you enjoy this electronics time capsule.

For the RECORD.

● BY THE EDITOR

AN AMATEUR'S RESPONSIBILITY

TO MANY of us, amateur radio is the greatest hobby in the world. Also, to some of us, amateur radio has grown to be a way of life. For years, dyed-in-the-wool hams have fitted amateur radio into their everyday lives more firmly than any other hobby has ever done. Life-long friendships, business associations, and even that most important partnership—marriage—have been formed through amateur radio contacts and acquaintances.

In years past it used to be that just to be a licensed ham was enough to merit a welcome in any circle, or group of other hams, anywhere. Today, the advanced state of the art has divided our interests so that there are many specialists' groups, each ardently pursuing their particular phase of the hobby. It is unfortunate that this has also tended to *reduce* the over-all bond that the operational and technical side of amateur radio once possessed.

There are many pleas made for tolerance but it is easier asked for than obtained. For example, an amateur vitally interested, qualified, and active on the v.h.f. bands finds it difficult to understand the motives behind the one-band operation of a confirmed 20-meter fone DX-er or an 80-meter c.w. traffic net operator.

Conversely, consider the viewpoint of an ardent and vocal “social net” operator on a 75-meter fone frequency. He may find it difficult to reconcile the enthusiasm with which a 10-meter mobile club enters into a Sunday picnic or hidden transmitter hunt.

With due consideration of the above (amateur radio does present a different facet to each licensee since we are all individuals) it must be realized that we do have, even now, one common bond—the so-called HAM spirit which has encouraged and stimulated the amateur until he is a vital force in the American scene. Through him amateur radio exerts its influence through public service and welfare, public morale and, through his contribution, has helped elevate the radio, television, and communication engineering art to its present high state.

We radio amateurs should be proud of our participation in this great hobby! True, in some isolated cases, amateurs are held in poor repute and their methods, results, and even their individualism have been ridiculed. Even some persons holding amateur licenses have been guilty of this type of intolerance.

There has never been a time in our history when it was so necessary that

we amateurs “stand up and be counted.” The complexity of modern life, the constant distraction of other endeavors, the not-inconsiderable effect of spreading amateur radio over a too-wide area of interest and activity have all combined to reduce the cohesive qualities of our common bond.

One guiding element is always necessary in any endeavor. Organization! Amateur radio has long had its very own organization—*The American Radio Relay League*. It has been the greatest contributing factor in the continuance of the hobby of amateur radio, with the exception of those most indispensable elements—the rugged individualism, persistence, and the indefatigable effort of the amateur *himself*.

The majority of radio amateurs of this country are *not* meeting their responsibility, that of support, through membership, of the amateur's own organization—the ARRL!

It is the obligation of *every* amateur to be a *member* of the ARRL regardless of his personal belief concerning any individual or any group within the structure of the vast ARRL organization. Furthermore, it is vitally important that the *future* of amateur radio be insured by a strong voting membership in ARRL plus intelligent action on the part of ARRL officials on behalf of all amateurs. Thus, the power of ARRL will increase in proportion to its numerical strength.

ARRL membership has declined in recent years until approximately only one amateur in three is a member. Many factors have contributed to this sorry state. But, regardless of *why*, the major consideration must be that it need not be so!

Membership does not imply complete agreement with *all* the actions taken by any organization. It does qualify the member, authorize his opinions, and permit him a “voice” in the conduct of the organization.

And, in amateur radio, the ARRL is the *one* organization carrying official weight and prestige gained by the efforts of the amateurs through long years of struggle. ARRL is fighting your battle, member and non-member alike. ARRL needs and must have the actual support—through membership—of all amateurs.

If you are not a member—join up and carry your weight in the effort to preserve, to continue, and to enhance amateur radio. The League must represent the *majority* of the majority—not the majority of a *minority* of the total licensees. O.R.

RADIO & TELEVISION NEWS

10-4 10-7

Radio 10-Codes, or as they were originally called, 10-Signals, are as much a part of public safety professional culture as badges and strong coffee. 10-Codes were developed to meet a need to abbreviate radio transmissions, improve clarity and lower air time demands on fledgling radio systems. Although there is some controversy as to who first developed the code, it is thought that credit goes to Charles “Charlie” Hopper – who in the 1930s was the Communications Director for the Illinois State Police, District 10 (located in Poso-tum, Illinois).

The “intelligence” contained in the 10-Code signals is tied to the number following “ten.” Then (as sometimes even now) the first syllable of a radio transmission was frequently chopped and not easily understood, hence preceding all codes with the word “ten” allowed a better chance of understanding the critical message portion.

In 1937 The Association of Public Safety Communications Officials, APCO, worked to standardize 10-Code use on public-safety radio. APCO’s Project 4 was the spearhead for development of the first Ten-Signals, which were subsequently made available to public safety agencies.

Following, is a list of Codes that appeared in the January 1940 issue of the APCO Bulletin:

10-1 Receiving poorly.	10-20 What is your location?	10-34 Clear for local dispatch?
10-2 Receiving well.	10-21 Call this station by telephone.	10-35 Confidential information.
10-3 Stop transmitting.	10-22 Take no further action last information.	10-36 Correct time?
10-4 Acknowledgement.	10-23 Stand by until no interference caused to Iowa (Mo.) (etc.)	10-37 Operator on duty?
10-5 Relay.	10-24 Trouble at station—unwelcome visitors—all units vicinity report at once.	10-38 Station report—satisfactory.
10-6 Busy.	10-25 Do you have contact with ?	10-39 Your Nr. delivered to addressee.
10-7 Out of service.	10-26 Can you obtain automobile registration information from?	10-40 Advise if Officer available for radio call.
10-8 In service.	10-27 Any answer our number?	10-41 Tune to kcs.for test with mobile unit or emergency service
10-9 Repeat, conditions bad.	10-28 Check full registration information (lie, motor, name, stolen, etc.)	10-60 What is next item (message) number?
10-10 Out of service—subject to call.	10-29 Check for wanted.	10-61 Stand by for CW traffic on kcs.
10-11 Dispatching too rapidly.	10-30 Does not conform to rules and regulations.	10-62 Unable to copy phone—use CW.
10-12 Officials or visitors present.	10-31 Is lie detector available?	10-63 Net directed.
10-13 Advise weather and road conditions.	10-32 Is drunkometer available?	10-64 Net free.
10-14 Convoy or escort.	10-33 Emergency traffic at this station—clear?	10-65 Clear for item (message) assignment?
10-15 We have prisoner in custody.		10-66 Clear for cancellation?
10-16 Pick up prisoner at....		10-67 Stations carry this item (message).
10-17 Pick up papers at		
10-18 Complete present assignment as quickly as possible.		
10-19 Return to your station.		

Continued on next page

List of Codes Continued

10-68 Repeat dispatch.	10-83 Have officer Nr call this station by telephone.	10-89 Request radio service man be sent to this station.
10-69 Have you dispatched.. ?		
10-70 Net message (State net traffic).	10-84 Advise telephone Nryour city that officer Nr will not return this date.	10-90 Radio service man will be sent to your station
10-71 Proceed with traffic in sequence (busy here).		10-91 Prepare for inspection (date).....(time)
(This “80” series is reserved for assignment by nets for local use. The meanings shown are suggestions and are intended for use in Missouri, Illinois., Iowa, and Minnesota.)	10-85 Officer___ left this station for (Jefferson City) (Des Moines)	10-92 Your quality poor—transmitter apparently out of adjustment.
10-80 tower lights at this station burned out.	10-86 Officer Nr left this station for at	10-93 Frequencies to be checked this date.
10-81 Officer Nr will be at your station	10-87 Officer Nr will be in if officer Nr.....will be in.	10-94 Test—no modulation—for frequency check.
10-82 Reserve room with bath at hotel for officer Nr	10-88 What phone number shall we call to make station to station call to officer Nr.....?	10-95 Test intermittently with normal modulation for
		10-96 Test continuously with tone modulation for

Although the original 10-codes bears some semblance to the more modern code, please note the meaning of Project 4’s original 10-62; “Unable to copy phone—use CW.” Now that’s a blast from the past!!

APCO’s Project 14 was tasked to revise the list of codes in the mid 1970s, into a form more in keeping with the advances in technology:

Despite attempts at standardization, 10-Codes evolved over time and have becoming anything but standard. While the codes were intended to provide universal understanding, the proliferation of different meanings in some geographic areas have rendered them useless in many situations, particularly so for mutual aid responses where people from different agencies and jurisdictions need to efficiently communicate.

Following the inter-organizational communications problems during post-Hurricane Katrina rescue operations, the Federal Emergency Management Agency discouraged the use of 10-Codes and other like codes due to the observed variability in meaning between responding agencies. APCO has likewise voiced sup-

port of using plain speech communications over public safety radio systems over traditional 10-Codes. This approach falls into line with the National Incident Management System (NIMS), an effort by the Department of Homeland Security to better coordinate emergency response between different jurisdictions and disciplines.

We should not overlook; however, that brevity in on-air communications remains a vitally important concept. Modern public safety trunked radio system designs are sized using historical data based on standard, dispatch-style radio transmissions. This history is based on 10-Code usage. Plain speech will undoubtedly increase the length of most voice call transmissions.

Thus, users of in-place trunked radio systems may find themselves suddenly “in the queue” and waiting for an available channel as the contingency “head room” in older designs is absorbed by long winded, plain voice transmissions. No matter what operational protocol is used, keep in mind to always keep it short and to the point!

WRITE BETTER SERVICE MANUALS

Ask any owner of a two-way radio shop or an amateur who enjoys rebuilding or restoring electronic equipment and one topic always bubbles up to the surface of conversation: poorly written equipment instruction and service manuals. Was it always this way? Apparently so, judging from a 1950 editorial in *Radio & Electronics News*.

Installing complex electronic equipment becomes less problematic if the owner and their installation team fully understand the processes involved and the proper sequence of events. Unfortunately, it seems that those tasked with developing these documents are perhaps so close to the product that they unintentionally overlook key aspects.

These may be intuitively obvious to some who has spent the past twelve or more months attached with a product's development, but the installation team doesn't have the luxury of time to gain such awareness. So, it is important, as was seen by our 1950s counterparts, that instruction books are written by those having perhaps as limited first hand product knowledge as those implementing the equipment in the field.

Next point, let's assume the equipment is installed and works as advertised. Ten months later it suddenly goes 10-7 and a hapless technical or field engineer is called to the task. An important point in repairing any defective electronic gear is this: it can't be repaired if the one doing the repair doesn't know how the equipment is supposed to work and why.

Too few manuals provide detailed descriptions of circuit/software theory and operation where the service person can make a reasoned determination of normal versus abnormal equipment performance. This absence of information leads to lost productivity, added service cost and delays in equipment restoration.

Here is one low-cost area where equipment manufacturers can substantially improve product acceptance and perceived product quality, particularly in the eyes of those who are often consulted by radio system owners in the evaluation new equipment procurements.

For the **RECORD.**

BY THE EDITOR

INSTRUCTION BOOKS AND THE ENGINEER

WE HAVE been noticing a sorry lack of adequate instruction data which accompanies quality merchandise in the radio, television, and electronic fields. Our own experience includes items designed for application in audio, amateur radio, television, and allied fields.

Our first example is an expensive high quality audio amplifier, possessing features of advanced design and capable of superb performance, even for FM broadcast use. In fact, the amplifier in question is far superior to most units in any price class. This unit retails in excess of \$200.00 and is quality merchandise throughout. Many innovations in design are apparent to the audio man versed in circuitry.

The instruction book enclosed with the amplifier devotes many paragraphs pointing to the design features, the achievement of high efficiency coupling, the wide frequency response, and how the chassis is constructed for speedy servicing.

But—and this applies to many manufactured items—there aren't any specific instructions which will permit the purchaser to install and maintain the equipment intelligently. Most needed data is not included. In fact there is no plate current data, voltage analyses, or other necessary information for routine testing, and yet this amplifier is a "Cadillac" in its field.

Our second example is a 10 and 20 meter, 3-element beam for amateur communications, complete with heavy duty rotator and remote position indicator. It sells complete for approximately \$300.00. The instructions for assembling the elements comprise a faded mimeographed sheet. In fact, it is almost impossible to follow the very brief data. Comprising nearly a gross of bolts, nuts, brackets and washers, it becomes a tedious process to try and assemble the elements with bolts of proper length and proper sequence. If adequate instructions (not a faded mimeographed sheet) had been printed, the time for assembly could be reduced by at least 50%.

The single page sheet with the rotator was crumpled like a dried out spit ball and was really a classic. One paragraph stated, "a 5-wire cable connects the antenna rotator to the indicator. It should be rubber covered." Now isn't that just peachy! There is a multiple terminal strip within the rotator housing with no identification or diagram whatsoever. There are 5 terminals all right, but that's all.

At the remote indicator is another set of terminals. The terminals are not

identified or marked and are apparently connected without any particular sequence of wiring. After much transposition, it was discovered that the two terminal strips, one at the rotator, the other at the indicator, were reversed. Another headache and another hour wasted.

Our final example is an instruction folder furnished by a leading transformer manufacturer. It apparently is intended to serve as a guide for connecting various impedances to numbered terminals on the base of the transformer. Here an attempt has been made to consolidate the entire transformer line of the manufacturer in a condensed and inadequate tabulation.

Many of the transformers shown and designed for a specific application could be used for other purposes, providing the instructions stated whether or not the current (d.c.) could flow in the windings. In audio in particular, there are several "bridging transformers" that could be used as "plate-to-line" if shunt feed were used by the technician to keep the d.c. out of the primary.

The point of our discussion is to call the attention of the manufacturer to the necessity for having his instruction data carefully checked by at least two persons who are not too familiar with his product or its application. It is a real mistake for the design engineer to be charged with the responsibility of doing a complete instruction sheet.

It is axiomatic that he will skip over important data, simply because he is *too* well informed on the product and assumes that the purchaser will also know exactly how to use the equipment or components properly.

Much can be done to win the confidence of the purchaser if the manufacturer will insist that *someone*, not too well versed in the *original* design, actually check and use *the* product exactly as he is told in the instruction book and to note and ask questions. By employing "guinea pigs" many overlooked points will be clarified and corrected before such instructions are approved and printed for inclusion with the manufacturer's products.

A few hours' attention to the "end user" can surely help in making better relations between the manufacturer and the customer. The added cost to the manufacturer is peanuts compared with the loss of confidence and the resulting loss of sales on the part of the confused and disgruntled purchaser. O.R.

RADIO & TELEVISION NEWS

ANOTHER HURRICANE SEASON...

A Need for Change

Louisiana has experienced another challenging hurricane season with this year's brushes with Hurricanes Gustav and Ike. New Orleans and the surrounding areas were spared a knock-out punch, fortunately, as the post-Katrina rebuilding in Orleans Parish continues albeit at a snail's pace. 2008, however, brought with it great challenges for those parishes along the state's coastal areas.

The effects of Hurricane Gustav, while thankfully not nearly as bad as predicted for the New Orleans region by the cable news media, caused a surprising amount of residential and commercial building damage to central Louisiana as far inland as Baton Rouge.

It is important to recognize the significant post-Katrina improvements Louisiana has made to its evacuation planning for surge vulnerable areas. Nearly 2 million people were safely and orderly evacuated in a manner far less traumatic than in prior years.

And, where the Blanco administration's efforts before and throughout the aftermath of Hurricane Katrina were a sad comedy of confusion and missteps, newly-elected Governor Bobby Jindal and his team took decisive action where needed

and provided meaningful information to those in the affected areas.

The contrast in performance could not have been more striking and welcome. Louisiana is now blessed with a wonderfully competent governor in Bobby Jindal, a man that will certainly advance far within the national stage.

In the area of public safety radio communications, more work is needed. We have been critical of the State's headlong jump into its new 700MHz radio network with good reason. It was done without adequate planning, the contract was let absent of either performance specifications or competitive bidding, and the new radio network has been installed largely on the same tower sites that failed (some catastrophically) during Hurricane Katrina.

Yet, while these are all in themselves good reasons for concern, our biggest gripe was the State's seemingly blind eye to adopting new practices that would have hardened these vital communication links in the face of hurricane conditions.

A recent Associated Press (AP) story indicated where nearly 22 of 50 the State's 700MHz tower sites lost T1 link connectivity during Gustav.

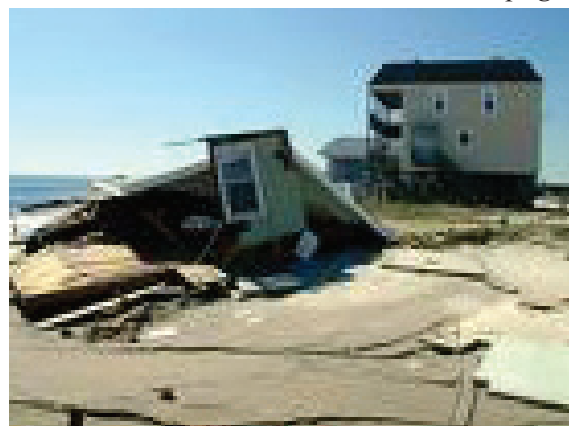
Bear in mind that all 50 sites were not located in areas directly affected by hurricane force winds or potential flooding, which makes the large number of sites reported by AP troubling.

Yet, in fact and at a recent State APCO meeting, it was reported that the number of sites sustaining interconnectivity link failures was actually in the low thirties!

It is impossible to maintain radio network interoperability if tower sites operate as independent radio systems and not as a cohesive network. This is the reason we have been a strong advocate where all public safety radio networks south of Baton Rouge should be interconnected via private, licensed microwave facilities.

Properly designed, these facilities can withstand prolonged losses of electrical power, decimated wired telephone/electrical grids and hurricane force winds.

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No amount of leased telephone connectivity can approach the proven reliability of private microwave technology. This fact has been well established in other coastal states whose public safety radio networks are likewise vulnerable, and have been tested, by recent hurricanes.

It is our understanding that the State is now aggressively working to secure funding to build such a facility overlay, but the timing could not have been worse. The nation's financial meltdown and costly federal bailout for investment banks will have a choking effect on downstream grant opportunities.

Louisiana is already seeing the effects of falling oil revenues, depressed sales tax revenues and a

state constitution lacking flexibility to steer funding to critical needs.

A microwave enhancement to the new 700MHz radio network cannot be postponed. It is vital to the public's safety and security. We strongly encourage all Louisiana residents to contact their state representatives and urge adoption of a budget that includes funding to correct this critical network vulnerability.

Louisianans have lived with bad roads for years. We can live with them a few years longer if that's what it takes to secure a reliable public safety communications network....one that can be trusted when the chips are down.

Backscatter's Candidate for the TCS HALL OF SHAME

SIDE MOUNTED ANTENNAS?

We had a new customer call and complain about a UHF repeater system that was recently installed, but performing very poorly. In fact, it seemed that coverage to a large portion of their service area was missing...as if someone had drawn down the window shades.

Someone did!

Installing antennas too close to steel tower members is a recipe for blocked coverage. Coverage modeling software tools assume the antenna is unobstructed, which is rarely the case for side mounted locations. Fortunately, extending the antenna several wavelengths away from the tower's face helps to minimize shadowing effects and detuning.



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