

W6VIO CALLING

JUNE



JUNE 1991 Volume 20 No. 6

Jet Propulsion Laboratory
W6VIO CALLING M/S 264-419
Attn: Eileen McKinney
1800 Oak Grove Drive
Pasadena, California 91109

BOARD

PRESIDENT: ART ZYGIELBAUM WA6SAL
VICE PRES: CARL DE SILVEIRA KG6LG
SECRETARY: WALT DIEM WA6PEA
TREASURER: JIM KESTERSON KA6IBF
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EMERGENCY COMM COORD: WALT MUSHAGIAN K6DNS
DIRECTOR AT LARGE: MARK SCHAEFER WB6CIA

CLOSED REPEATER TRUSTEE: WALT DIEM WA6PEA

EDITOR: EILEEN McKINNEY KA6DGV

Club Meetings:

Everyone is encouraged to attend - Bring your lunch.

12 Noon

Program - Second Wednesday of month in 238-543

Business - Fourth Wednesday of month in 180-703B

Newsletter Article Deadline: The 5th. day of each month. If the 5th. falls on a weekend, the following Monday will be the deadline.

Your articles, ads, photos, diagrams, Letters to the Editor, or technical instructions should be submitted to Editor at address above.

EXCHANGE CLUBS: PLEASE NOTE ADDRESS ABOVE

Permission is granted to copy enclosed articles providing credit is given to "W6VIO CALLING".

REMEMBER FIELD DAY: JUNE 21,22,23: MT. GLEASON

SEE FIELD DAY INFORMATION KIT PREVIOUSLY MAILED OR CALL COORDINATORS ON PAGE 5; RETURN FORM ON BACK PAGE

GETTING THERE

The following distances are approximate.

Please use 224.080 as a talk-in frequency. Use the repeater when you are far out and simplex on the output when you are close to the field day site. You may also use 145.28 simplex on two meters.

NOTE: When you get to the site, there will be a locked gate. We will have someone at the gate during peak hours. If no one is there, call on one of the two frequencies (simplex) and we will get someone down to open the gate for you. If all else fails, it is about a 1/4 mile walk from the gate to the site.

Take Angeles Crest Highway north from the 210 freeway in La Canada.

When you get to the Clear Creek Ranger Station, turn left on Angeles Forest Highway toward Palmdale. That is approximately 9 miles above La Canada.

Stay on Angeles Forest Highway past Hidden Springs and the Mill Creek Campgrounds.

Approximately 12 miles north of Clear Creek Ranger Station, at Mill Creek Summit, you will come to Mt. Gleason Road (there is a small sign). If you happen to see Alliso Canyon road, you have gone too far!

Head up Mt. Gleason Road. All turns are very obvious. If you have any doubts, call us on the radio. You will travel about 6 1/2 miles to the Field Day site. You will know you are there by the locked gate.

FACILITY NEWS

By Jerry Hawkes, W6WXL

The second set of guy lines has been installed on the new tower by the water tanks. A work party should be organized to lower the summer antenna for reorientation and a check for the 40M problem. We'll need about 4 to 6 people for the job. If I can get the helping hands for Saturday, July 20th., we'll have a party.

Walt and I will string a 40M & 80M antenna from the 3rd level of the new tower at some future date. The antenna is being made now. Coax "A" on the patch panel in the shack now has a 40M dipole inverted "V" hung from a ladder on the West water tank. By the way, the new tower is now fully extended, thanks to tower climber Len Ricardo- VK1LR. Thanks to all. Jerry Hawkes W6WXL

NEWLY REVISED 220MHz BAND PLAN by Walt Diem, WA6PEA

The 220 SMA met on Saturday June 1, 1991 at the Los Angeles Police Department's Parker Center Auditorium and adopted a revised band plan reflecting the FCC's deletion of 220-222 MHz from the Amateur Band.

There were three separate proposed band plans. One was prepared by the 220 SMA membership at the April 13, 1991 General Meeting. Another was prepared by the 220 SMA Frequency Board. A third proposed plan was prepared by Jim Fortney (K6IYK).

The proposed plan prepared by the 220 SMA membership at the April 13, 1991 General Meeting would have eliminated 8 existing repeater channels while increasing weak signal from 100 KHz to 160 KHz and providing 180 KHz for Packet. That proposed plan was quickly rejected. The K6IYK proposed plan would have eliminated 5 existing repeater channels, reduced weak signal from 100 KHz to 70 KHz, and provided 180 KHz for Packet (divided into 2 sub-bands). The plan proposed by the 220 SMA Frequency Coordination Board would maintain the existing 69 repeater channels but would provide only 40 KHz for packet, provide 20 KHz for weak signal, and place weak signal between repeater inputs and simplex. This proposed plan was modified to move weak signal to the bottom of the band and to provide 80 KHz for packet. The 220 SMA Frequency Coordination Board proposed plan, as modified, was adopted by a very significant majority of the 124 members present. The Treasurer reported that there are now a total of 225 members, 65 of which joined since the previous meeting.

The adopted 220 MHz Band Plan for Southern California:

222.000 - 222.010	Weak Signal: EME, CW, SSB, ACSB
222.020 - 223.380	Repeater Inputs
223.400 - 223.520	Simplex Voice/Autopatch, Remote Base, Control
223.540 - 223.600	Packet (Sub-coordination by SCDCC)
223.620 - 224.980	Repeater Outputs

The deadline for vacating 220 - 222 MHz is 27 August 91 at 5 pm PDT.

DX NEWS By Bob Polansky, N6ET

Although the solar flux continues to be very high, the HF bands have been frequently wiped clean of dx by a strong series of solar flares this past month. In spite of this, D2ACA from Angola has managed to keep a signal into the West Coast most days since the beginning of June. The DX Bulletin advises that Penguin Island has been accepted as a new DXCC country. Cards can be submitted for this one after 1 September, 1991. North Korea and Jarvis Island may not be far behind! And now for the news:

BURUNDI - 9U5BZP is active now. Look for him on 21292 kHz at 2100Z, 21279, 14279, and 28507 kHz also.

CENTRAL AFRICAN REPUBLIC - TL8FD frequents 21021 kHz, or thereabouts, around 2045Z. Look for him also on Fridays on 14022 kHz at 2300Z.

CROZET ISLAND - FT4WC continues his frequent appearances on the long path most mornings around 14020 kHz from 1200 to 1600Z. Look for the big pileup.

MADAGASCAR - 5R8AL will be a fine catch on cw through 24 June. I caught up with him on the low end of 20 cw around 1300Z. Again, he responded quickly to direct QSL's.

MARKET REEF - OH0AP/OJ0 will be active from 7 to 15 July. He

made a brief appearance the weekend of 8, 9 June also.

RWANDA - 9X5HG continues activity on 15 meter cw, anywhere from 21002 to 21065 kHz. 0100Z is his favorite time, but he has been reported anytime between 1800 and 1200Z in the past several months. I've yet to hear him, but I'm looking!

TADZHIKISTAN - UJ8JI is on almost every morning from about 1200Z to 1400Z around 14005 kHz. He rapidly responds to direct QSL's.

Keep thinking good thoughts. Maybe the severe solar storms will disappear and permit us to work some of this good stuff. Until next month, 73.

224.08 CO-CHANNEL NEWS By Walt Diem, WA6PEA

The Santa Barbara Amateur Radio Club expects to have K6TZ/R operational on 224.08 MHz from La Cumbre West Peak above Santa Barbara in about one month. The repeater is listed as open with a 131.8 Hz PL. The reason we never heard them on the channel is that they lacked the equipment to operate on the channel. They just received funding and have ordered an Icom repeater and ACC controller. So don't be surprised if you hear K6TZ/R on the channel.

BOARD MEETING MINUTES - March 27, 1991 by Art Zygielbaum, WA6SAL

The board met at the scheduled periodic meeting place and time.

There was discussion on whether the JPL ARC should affiliate with a Volunteer Examiner Coordinator organization such as the ARRL. This might be useful in helping to license new hams.

A review of the club's financial situation indicated that the W6VIO/R compressor/limiter grant had been spent. The compressor/limiter would be installed in time for the next Shuttle Audio support. On the negative side, Rick McKinney indicated that the club could not expect to get the same level of support from the ERC that we had in the past. We had asked for \$2500 in grants. The ERC will give us \$1000 if we can match with \$1000.

The ERC Council has had its elections. Rick McKinney is now the Vice President! Judy Ryken is the sub-club chairman. Judy was the JPLARC president's secretary for many years!

We need to follow-up on a JPLARC annual calendar. Dave, KC6NRL, was going to develop this. Art Zygielbaum will follow up. Key upcoming events are Field Day and commemoratives (such as the CIT Centennial celebration, Magellan 100% mapping, etc.)

Jerry Hocks reported that the first tower section is up at the antenna site, but that all dipoles are currently down. The antenna party for Saturday looked iffy based on the number of volunteers. But the party was needed to get W6VIO in shape to support HF transmission of SAREX events from STS-37. It was decided to have a quick antenna party on Thursday evening. Art Zygielbaum volunteered to try to get a cherry picker from transportation to help out.

Larry, AA6TV, said that the club's safety belt was worn out. The Board voted an expenditure of \$100 for a new one. (The motion was made by Walt, K6DNS, and seconded by Mark, WB6CIA).

Jan Tarsala said that he did not know where the Kendecom was. Unfortunately Walt Diem was not at the Board meeting to answer questions. Jan indicated that we may have a site at Porter Ranch for the remote receiver for WB6IEA/R and its 900 MHz link to the repeater site.

BOARD MEETING MINUTES - May 22, 1991 by Walt Diem, WA6PEA

The meeting was led by President Art Zygliebaum, WA6SAL.

Board members present: Art Zygliebaum, Carl deSilveira, Jim Kesterson, Mark Schaefer, Walt Mushagian, and Walt Diem.

Art Zygliebaum presented proposed minor changes to the By-Laws to reflect the current organizational needs of the club. The Board was in agreement with the proposed changes with minor wording changes. The proposed By-law changes are summarized as follows:

1. The purpose of the club includes encouraging others to become radio amateurs.
2. Membership applications are sent to the Membership Chairman.
3. The number of non-JPL employee members shall not exceed 20% of the total membership in accordance with the ERC By-Laws.
4. A minimum of 50% of the Board shall be direct JPL employees.
5. Provisions for multiple Trustees.
6. Deletion of QSL Bureau and Interference as standing committees and addition of Emergency Communications and Repeater as standing committees.
7. Election of officers in November, instead of December, to allow time for the new Board to prepare a budget for the following year to meet ERC's budget schedule.

The proposed revised By-Laws will be prepared for mailing to the members for approval in accordance with the present By-Laws. An affirmative vote by two-thirds of those voting is required for passage.

Art and Chris Zygliebaum, Jay Holladay, Rick McKinney, Bob Polansky, Stan Sander, Larry Smith, John Tallon, and Sam Weaver will meet to plan Field Day.

Gil Yanow is requesting equipment and technical assistance to put up a 220 MHz repeater at Window Rock, Arizona.

The club budget was reviewed with respect to anticipated income. ERC did not approve our budgeted request for a \$2000 grant for equipment nor the request for a \$500 grant for support of the '91 picnic. However, they did approve \$1000 of matching funds. Received dues to date is \$125 more than shown in the budget. The budget will need to be adjusted for the significant changes in anticipated income.

BOOK REVIEW By Courtney Duncan, N5BF

The Satellite Experimenter's Handbook, 2nd Edition
Martin Davidoff, K2UBC
ISBN 0-87259-318-5
The American Radio Relay League
225 Main Street
Newington, Connecticut 06111
\$20.00 (order Number 3185)

Reviewed by Courtney Duncan, N5BF, AMSAT-NA VP Operations 2 June 91

Amateur Satellite enthusiasts are generally aware of the basic reference work for the satellite "corner" of the hobby, the Satellite Experimenter's Handbook which first appeared in 1985. A new, 2nd Edition is now available which is significantly expanded and updated. To compare the 1st and 2nd Editions of the Handbook, one might get the impression that, in terms of information and background needed

by satellite users, the last six years have seen as much change and expansion in the service as the first 24, beginning with OSCAR-1 in 1961.

My very first impression of the 2nd Edition was to notice that the word "Experimenter's" was still in the title. It will be nice someday to see a book called the "Satellite User's Handbook" or the "Satellite Operator's Handbook" which contains the sum and substance of what is needed to effectively use satellites for routine communications, but that day is not yet here nor is it on the horizon. It still requires significant additional knowledge (beyond that required just to obtain a license and get on the air), understanding, and possibly experience to become a satellite "regular" and will for the foreseeable future.

The volume is about twice the size (and cost) of the 1st Edition.

As I progressed through the chapters in the reviewing process, one quality stood out. This book is <bold and/or italic> thorough, thorough, thorough <regular> as might be expected from an author who is a professor of mathematics. There is considerable treatment of many of the theoretical background concepts needed for various facets of satellite operation, peppered with copious examples. There are many practical sections and there is much common sense discussion, advice, and guidance. As AMSAT knows all too well, it is not easy to set up and operate a satellite station without some elmering. Used carefully, an average amateur radio operator should be able to achieve that goal using this book. Every possible subject is not covered in exhaustive detail, but every subject that is covered is extensively referenced. There are enough pointers on nearly every page to get you started down a path to successfully unravelling nearly any problem (if you have the persistence) or question you are likely to encounter.

When I pulled out my copy of the 1st Edition for comparison, a bookmark (dated 1988) fell out. On it it said, "Overwhelming! Amateur Radio in the space business: Education, Science, Communication." This manual, in both editions, is the indispensable reference on the topic.

The Satellite Experimenter's Handbook, 2nd Edition, breaks down into three logical sections and references: (just like the 1st Edition) Introduction; Fundamentals; For The Advanced Enthusiast; and Appendices, Glossary, and Index.

In "To the Reader" at the front, the author encourages readers, in their enthusiasm to get on the air, not to skip the introductory chapters which provide an historical overview of the amateur satellite program (all the way back, actually, to Sputnik). Even if you do skip to the middle initially, I vote with the author on this advice. Someday you will ask or be asked questions like "why aren't there more Mode A satellites?" or "why is all the DX on Mode B?" or "Why is some new piece of equipment required for every new satellite?" ("experimenter's," remember?), or "Why is there Mode K?" or "Why are higher and higher frequencies used where I can't just buy equipment?" An historical overview such as the one given in Chapters 1 through 4 either answers such questions directly or gives the progressive rationale for why things are the way they are. Like Americans (and others) who benefit greatly in the present from the efforts and sacrifices of those who came before, amateur satellite operators today benefit greatly from over thirty years of foundational work, not just in satellite hardware, but in regulatory matters (like the very existence of a Radio Amateur Satellite Service with its own frequency sub-allocations) and on other fronts as well. Anyone who takes satellites seriously enough to get on the air owes it to themselves and to the movement to go over this history.

In Chapter 4, "1980 Into the Future," the history begins to wind through the present and the near future. At this point, Davidoff puts in a rather lengthy discussion of and lobby for the Phase IV,

Geosynchronous program. Two revealing features of the amateur satellite program are highlighted by this inclusion. First, it is quite vital and is always changing flavor as key volunteers go through various phases of their activity as decision makers, project participants, and publication authors. The dreams and goals are not always unified and coherent across AMSAT at any given time, particularly in times of transition. Second, and similarly, Phase IV was shelved by AMSAT-NA within just a few months if not weeks of the publication of this edition making most of the Phase IV Information obsolete except as a report on half a decade of studies and preparatory work that was done. At the rate things are going, the Satellite Experimenter's Handbook will be in its 3rd or 4th Edition before Phase IV or something like it is sparked off once again.

The section starting with Chapter 5, "Getting Started" contains the introductory information you will need to get started establishing a satellite station. Everything is laid out explicitly in excellent detail reducing the chances for misunderstandings and bad assumptions for beginners. Advice like, "If you've never operated packet and you want to operate satellite packet, you should first gain some experience operating terrestrial packet on 2 meters." is good advice, and applies to all satellite modes. You'll notice that the emphasis here is on solving the problems of establishing communications, not communicating itself (i.e., what to say once you're on). This again indicates that amateur satellite communication is still developmental and experimental. An explanation of why Mode A is sometimes flaky during sunspot highs is enlightening. The chapter ends with four case studies describing how hams from four different backgrounds can find their way into the ranks of active satellite operators. These are fun to read, you'll certainly find yourself and most of your ham friends among these personalities.

Chapter 6, "Tracking Basics" is the first of several that deals with satellite tracking. It deals mainly with OSCARLOCATOR and other similar manual, graphic devices, though it touches on computer programs toward the end. With the prevalence of computers in ham shacks these days, particularly amateur satellite ham shacks, the quantity of information in this chapter may be a little high. In fact, many of the examples deal with satellites (like AO-8) which were in use when manual tracking methods were in their heyday but which are now long gone. You be the judge, if you really must build some sort of OSCARLOCATOR, all the information, references, and sources are right here.

If there is one area where all hams think they are experts, and few really are, it is antennas. But, I learned, or had clarified, several important concepts about antennas while I read Chapter 7, "Antenna Basics." If everyone thoroughly understood the material presented here, there would be much less confusion on issues like: "Why is it expeditious but not essential to use circular polarization on AO-13," and "Why is it not necessarily best to use circular polarization on other satellites in other circumstances," and perhaps most important, "What is the difference between transmitting and receiving criteria for antennas?" If you can *correctly* answer this plus the bonus question, "Why do I still hear signals from AO-13 when I've switched to left handed circular polarization, though they have more spin modulation?" you might be able to safely skip this chapter, however, I would still scan over it to make sure I wasn't forgetting something important before I made any decisions about antennas at my station.

Chapter 8, "Practical Space-Communication Antennas," carries the theory from Chapter 7 into several practical, field proven examples of antenna useful in satellite work. Again, coverage of the topic is very thorough and includes extensive references for further research or resources. Probably most valuable is the good, solid advice on tradeoffs between various antenna systems in various applications. Examples range from extremely simple to rather complex, from tried and true designs to ideas and suggestions for further work among the

"real" experimenters out there.

Chapters 9, "Receiving and Transmitting," and 10, "Operating No get into the details of the radios to be used and how to use them. One interesting but frustrating phenomena that AMSAT deals with is that satellite operators, both beginners and more experienced ones, seem to grind up a lot of time and energy resolving a lot of the same problems that have already been solved before, like deciding whether or not to use mast mounted pre-amps (or pre-amps at all), how and whether to adapt existing equipment for higher frequency operation in satellite bands, or whether to tune uplink or downlink frequency when spotting on a linear transponder (which, by the way, is a trick question, the rule of thumb is to tune the highest frequency, whichever it is). As with antennas, an excellent use of this book for anyone setting up or improving a satellite station is to think about what you want to do, explore the options that become obvious in thinking and talking about your ideas, then, with the burning issues in mind, review these chapters for good, solid advice and well referenced information. Examples range from pre-amp circuit board designs up to entire station block diagrams, from how to operate a linear transponder to how to contact an RS-Robot. Chapter 9 is particularly good for those working on non-appliance stations. Chapter 10 also has miscellaneous operational information like "Contest Policy" and "435-MHz Transmitting Restrictions." As always, excellent reference, excellent foundational reading.

Unfortunately, operation is another area where the fast paced, developmental nature of the whole amateur satellite movement leaves a book with an editorial lead time of several months behind all too quickly. Substantial information about pacsat file server (such as is used on AO-16, LO-19, and UO-14) utilization is completely missing since the Handbook came out at nearly exactly the same time that these server operations began in earnest on the three new pacsats late in 1990. The information about the FO-20 BBS is still good. If you are interested in setting up a pacsat station, the Satellite Experimenter's Handbook will get you started with radios and some information on 1200 baud PSK modems, but for a discussion of pacsat software, 9600 baud, and the latest on other hardware, you should obtain the new Microsat User's Guide which just became available from AMSAT-NA this spring.

Chapter 11, "Satellite Orbits," begins a cycle of chapters "For the Advanced Enthusiast." If you're really interested in the physics and mathematics of satellite trajectories and want to write your own computer program for tracking, there is enough information in this chapter to support the work. (I wouldn't recommend writing a tracking program, however, except for self education, or in support of a system for which a program is not already available from AMSAT. Check with AMSAT-NA Headquarters first.) The best general use of this material is to learn or review the various orbital parameters (in standard Keplerian element usage) and their meanings and interrelationships. It stops short (as it should) of a discussion of exotic effects like the luni-solar perturbations which may well spell the early demise of AO-13. Chapter 12, "Tracking Topics" appears to be a catch-all for material not included in Chapters 7 or 11. "How to build and use an OSCARLOCATOR for Phase III" (certainly an advanced topic compared to the simplicity of the Phase II versions!) seems to be the main drift.

Closing out the set of chapters of interest to ground station builders and users, Chapter 13, "Satellite Radio Links" offers not only an in depth discussion of doppler shift in its various manifestations but also covers special subjects such as spin modulation, Faraday rotation, and unusual phenomena. Every radio amateur (not just satellite operators) should read the "Frequency Selection" section beginning on page 13-9. It covers in depth legal, technical, political, visionary, and sensible issues concerning amateur frequency management and sharing.

Non-amateur "Weather, TV, and Other Satellites" and amateur grade "read: "cost") ground equipment for receiving them is the subject of Chapter 14. The Satellite Experimenter's Handbook is not intended to be the exhaustive reference into this area as well as the amateur satellite field, but, again, the information is a good introduction and is copiously referenced.

The Handbook ends with two chapters on the amateur satellites themselves. Chapter 15, "Satellite Systems" gives a good overview of existing and potentially useful satellite systems and technologies. I was amazed at the engineering excellence that has been achieved by volunteer amateur radio operators in their satellite programs and the visionary approach to low-cost space technology apparent throughout this section. (I was also amazed at the sheer quantity of work that has been done on an unpaid but certainly not unprofessional basis over the years.)

Virtually all amateur satellite users at one time or another aspire to be involved in actually building a satellite. One other section of this book that all radio satellite amateurs and members of any kind of volunteer organization should have as required reading is Chapter 16, "So You Want to Build a Satellite." Davidoff has a grasp of the organizational and personnel problems involved in an effort of this type that can only have come from personal experience as both a volunteer and a volunteer manager, and from close association with others in those roles. When you see the (incomplete) list of 19 major activities involved in satellite construction, don't just skip to the soldering, drilling, and bolting parts thinking that they are the only really important ones. AMSAT is very tight with its approach to volunteers and to technological problems, it has to be to accomplish anything at all on very limited volunteer time and even more limited financial and material resources. The categories listed here are some * those that have panned out over many years and many projects as absolutely essential ones.

The following, representative statement about estimating the personal price of volunteering for an AMSAT task is right on the mark and should be taken at face value:

"Frankly, no matter how thorough you think your estimates [of time and effort that a task will take] are, you'll probably grossly under-estimate the real effort needed. Psychologically this might be a good thing: If we knew what we were really committing ourselves to, far fewer might volunteer."

Considering the amount of research and writing that went into the Satellite Experimenter's Handbook, the author might well be talking about the book itself with this statement. Once you've seen a copy, I think you'll agree with me that it is one indispensable ingredient of a successful amateur satellite program.

The work concludes with five Appendices, a Glossary and an Index:

- *Appendix A: Radio Amateur Satellite History: Dates and Frequencies
- Appendix B: Spacecraft Profiles
- Appendix C: Tracking Data and Overlays
- *Appendix D: Computer Programs
- Appendix E: Conversion Factors, Constants and Derived Quantities
- Appendix F: FCC Rules and Regulations Governing the Amateur-Satellite Service

* Indicates an Appendix that is new with the 2nd Edition.

Appendix B is very complete. For any more information on a particular satellite than is given here, you will need to refer to a specialized publication about specific satellites or specific sub-topics like telemetry. I found Appendix A useful just today. When I heard that AO-10 had been heard in Mode L, it was necessary to refer to an historical frequency list to figure out where to listen. Since the loss of onboard computer control of AO-10 in 1986, it was thought that Mode L would never be available again, so modern frequency guides don't list its beacons or transponders.

I highly recommend the Satellite Experimenter's Handbook, 2nd Edition to you. This book belongs within arm's reach of any amateur satellite user's operating position or workbench. If you already have the 1st Edition, you need to upgrade to the 2nd as soon as possible before your next need to refer to it. That's where it will be in my shack, just as soon as I finish re-reviewing some of the material on microwave techniques!

JPL Amateur Radio Club

Field Day Information Kit
June 21, 22, & 23, 1991

Who's who on Field Day:

Field Day Coordinator

Art Zygielbaum, WA6SAL

Logistics Coordinator

Larry Smith, N6PBS

Food Coordinator

John Tallon, N6OMB
Rick McKinney, KA6DAN

Contest Operations Coordinator

Jay Holladay, W6EJJ
Bob Polanski, N6ET
Chris Zygielbaum, N6WEI

Set-Up Coordinator

Walt Mushigian, K6DNS

Ye Ol' Tear Off Sheet!

Name: _____ Call: _____

Address: _____

Telephone Number (Home): _____

(Work): _____

Expected Arrival Time: _____ Departure Time: _____

Preferred Operating Position:

☐ Novice

☐ Technician

☐ Phone

☐ CW

☐ Logging/Dupping

☐ Set-Up

☐ Tear-Down

☐ Computer Logging Experiment

Please mail this sheet to:

Art Zygielbaum

180-701

W6VIO CALLING, M/S 264-419

Attn: Eileen McKinney

Jet Propulsion Laboratory

4800 Oak Grove Drive

Pasadena, California 91109

LIST 194

SECT 381

168-222

Noted, Scott