★ THE ★ MINUTEMAN

THE OFFICIAL NEWSLETTER OF THE MMRA

VOL. 4 Bicentennial 1776-1976 NO. 1

FEBRUARY, 1976

TECHNICAL TOPICS

THE UPS AND DOWNS OF TOWERS

The Gods must look with favor upon us!

Typically a "Ham" will take a commercially available tower of appropriate height (which is rated for a maximum of 3 square feet of projected area mounted at the apex) load it with 8 square feet of antenna on a 20' mast, balance it on a minimum base, guy it to any available point within range, and remain blissfully unaware that wind loading during a routine winter storm could easily exceed 22000 ft/lbs.! Yet it stays up!

This series of articles will attempt to explain some of the stresses involved, and calculations necessary to produce a sound antenna installation. You will need only pencil, paper, and a calculator with trigonometric functions.

First consider the loads encountered on an antenna: 1) wind loading, 2) dead load, 3) ice loading (which adds to both wind loading and dead load). Dead load can be ignored, since an installation designed for wind and ice loading will be more than adequate for dead loadings imposed.

Taking advantage of a design allowance that states "for cylindrical surfaces, take 2/3 of the frontal area," to compensate for a 50% ice loading, we can use the full calculated frontal area which will exactly balance the ice loading.

So, on with the calculations:

Assume for example, a 6 element beam for 50 MHz, horizontally polarized at the top of a 42' mast. On the same mast at 6' above the tower, an array of 4 11 element antennas for 147 MHz vertically polarized (arranged in an H frame).

"THE MINUTEMAN" is the official Newsletter of the Minuteman Repeater Association and is published monthly. Letters to the Editor are strongly encouraged, but they must be signed. Name and Address will be withheld if requested. Material for the "MINUTEMAN" should be sent to the Editor, Dan Heather, WA1VOK, 7 Darren Dr., Brockton, Ma. 02401.

The Minuteman Repeater Association supports three repeaters in the eastern Massachusetts area. They are: 146.01/146.61 in Marlboro, 146.07/146.67 in Quincy and 146.22/146.82 in Weston. All Amateur Radio Operators are invited to use the machines and join the fun and fellowship of our Association. General correspondence to MMRA should be sent to P. O. Box 282, Wayland, Ma. 01778.

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Step 1 - List in Tabular Form the following:

Antenna Number	Element Dia.	Element Length	Number of Elements	Boom Dia.	Boom Length	Height	
1	.5"	117"	6	2"	24'	12'	
2a	.1875"	40"	11	1"	12'	6'	*
b	.1875"	40"	11	1"	12'	6'	
c	.1875"	40"	11	1"	12'	6'	
d	.1875"	40"	11	1"	12'	6'	

*Dist. to center of array from top of tower.

Step 2 - Convert all dimensions given in inches to decimals of a foot.

(e.g. 3/16" = 0.1875" ÷ 12 = .016')

(117" ÷ 12 = 9.750')

Step 3 - Calculate element and boom areas for each antenna (keep separate totals) and list in tabular form as follows:

1) Element Dia x Element Length x Number of Elements

2) Boom Dia x Boom Length

Antenna Number	Hor. Polarized Element Area	Vert. Polarized Element Area	Boom Area
1	2.457	---	4.000
2a	---	0.587	1.000
b	---	0.587	1.000
c	---	0.587	1.000
d	---	0.587	1.000
TOTAL	2.457	2.348	8.000

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Step 4 - Visualize the H frame and assume that there are 4 additional booms being used for stacking, 2 horizontal (which will be treated as horizontal elements) and 2 vertical (to be treated as vertical elements) each 1 1/2" dia. by 7' long. Calculate the areas of the additional booms and list in columns as follows:

Horizontal	Vertical
0.875	0.875
0.875	0.875
1.750	1.750

$\frac{1.5''}{12} \cdot \left(\frac{84''}{12}\right) = 0.875^{1}$

Step 5 - Add horizontal boom total (from Step 4) to horizontal element total (Step 3)

1.750 + 2.457 = 4.207

Add vertical boom total (from Step 4) to vertical element total (from Step 3)

1.750 + 2.348 = 4.098

Step 6 - Divide boom area (from Step 3) by horizontal total (from Step 5)

8.000 ÷ 4.207 = 1.902

The result is the tangent of the wind angle which will produce maximum wind loading on your array.

If you now push the TAN^{-1} button on your calculator you will discover two things:

1) Whether your calculator works in radians or degrees, and

2) What your critical wind angle is.

If you don't get 62.26 degrees, for this example, multiply your answer by 57.29578 (write down the other number which should be 1.087, you will need it later).

Step 7 - For each antenna list the following:

	Area of Horizontal Elements (Including Hor. Booms for Stacking) (Area 1)	Area of Vertical Elements (Including Vert. Booms for Stacking) (Area 2)	Boom Areas (Area 3)
1	2.457	---	4.000
2a, b, c, d	1.750	4.098	4.000

Step 8 - For each antenna calculate the following:

$40 \left[(\text{Area 1} \times \cos\phi) + (\text{Area 3} \times \sin\phi) + \text{Area 2}\right] = \text{Load}$

ϕ = Angle from Step 6 (Depending on your Calculator) Radians or Degrees

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Answers for this example:

1 = (4.684)(40) = 187.360#

2 = (8.453)(40) = 338.101#

Step 9 - For each antenna multiply load (Step 8) by height above tower (Step 1) and total load and moment:

Antenna #	Load	Height	Moment (Ft-Lbs)
1	187.360	12'	2248.320
2	338.101	6'	2028.606
TOTAL	525.461#		4276.926 Ft-Lbs

Step 10 - Divide moment by load (totals from Step 9):

4276.926 ÷ 525.461 = 8.139'

This is the point at which total load (526# from Step 9) can be considered to act, measured from apex of tower.

This concludes the first article in the series. Consider that if the example array is mounted on a 60' tower then the force trying to overturn your tower is

526# x (60' + 8.2') = 35,873 ft. lbs.

The next article will detail loads on the tower itself and calculation of foundation and guying to keep it from overturning.

de WA1IMS

(Ed. Note: Dick is obviously a very talented Structural Engineer and I would like to thank him for taking the time, a great deal of it no doubt, to prepare this article. I will have to admit, however, that when a tower goes up in my yard, a phone call to WA1IMS is in order because I start to get scared somewhere around step 3 or 4.)

CONTINUED

Quiet, Genius At Work!

A group of Hams discussing their membership in Radio Clubs discovered the following: each Ham belonged to exactly two Radio Clubs; each Radio Club was represented in the group by exactly three Hams; every possible pair of Radio Clubs had exactly one member of the group in common. How many Hams were in the group, and how many different Radio Clubs were represented?

Answer to last month's useless question is:

$$-(1.8 \times 10^{-6}) + (0.9 \times 10^{+3}) + (9.0 \times 10^{2})$$

(Ed. Note - please send in any puzzles or brain benders that you think might tie up our amateur experts for a couple of hours.....or days. Include your answers so that the Ed. doesn't look dumb, okay?)

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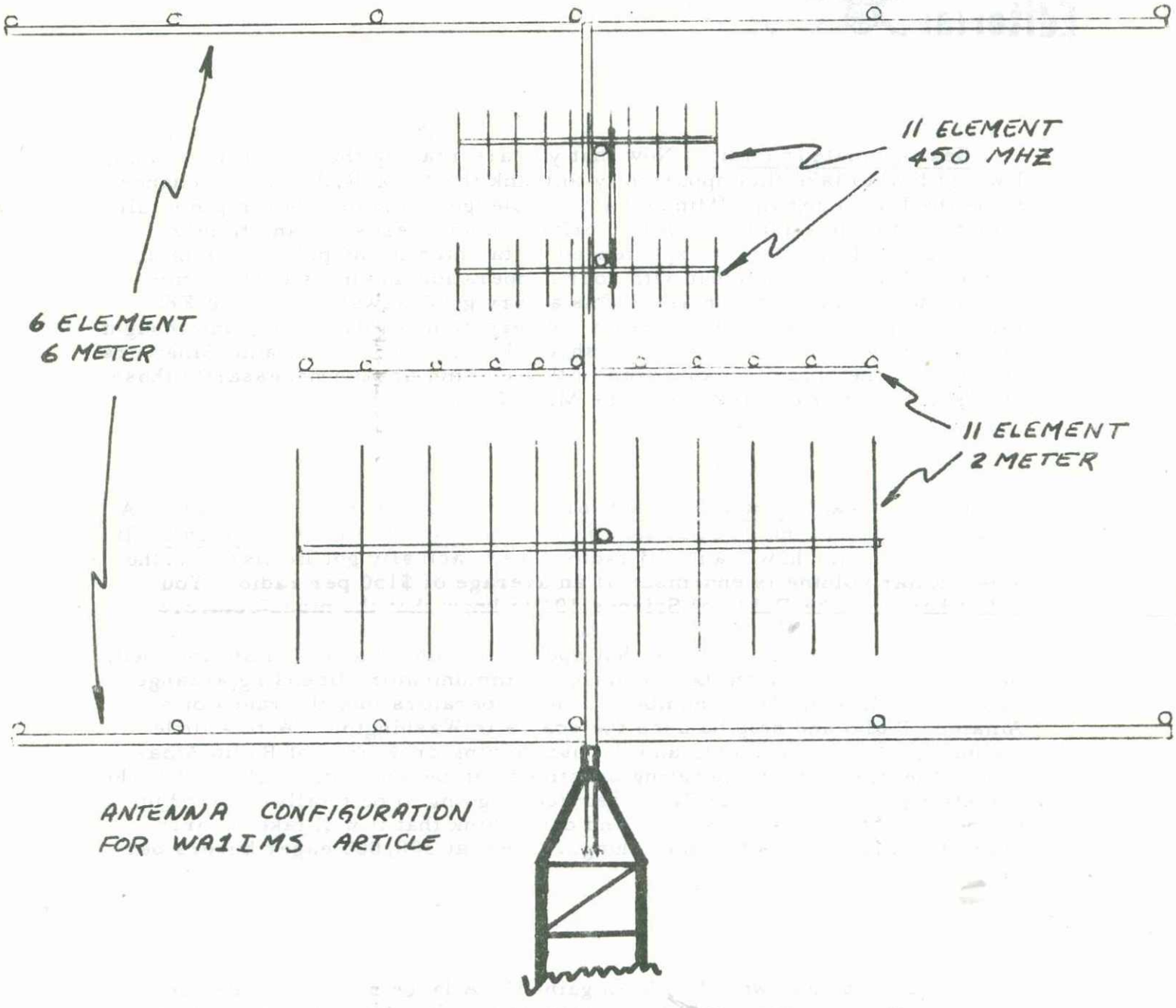
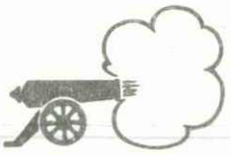


ANTENNA CONFIGURATION
FOR WA1IMS ARTICLE

Board of Directors' Report

NOT AVAILABLE THIS ISSUE

Editorial



Sex in Amateur Radio. Now that you are reading the Editorial column, I would like to take this opportunity to thank the M.M.R.A. for the chance to be the Editor for the "Minuteman." I pledge to the membership my full efforts and enthusiasm in order to bring you an interesting and timely Newsletter. I'm not very experienced or talented in the publication of a periodical such as this, but with your cooperation and news contributions we can have some real fun as well as a very good Newsletter. The Editorial column will attempt to create conversation, controversy, and thought on subjects which are, or perhaps should be, of interest to Radio Amateurs. Of course, the opinions expressed in this column are not necessarily those of the Board of Directors nor of the M.M.R.A.

Citizens Band Is Really Great for the manufacturers of CB radios. A recent rumor has the F.C.C. issuing around 300,000 licenses a month! If you then consider how many CB radio owners actually get licensed....the sales dollar volume is enormous at an average of $150 per radio. You didn't have to take Political Science 101 to know that the manufacturers are going to pressure Washington into providing frequency spectrum and privileges to the Radio Service that spends the most money. I am inclined, therefore, to agree with the proposed "Communicator" licensing arrangement. It will pump large numbers of new operators into the ranks of Amateur Radio and help balance the scales in Washington. With a little planning, law enforcement, and the ostracizing pressures of Radio Amateurs, the dreaded CB operating practices can be avoided. We've got to do something or the Amateur Radio Service is going to be totally covered up by the heel of the giant's shoe. And don't think that it will take 10 or15 years for any changes to come along.....not at 300,000 eager buyers per month!

Move 01/61 and what has been gained? A large number of members in the northern sector would be pleased as punch. And a large number of members in the western sector would be downright mad. Tough decision! I'm glad that the Board doesn't claim me as a member when this vote is taken. But why is the issue so narrow? Can't we formulate a plan that will satisfy both sides in this controversy?

My suggestion.....leave 01/61 where it is and immediately turn our technical experts to the problem of providing coverage for our present and future members in the north. The only problem then is money. At least that's a black and white problem with a number of workable alternatives. Trying to solve the present controversy is sort of like trying to push a rope up a chimney.

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What's Wrong With "CQ 22/82"? Would someone please tell me why simply saying, "CQ 22/82, this is WA1VOK" is so improper? Certainly gets the point across in a succinct format. Seems like QRZ has somehow evolved into the traditional CQ during the trip up from the low bands. I looked up the meanings of those two abbreviations in the ARRL "Operating Manual" just to refresh my memory. It didn't help explain the metamorphosis at all. So I went to the ARRL "FM and Repeaters" book. That stated that the best one word description of good FM operating procedure is "concise." Every time I count it, CQ keeps coming out one letter shorter than QRZ.

See you next month and — "Keep those cards and letters coming!"

73's Dan WA1VOK

REPEATER STATUS REPORT

07/67

SIX SEVEN SCUTTLEBUTT

As soon as this article is published the machine will probably break down. But, at the risk of incurring Mr. Murphy's wrath, I must congratulate the technical types on the reliability of the 67 machine. Let's hope it continues.

On the subject of the autopatch, it has been noted that some of the members have been having a bit of trouble clearing the patch. They are reminded that depressing the # button will immediately clear the patch. Any button held for about 3 seconds will also clear, but the # is immediate.

As of 1/11/76 a 10 second delay has been installed in the autopatch tape recorder so you may I.D. anytime up to 10 seconds after clearing the patch.

We are looking forward to the installation of a tone pad test facility in the very near future.

If anyone has 220 MHZ capability, please let me know(or any member of the technical crew) as we will be shortly conducting some experiments on 220 from the Quincy site.

We are all pleased to have W1ZFD and W1MA back on after their hospital stays.

"Nuff sed" for now,
BCNU
Warren W1UIQ

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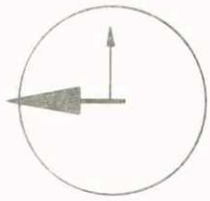

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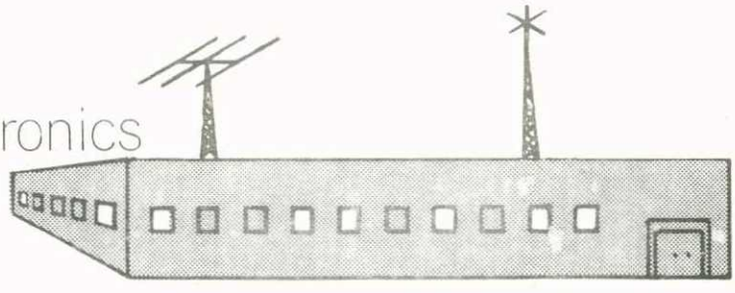
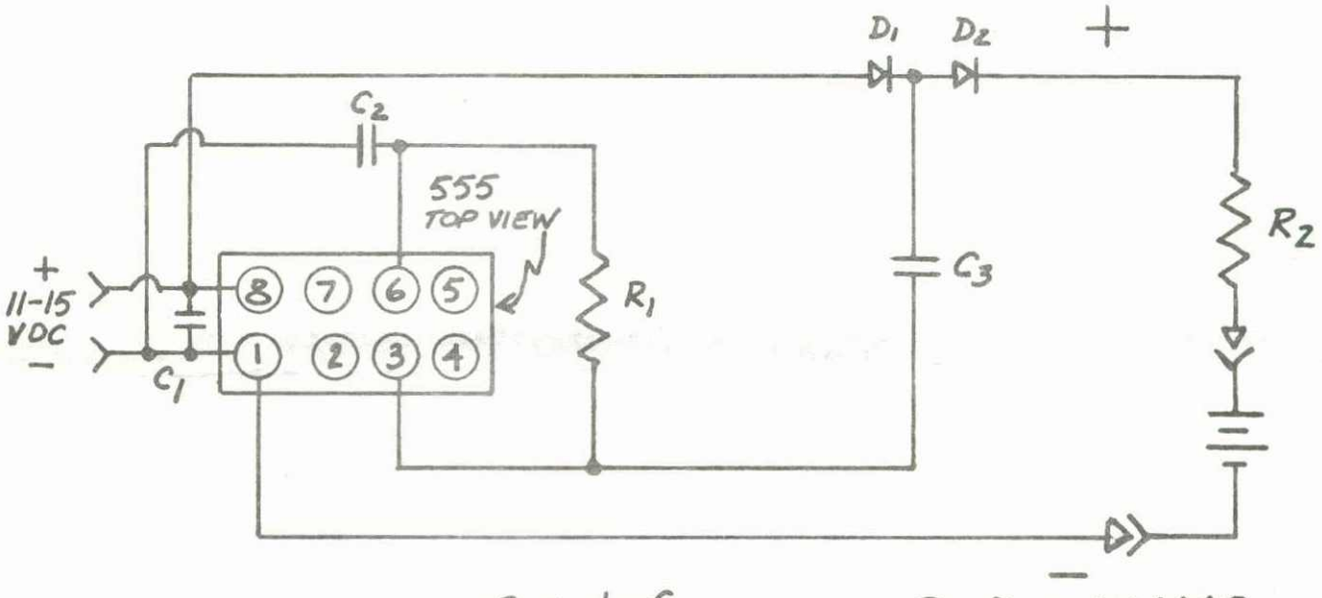


CONSTRUCTION PROJECTS

You Will Get A Charge Out Of This!

HT 220 walkie users may wish to charge their 15 volt NICAD packs from their 12 volt automobile battery, where 115 volt power is not available. This circuit, using a Cheapie 555 IC, 2 resistors, 2 diodes, 3 capacitors will charge at any rate up to 40 MA, depending on the value of R2. The automobile battery can be anywhere from 11-15 volts. W1JSH has one in use currently. This circuit is also useful for NICAD battery packs running 15 volts or less. R2 is selected for desired charging current.



C_1 – 1μf.
C_2 – .001μf. DISC
C_3 – 10μf.

D_1, D_2 – 1N4148
R_1 – 33K, 1 W
R_2 – SEE TEXT

de W1JSH Mort
WA1HON Eric

LETTERS to the Editor

"LETTERS TO THE EDITOR" is a section of the Newsletter intended to give the members a place to speak their minds. It will be totally "unedited" and All letters will be published (assuming they are written in good taste). Isn't there something you have been wanting to say or suggest? Scratch it out now and send it in, okay?

Questions & Answers?

All members are requested to submit questions of any nature to the Editor for inclusion in this section of the "MINUTEMAN". The best available talent will be used in answering the questions in order to provide the entire association with helpful information. If you have a question you'd like answered, jot it down (in long-hand, of course), and send it along. NOW!

FOR SALE- BASE (AND MOBILE) STATION: IC-21 (10 watt, 24 channel) plus receive VFO plus TT pad.. Operates on 110 vac or 12 vdc. Includes xtals for all 146 MHZ repeaters plus tuneable receive. Excellent condition and on the air. New cost well over $500. (excluding xtals). $400. firm. K1JDF, Paul, 828-5228.

FOR SALE- Sony stereo cassette player for auto. Craig stereo 8 track player for auto. BC221 frequency meter. Phonemate model 400 telephone answering system. Dual model 1019 turntable. W1JSH, Mort Grant, 657-7940 home, 547-2580 office.

FOR SALE- DIGITAL VOM- Data Precision Model 245, 4½ digits, DCV, ACV to 1 KV, AC Ma, DC Ma to 1 Amp., R to Rx10 Meg.,small and portable, 6"x3-3/4"x2". Use with internal batteries or with AC adapter. Mint condition with carrying case, AC adapter, test leads and full manual. Original price $285- asking $175 or best offer. K1RAK, Lou Savoie, 767-1638

FOR SALE- GERTSCH FM 3 SIG GENERATOR, VHF freq meter with DM 1 Peak Deviation Meter included. AC operated, .001% accuracy, fundamental range 20- 40 MHZ with 40- 400 MHZ and 400- 1000 MHZ harmonics, Excellent Condition. DM 1 Deviation Meter battery operated- batteries not included. All manuals included. Asking $110 or best offer, open to negotitate. K1RAK, Lou Savoie, 767-1638

STOLEN IN WALTHAM 12/5/75- Heathkit HW202, black outer case, engraved on inside of chassis- K1IXX 07435. Contact Frank McInnis, 481-2073, 891-0400.

CONTINUED FROM PREVIOUS PAGE

FOR SALE-COLLINS 32S1, Mint condition,spinner knobs, manual, $375 W1BGW, 327-8950.

FOR SALE- Selling home and moving to Florida. MUST SELL equipment, all in like new condition. Heathkit HW-7 QRP and AC Supply $65. Clegg FM 27B latest model 4 pos. rotary switch and ALL modifications $295. Collins like new KWM-2 with Waters Rejection Tuning, NEVER MOBILE, $695. Collins 312B-4, $150. Collins 399C-1, $150. Collins 516F-2, $135. Collins MP-1, $175. Collins 51J4 with 3 filters and ALL NEW tubes, Excellent, $395. Collins KWM-1 with NEW SET RCA spare tubes, old but Excellent, $295. Henry 2K, like new with 4 NEW spare tubes and 2 NEW spare 3B28's, $550. Prefer local pickup and inspection, but will ship prepaid. Bob Anderson, 428 Central ave., Milton, Ma. Tel evenings 698-9337, days 227-2981.

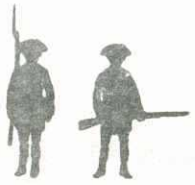


PHOTO PAGE

The "PHOTO PAGE" will contain photographic pictures of subjects of interest to MMRA members. Questionable or risque photos should be sent to the Editor for clearance. They will not be published or returned. Black & White prints of "snapshot" size (glossy or matte finish) would do very nicely. C'mon gang, start sending in those events your lens has caught. I would like to know if someone could be called upon to do some photo journalism at MMRA activities. If so, please drop me a line so we can get started. The pay isn't very good, but it's great fun!

A Word From The PRES....

NOT AVAILABLE THIS ISSUE

MMRA NEWS '76

This section needs little explanation. What it needs is a little news. Please send in anything that you consider to be general news. Sueh as..... Al, WA1TOU has a new FM 27B; Steve, W1WSN and Jack W1DXQ spent some time in Florida(tough duty,huh?); Jim, WA1LUV is running radio theory and code classes in Stoughton; Lou, K1RAK is building an ST6 for RTTY; Paul, W1GRN has built a 250 MHZ counter.....I'm sure that a lot more is new, so why not write in and tell me!

Someone asked me how long an artiele or news item 'had' to be for the Newsletter. This one is already too long. Get the message? --Ed.

Coming Events

--ELECTRO 76 IEEE Show in Boston May 11-14

--MMRA General Meeting [tenative] March 8

$ Treasurer's Report $

AS OF 12/31/75

ALL BILLS PAID Balance $3746.80

BUDGET STATUS

F/Y Budget	YTD Expenditures	% Expended
$6765.00	$2105.72	31.1

Public Service Committee

The Public Service Committee membership is presently as follows:

Dan Hamilton	W1AEQ	Belmont
Arthur Canorlengo	WA1GRH	Woburn
Robert Salow	WA1IDA	Newton Highlands
Weston Lant	W1IPA	Carver
Pat Desalvatore	W1NOG	Melrose
Robert Gibbons	W1REP	Canton
John Aversa	WA1RLX	West Roxbury
Ron Marshall	W1TNK	Foxboro
Wm. Seneabaugh	K1UAQ	Wilmington
Joe Aversa	K1UVD	West Roxbury
Stewart Johnson	W1UVE	Newton Upper Falls
Dan Heather	WA1VOK	Brockton
John Trembly	K1WFZ	Burlington
Steve Rudin	W1WSN	Stoughton
Charles Evans	W1WUL	Melrose
Paul Sowsy	W1GRN	Brockton(Comm. Chrmn.)

A word of thanks to these gentleman for a job well done. After all, Public Service is what Amateur Radio is all about, remember? Next's months Newsletter will cover some of the activities going on in the P.S.C.

MMRA NEWSLETTER

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