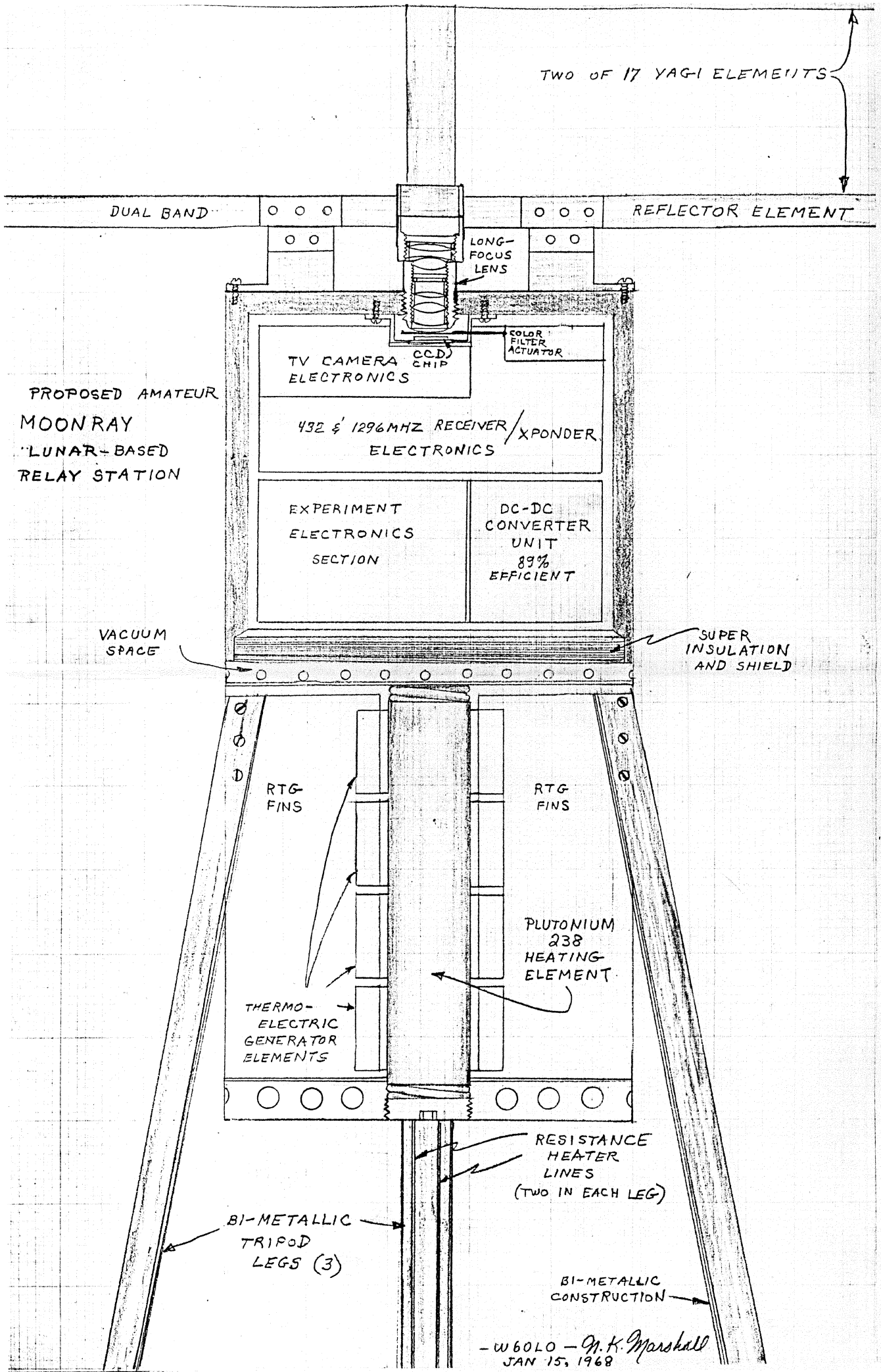
TWO OF 17 YAGI ELEMENTS
DUAL BAND
REFLECTOR ELEMENT
LONG-FOCUS LENS
COLOR FILTER ACTUATOR
CCD CHIP
TV CAMERA ELECTRONICS
PROPOSED AMATEUR
MOONRAY
LUNAR-BASED
RELAY STATION
432 & 1296MHZ RECEIVER/XPONDER ELECTRONICS
EXPERIMENT ELECTRONICS SECTION
DC-DC CONVERTER UNIT 89% EFFICIENT
VACUUM SPACE
SUPER INSULATION AND SHIELD
RTG FINS
RTG FINS
PLUTONIUM 238 HEATING ELEMENT
THERMO-ELECTRIC GENERATOR ELEMENTS
RESISTANCE HEATER LINES (TWO IN EACH LEG)
BI-METALLIC TRIPOD LEGS (3)
BI-METALLIC CONSTRUCTION
-W6OLO - N. K. Marshall
JAN 15, 1968

PROJECT MOONRAY FACT SHEET
BY NICK MARSHALL, W6OLO

In 1960, a year before the launch of the first OSCAR satellite, this writer, who was the Technical Director of Project OSCAR, wrote the Project OSCAR Master Plan. 25 follow-on experiments were proposed, several have been implemented: Earth's magnetic field attitude control, Tape-recorder-playback voice communications,Cloud-cover Television camera,Mail-box and Solar-cell battery charging. A lunar repeater was also among some of the more exotic experiments suggested but has not yet materialized.

A major effort was put forth starting in 1966 to revive this concept and the name Project MOONRAY was adopted. Contacts were made with Owen Garriott, W5LFL to explore the possibility of having NASA transport an Amateur repeater package to the moon on one of the forthcoming APOLLO flights. Owen was in training at that time to be one of the future astronauts to go to the moon on APOLLO 18, 19 or 20. The MOONRAY package was to be stowed under the seat of the Lunar Rover vehicle. Owen was to be the driver and when he had reached a suitable spot on the moon's surface, he would have set up the MOONRAY repeater, turned it on, pointed the antenna and bore-sighted the TV camera onto earth. He then was to unplug his space-suit communications microphone,plug it into the MOONRAY package and work some QSO's with hams on earth. As you may know, congress cut off all funding for the APOLLO program beyond APOLLO 17 and our plans have been temporarily shelved until we can find another mission willing to carry a MOONRAY package for us.

Since there are plans for a manned Lunar Outpost to be built sometime in the future,the Project OSCAR group has decided to undertake the design, development and construction of an up-to-date, state-of-the-art MOONRAY package. We will be getting in touch with the first group that we find showing some activity in returning to the moon. Meanwhile we have already started to design the MOONRAY unit. We are actively seeking expert assistance to help us determine the best characteristics to incorporate into the MOONRAY package. Suggestions are welcome and if used, full credit will be given to the suggester. Some of the parameters that need to be determined are:

- Uplink and downlink frequencies (within Amateur Satellite bands)
- Bandwidths to be used, path loss considerations, receiver noise figures
- Antenna system choice for maximum gain and polarization mode
- RF Power levels needed and perhaps automatic or commandable level control
- Type of modulation to handle cw, SSB,Slow-scan or real time TV, Packet, etc.
- Repeater method (Cross-band, same band, double frequency, etc)
- Antenna pointing methods to lock onto earth during lunar libration
- Temperature control in lunar environment including sun shade methods
- Experiments and data to be telemetered, how many and what kind?
- Telemetering rates, methods,timing,processing and reception techniques
- Physical configuration of the MOONRAY package
- Models, mock-ups,breadboards, prototypes,test units, flight packages
- Test methods, lunar environment simulation,life tests, failure modes
- Instruction manuals,final checkout procedures,test data recording, etc.
- NASA requirements and conformity methods to assure acceptance
- Progress reports, bulletins, publications, press releases, publicity
- Ground control center requirements,locations and implementation
- Astronaut training, liaison, task considerations and backups
- NASA liaison, proposal group, technical advisors,chronologist,historian
- Methods of dissemination of progress and schedules (nets,reports, bulletins)
- Miscellaneous tasks: Material procurement,fund raising methods,test areas (labs)
- World-wide participation: AMSAT UK, AMSAT DL, AMSAT Japan, Australia, Canada, etc.

• For any additional details about Project MOONRAY, you can write to me personally: N. K. Marshall 2207 Peachland Avenue Sebastopol, CA 95472 or telephone: (707) 823-5426

You can contribute to MOONRAY's success by offering your technical expertise at this time in the design, development, construction, test, checkout, advisory or financial support. You can also help by talking about Project MOONRAY on the air, at club meetings, among your friends and acquaintances. If you write articles for publication, please submit prepublication copies to: Project MOONRAY c/o Project OSCAR, PO Box 1136,Los Altos,Ca 94023-1136.

• MOONRAY articles have already appeared in QST (Nov 1967); in CQ (Dec 1967); in 73 (July 1967 and March 1969)also in Ham Radio (Aug 1968)