CROSSTALK

News Bulletin of the TRW Amateur Radio Club

Volume 99 Number 10 October 1999

HAMCON '99

Don't miss out on the 1999 ARRL SWD Convention this year aboard the RMS Queen Mary in Long Beach, October 2nd & 3rd. The Club Van will be there, and we'll have a Hospitality room where you can come and socialize with fellow Club members.
The Talk-In frequency will be 146.52 simplex operating as W6RO.
Cost is $15.00 at the door, and all day parking is only $2.00 as long as you show your Convention badge when you exit the parking lot.

1999 ARC Banquet

Yep, it's that time again, the 33rd Annual Awards Banquet coming in November. The best part is that the price is the same as last year. It will be on November 20th at the Blue Moon Restaurant in Redondo Beach.
This year's Guest Speaker is none other than Bill Pasternak, WA6ITF.
Bill is is a Broadcast Engineer with KTTV Fox 11 Television in Los Angeles. He is the co-founder and volunteer Managing Editor of the Amateur Radio Newsline bulletin service and Creator/Administrator of the annual "Newsline Young Ham of the Year Award" program that each year honors the accomplishments of a radio amateur age 18 or younger with a trip to Space Camp in Huntsville Alabama. Bill and his wife Sharon (KD6EPW) reside in Santa Clarita California.
He is the author of three books, co-producer of several educational films and videos, writes a monthly column for Worldradio Magazine and is a frequent contributor to CQ VHF Magazine.
Bill can be reached by e-mail to billwa6itf@aol.com or newsline@arnewsline.org

Don't miss this opportunity to attend a first class event with great food also, and of course door prizes and also that chance to see your fellow ham that you might have not seen in a long time.

See Page 3 and 4 for more details

SWAPMEET is moving!!!!!!!??

The October Swapmeet will be the ***last*** at the present location *I'm being told.* Stay tuned, a new location has not yet been determined!!!!

In This issue:

TRW ARC Monthly Calendar of Events

First Tuesday of each month	5:30 pm	**Executive Board Meeting, R4/2041** (All Club Members are invited)
Second Tuesday of each month	5:30pm	**Club Meeting** **Round Table Pizza, (Redondo Bch. & Hawthorne)**
Second Tuesday of each month	12:00 noon	**Emergency Communications Team Meeting** R3 Emergency Operations Center
Last Saturday of each month (Rain or Shine)	7:00 am	**TRW ARC Swap Meet** Marine and Aviation (Northeast Corner)

Weekly Events

Every Monday Night (Except the 1st & Holidays)	7:30 pm	**Disaster Communication Systems (DCS) Net** DCS Members: Check in on 2 Meter Repeater
Every Wednesday	12:00 noon	**ECT Net on 2 meter Repeater** All Amateurs Welcome
Every Thursday	7:00 pm	**Space Hams Net on 2 meter Repeater** with N6SHI and W6EKK
Every Mon, Wed, Fri	2:00 pm	**TRWARC Retirees Net** 7185 KHz
Every Friday Morning	7:30 am	**TRW Amateur Radio Club Breakfast** Building S Cafeteria - Everyone is invited Talk-in on 2 Meters

Other Events

Computer Fair ***Hours: 10:00 to 17:00*** ***(get a $25.00 annual pass see: http://www.lacomputerfair.com/annpass.html)***

POMONA $7.00 admission
Live Broadcasts: KFWB, KFI
October 2 & 3, 1999 (Sat. & Sun.) bldg. 4
October 23 & 24, 1999 (Sat. & Sun.) bldg. 4
Fairplex Exposition Complex Exit Highway 10 at Fairplex Drive.
Go north to McKinley Avenue, turn right. Turn left on White Avenue to Gate 14.

RESEDA $3.00 admission
October 9, 1999 (Sat.)
Sherman Square Entertainment Center From the 101 Freeway take the Reseda offramp,
go north to Sherman Way and turn right. Go one block to Canby Street. 18430 Sherman Way.

BUENA PARK $5.00 admission
October 10, 1999 (Sun.)
Sequoia Conference Center Take the Beach Blvd. exit off the 91 Freeway.
Go one block north to 7530 Orangethorpe.
All Shows Open to the Public 10:00 a.m. to 5:00 p.m.
Call for more information (408) 778-5200 or 800-800-5600 Fax# (408) 779-1374

Other Ham Swap meets:

Inland Empire ARC - 2nd Sat. ea. mo. 7:00 to 11:30 AM @ A.B. Miller High School, Walnut & Oleander in **Fontana** Talk-in 145.480 (-600 pl=77.0hz)
El Cajon ARC - 1st Sat. ea. mo. 6:00 AM @ Santee Drive-In Theater, Woodside Ave. @ Hwy 67 in **Santee** Talk-in 146.52
CAL POLY - 3rd Sat. ea. mo. 7-11am in lots F8,F9 and F10 @ CAL Poly Pomona at 3801 West Temple.
Talk-in TBD *(if you know, please email me... ed.)*

TRW ARC 33rd Annual Awards Banquet

Saturday November 20, 1999

Featuring Guest Speaker
Bill Pasternak, WA6ITF
Broadcast Engineer with KTTV Fox 11 Television and co-founder and volunteer Managing Editor of the Amateur Radio Newsline bulletin service.

Buffet style dinner
Awards, Fun, and Prizes

5:30 pm to 10:00 pm
See reverse side for sign up form

TRW AMATEUR RADIO CLUB BANQUET RESERVATION REQUEST

Join us for the 33rd Annual TRW/ARC Awards Banquet
Saturday, November 20th, 1999 5:30 PM to 10:00 PM

Buffet Dinner, Awards, Guest Speaker, Door Prizes, and Fun!

The Blue Moon
207 North Harbor Drive
Redondo Beach

An Employee Member may invite up to 2 guests. Non-Employee Members (including Retirees) may invite 1 guest. Due to limited seating, 2nd Guests *may* be bumped to make room for club members.

All reservation requests will be confirmed by mail no later than November 6th. If you do not receive a confirmation, please call Duane, WA6EIK, at (310) 813-4219 or Wendy, KQ6CG, at (310) 374-0795 to insure we received your reservation!

Return this portion of form ASAP! Reservations are First Come - First Served!!!

Club Member's Name: _____ Callsign: _____

1st Guest's Name: _____ Callsign: _____

2nd Guest's Name: _____ Callsign: _____

Address: _____

City: _____ State: _____ Zip: _____

TRW Mail Station: _____ Daytime Phone: (____) _____

Dinner Buffet includes Entrees, Salads, Side Dishes
Enclose $12 for each TRW/ARC Member dinner.
Enclose $15 for each Non-Member dinner.

Make checks (no cash please) payable to: **TRW Amateur Radio Club**

Send Reservation Requests to: Wendy Crawford
1637 Nelson Ave.
Manhattan Beach, CA 90266

(Thanks Dennis Santiago KQ6KR our 1999 Field Day Chairman for this submission)

ARRL Field Day - 1999

Call: W6TRW Novice: KE6GJI Country: USA
Section: LAX Category: Multi-Multi
Class: 7A

Band	CW QSO	CW QSO PTS	SSB QSO	SSB QSO PTS	DIG QSO	DIG QSO PTS
160	0	0	0	0	0	0
80	0	0	155	310	0	0
80N	0	0	0	0	0	0
40	361	1444	671	1342	0	0
40N	0	0	0	0	0	0
20	321	1284	986	1970	49	196
15	258	1032	672	1344	19	76
15N	0	0	0	0	0	0
10	0	0	142	284	0	0
10N	0	0	153	306	0	0
6	0	0	87	174	0	0
2	0	0	47	94	0	0
222	0	0	21	42	0	0
432	0	0	5	10	0	0
1.2	0	0	20	40	0	0
2.3	0	0	0	0	0	0
3.4	0	0	0	0	0	0
5.7	0	0	0	0	0	0
10G	0	0	0	0	0	0
24G	0	0	0	0	0	0
LHT	0	0	0	0	0	0
SAT	0	0	4	6	0	0
Mode Totals	940	3760	2962	5922	68	272

Total QSO 3970 note: All transmitters under 150 Watts.
Total QSO Points 9954 note: Satellite Points Computed as QSO's -1 x 2 pts

Bonus Points			
	Satellite Contact: station maintained operations for full 24-hours		100
	Public Facilities: Friendship Park, Los Angeles County, California		100
	Press Materials, Gifts, Visitors Log		100
	Emergency Power	Stations 7	700
	Message Origination		0
	Message Relay		0
	Natural Power		0
	W1AW Message		0
		Total Bonus Points Earned	1000

Total Score 10954

Operator List: See Attached

Equipment Description: See Attached

Club Affiliation: W6TRW Amateur Radio Club

This is to certifyy that in this contest we have operated our transmitters within the limitations out our license and have fully observed the rules and regulations of the contest.

Signature: _____
Dennis Santiago, W6TRW Field Day Chairman (aka KQ6KR)

Mailing Address: W6TRW Amateur Radio Club, W6TRW
One Space Park - S/1168
Redondo Beach, CA 90278

(Thanks Dennis Santiago KQ6KR our 1999 Field Day Chairman for this submission)

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Call: W6TRW Novice: KE6GJI Country: USA
Section: LAX Category: Multi-Multi
Class: 7A

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15N	0	0	0	0	0	0
10	0	0	142	284	0	0
10N	0	0	153	306	0	0
6	0	0	87	174	0	0
2	0	0	47	94	0	0
222	0	0	21	42	0	0
432	0	0	5	10	0	0
1.2	0	0	20	40	0	0
2.3	0	0	0	0	0	0
3.4	0	0	0	0	0	0
5.7	0	0	0	0	0	0
10G	0	0	0	0	0	0
24G	0	0	0	0	0	0
LHT	0	0	0	0	0	0
SAT	0	0	4	8	0	0
Mode Totals	940	3760	2962	5922	68	272

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Mailing Address: W6TRW Amateur Radio Club, W6TRW
One Space Park - S/1156
Redondo Beach, CA 90278

The LinkPlus Lincompex or — by Jim Harrison K6OUE

How TRW got Involved in the Ham Radio Business

Did you know that TRW was in the ham radio business? Would you believe that right now you can buy a ham radio product that was designed right here at Space Park? Believe it or not, it's true and this article will explain what it is and how that came about.

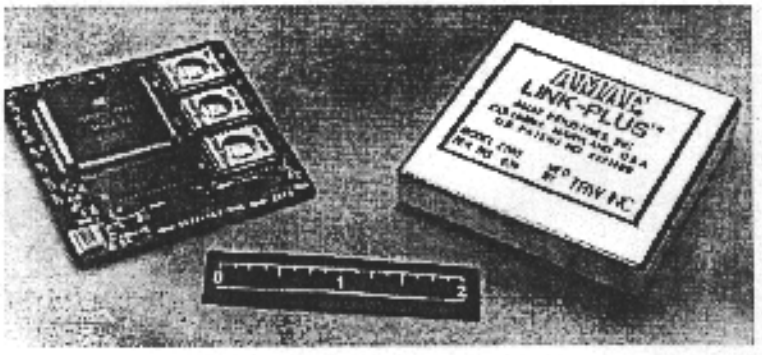
History

It all started in 1987 when a small company in Maryland by the name of AMAF contacted TRW LSI Products in La Jolla, California. AMAF had designed an all-digital lincompex as a nineteen inch rack mount unit and they needed some help in miniaturizing it. Their hope was that if they could get the unit small enough they could sell it to the military for use in walkie-talkies and mobile radios. TRW LSI Products proceeded to put the lincompex function into two digital signal processor (DSP) chips and got the design down to two medium sized circuit boards. AMAF was pleased with the results, but they wanted to get the size down even more. LSI Products felt that this was not really in their product line, and that they did not have much capability in electronic system packaging, since they were a commercial IC manufacturer. Therefore, they referred AMAF to TRW Space Park. We had our first meeting with AMAF in 1988.

By now I am sure you are asking, "What is a lincompex?" Lincompex is an abbreviation for "link compressor and expander." At the transmitter end of a radio link it compresses the amplitude of voice the same way the voice compressor on your HF radio does. However, the lincompex compresses voice more than a standard compressor does. At the receiver, the lincompex expands the voice amplitude back to its normal levels. Obviously, a lincompex unit is required at both ends of the link. The result of this is to maximize the signal to noise ratio of the link, maximize the transmitter's efficiency, and transmit greater distances.

Lincompex units were developed in the 1960's for radiotelephone use. The original long distance telephone links were at HF or VHF frequencies before the telephone companies went to microwaves. In fact, AMAF told us that the Soviet Union and some other countries still used HF for their long distance telephone service as of 1988. Lincompex units reduced the noise and fading on these links. The first lincompex's were the size of an entire 19-inch rack and were analog which required some maintenance and adjusting. So AMAF's all-digital lincompex was a great improvement in size, reliability and maintainability. However, sales to the telephone industry were dropping, so AMAF was targeting military radio and marine radio, and for these applications they needed to get the size even smaller.

TRW Designed Link-Plus Lincompex Module



In 1988 in the Ground Systems Center in building M5, we began redesigning the Lincompex. I was responsible for designing the electronics, and I chose the Motorola 56000 for the digital signal processor. A software engineer began translating the software that had been written at LSI Products for the Texas Instruments DSP's, to the Motorola DSP, and a product engineer started working on the packaging. Greg Shreve KE6YEX was also involved in the systems engineering. We got the size of the lincompex down to a single circuit board 2 inches on a side. This was then packaged into an aluminum can to make a self contained module. TRW EPI of Colorado Springs, Colorado, were involved early on to help make the unit manufacturable, and in 1989 they did an initial production run of 200 units. AMAF was then to start marketing them, and when larger orders came in, TRW EPI would produce more units. TRW was to get a royalty on each unit sold. In 1992 AMAF changed their name to the LinkPlus Corporation to improve their identification with their product. In 1994 they asked us to modify the DSP code so that the units could be used with marine radios to increase their marketability.

How does Lincompex work?

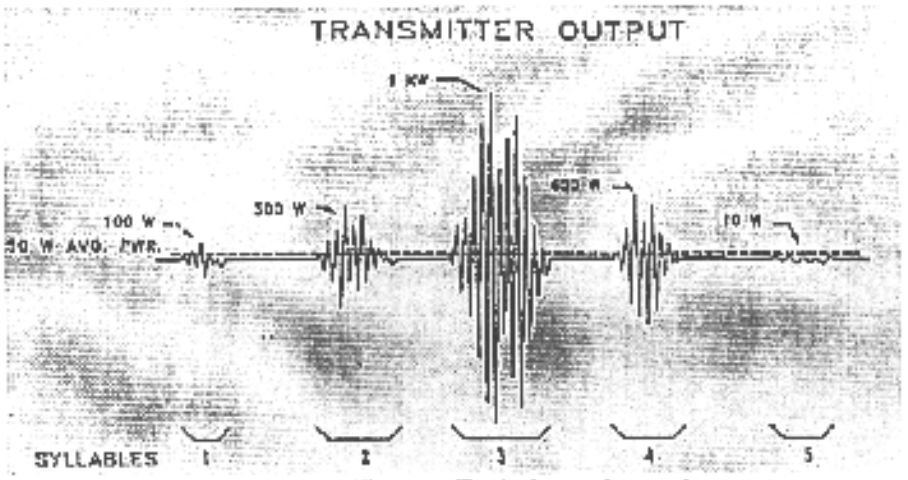
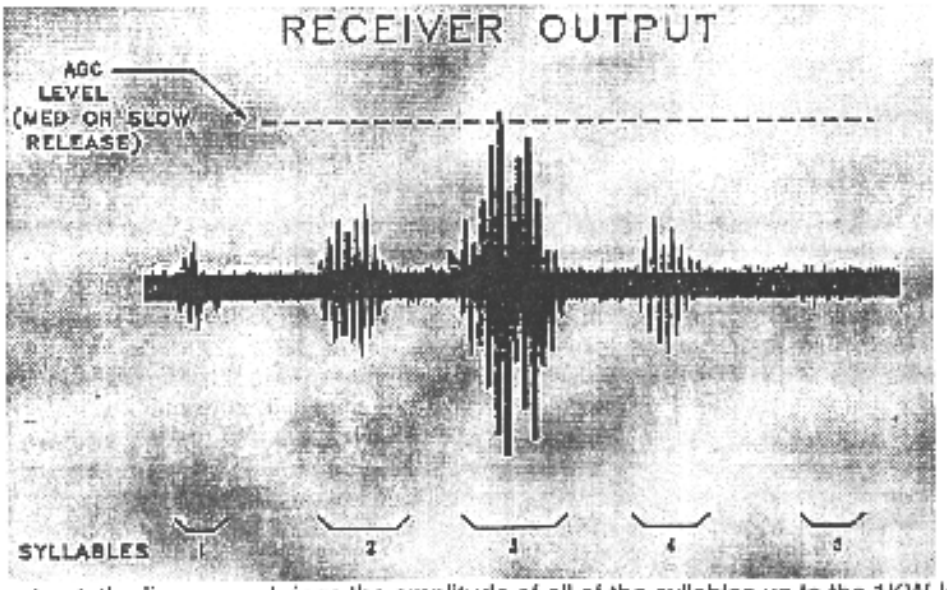


Figure 1 Typical speech waveform

Figure 1 shows a typical speech waveform. If this speech waveform is AM or SSB modulated and sent to a 1KW amplifier, only the highest peak of the speech will actually be transmitted with 1KW. The average transmitted power is only 50W, and the fifth syllable is only 10W. If you are using a 100W transmitter at home, your average transmitted power is only 5W! This is why CW goes so much farther than voice, your transmitter is putting out its maximum power whenever you key down. When noise is added to this signal, as in Figure 2, the low level syllables are completely lost.

Figure 2 Speech waveform plus noise



In contrast, the lincompex brings the amplitude of all of the syllables up to the 1KW level as shown in Figure 3. Now you are getting the full use of your 1KW amplifier. Low level syllables that would have been lost in the noise are now well above the noise level.

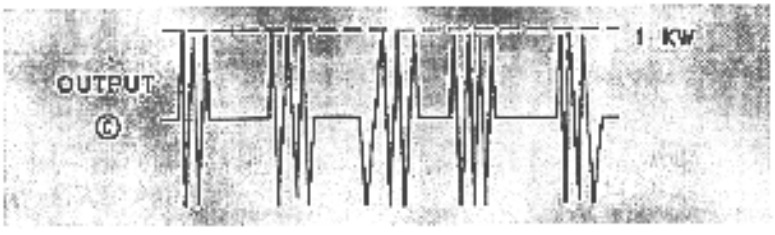


Figure 3 Lincompex processor output to transmitter

But how is the receiver to know what the original amplitude of each syllable was so it can reconstruct the signal? The transmitting lincompex injects a tone into the speech signal whose frequency is proportional to the original speech amplitude. This tone varies between 2800 and 3000 Hz, which is above the voice bandwidth but still within the passband of the radios. The transmitted spectrum is shown in Figure 4. The control tone is like an FM modulated subcarrier. The receiving lincompex detects this tone, filters it out so the listener doesn't hear it, and restores the amplitude of each syllable, as shown in Figure 5. Note that when the receiving lincompex reduces the amplitude of the lower level syllables, the noise is reduced the same amount, so that all syllables have the maximum signal to noise ratio. And the spaces between syllables are almost completely silent. So it sounds similar to talking on a telephone.

Figure 4 Lincompex spectrum

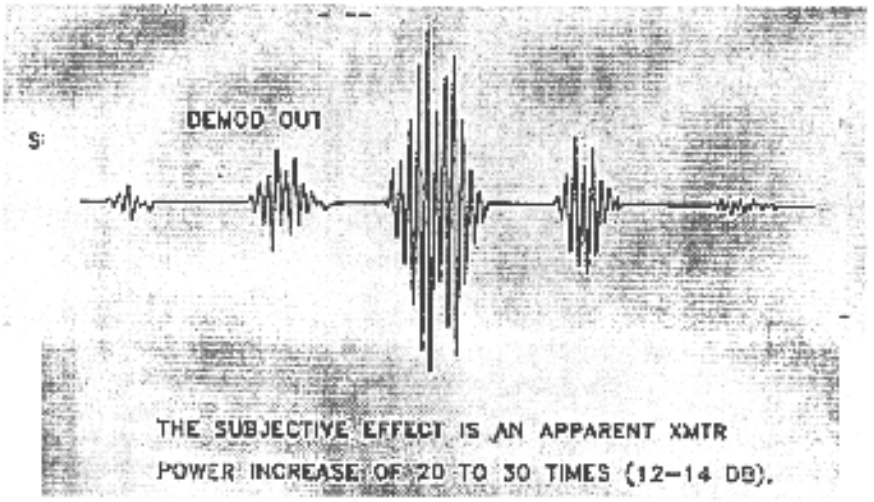


Figure 5 Lincompex output to listener at receiver

There is one problem however, what if the receiver is mistuned? The control tone will no longer be the correct frequency and the lincompex will not decode properly. LinkPlus solved this problem with a patented calibration method. At the beginning of each transmission their lincompex transmits a constant 2900 Hz tone with a sequence of amplitude shifts. The receiving lincompex looks for this particular sequence, and when it detects it, it knows that the control tone should be exactly 2900 Hz. If the tone is off frequency, the lincompex stores the difference and uses it to compensate all further measurements of the control tone. The calibration sequence is sent every time the PTT button is pressed and only lasts about a third of a second.

While we were developing the lincompex here at TRW, the LinkPlus engineer asked if we could use the knowledge of the control tone offset to correct the voice spectrum as well. I said that it would actually be quite easy since we were doing everything in the DSP chip. It would be a matter of complex modulating the voice spectrum up or down in frequency the same amount as the control tone offset. This would be difficult to do in actual hardware because it might mean a translation of only a few hertz, but this kind of thing is ideally suited to DSPs. We implemented this autotuning feature and it worked perfectly. It made a very impressive demo to tune the radio off a 100 Hz, hear horrible "duck talk", then press the calibrate button and instantly the voice was perfectly tuned in. Note that it does not retune the radio, this compensation is all being done at baseband.

Whatever happened to the LinkPlus/TRW Lincompex?

While we were working on the development of the Lincompex at TRW, it became obvious to myself and Greg Shreve that it would be very useful for amateur HF/VHF SSB communication. We mentioned this to LinkPlus but they dismissed the amateur market as too small. However, their military markets never materialized, the military considers HF to be only a backup technology and they are not interested in putting any more money into it. LinkPlus never sold all 200 of the original units and TRW never received any royalties, LinkPlus saying that they were already in debt. TRW eventually severed their relationship with LinkPlus.

So, whatever happened to LinkPlus? They are still in business, but at a very low level. And they are now marketing the lincompex to amateurs. They have a unit for ham use called the LinkMate (Figure 6) which contains the lincompex module and comes with a microphone and built-in speaker and operates off of 12 volts. They sell interface cables for all the leading amateur radios. Their web site has a list of LinkMate users so you can find other hams to talk to with your LinkMate. In May 1996 the ZL8RI Kermadec Islands DXpedition used two LinkMate units for communication between the DXpedition site and their base station in Florida. When they

would be in contact with the base station for logistical communications, other hams would try to contact them. They said that the LinkMate units rejected other communications and enabled them to talk over the QRM. They also used the LinkMate in simple compression mode during some of their DX QSOs and were given compliments on the voice quality and "punch thru" ability of their signal.

The LinkMate can be purchased directly from their web site at http://www.linkplus.com for $495 plus $5 shipping. The price may seem high, but remember that it is still being produced in small quantities. The obstacle to its acceptance is the fact that a unit is needed at each end of the link. But a good application would be if you have a daily or weekly contact with the same person on HF. If each of you had a LinkMate the contacts would be as solid and noise free as a telephone conversation. Remember also that the LinkMate can be put into one way compression mode and can be used as a super compressor to bust thru pileups when you are trying to get that rare DX. Maybe the club should buy one or two units and get ourselves listed on their circle-of-users web page. It seems like a good idea since we designed it. Let me know what you think.

Figure 6 LinkPlus LinkMate for amateur radios

TRW AMATEUR RADIO CLUB

ELECTED OFFICERS

President	**Greg Shreve**	**KE6YEX**	**201A/3009**	**(310) 812-2079**
Vice President	**Elizabeth Kunkee**	**KS4IS**	**D1 / 1024**	**(310) 813-0524**
Secretary	**Craig Gullickson**	**N6ED**	**R6 / 2529F**	**(310) 812-5389**
Treasurer	**Steve Lambert**	**KQ6ZC**	**R6 / 2529**	**(310) 812-5019**

APPOINTED STAFF

447 Repeater Autopatch	Duane Park	WA6EIK	M2N / 1384b	(310) 813-4219
Activities Chairman	Greg Martens	N6RRY	M1 / 1275	(310) 813-4049
Crosstalk Editor	Duane Park	WA6EIK	M2N / 1384b	(310) 813-4219
Emer. Comm. Coordinator	Wendell Young	KE6ASC	R5 / 1060B	(310) 813-7691
Librarian	Steve Papa	KO6VF	O2 / 1715	(310) 812-5305
Membership Chairperson	Dave Nelson	AB6DU	R8 / 2144	(310) 813-9775
Past President	Elizabeth Kunkee	KS4IS	D1 / 1024	(310) 813-0524
Publicity Chairperson	Dave Nelson	AB6DU	R8 / 2144	(310) 813-9775
QSL Manager	Bryan DeAro	KN6OW	120 / 1020B	(310) 812-4789
S.P. Packet/Internet Sysop	Chris Wachs	WA2KDL	M4 / 2375	(310) 813-1506
SEA Representative	Nina Whiddon	KN6FL	01 / 2020	(310) 813-9351
Swap Meet Manager	Greg Martens	N6RRY	M1 / 1275	(310) 813-4049
Technical Chairperson	John Cheatham	KE6OJM	R9 / 2477	(310) 813-5903
Training Chairperson	Bryan DeAro	KN6OW	120 / 1020B	(310) 812-4789
Trustee of W6TRW License	Elizabeth Kunkee	KS4IS	D1 / 1024	(310) 813-0524

TRW ARC Hotline (Club Answering Machine)	(310) 813-8569
W6TRW 2 Meter Repeater (Open Repeater)	145.32 (-600) PL 114.8Hz
W6TRW UHF Repeater (Open Repeater / Closed Autopatch)	447.00 (-5 MHz) PL 100 Hz
W6TRW-3 Packet Radio Internet Gateway and BBS (1200 Baud Port)	146.745 (-600)
W6TRW Internet Home Page	http://www.w6trw.ampr.org/w6trw/

TRW Amateur Radio Club
S/1156
One Space Park
Redondo Beach, CA 90278

FIRST CLASS

Deliver To: