

DUMAND CHECKLIST

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Hawaii DUMAND Center, 3 Apr 1987.

This is a first attempt at providing a checklist for design questions to be settled for DUMAND2.

A. OVERALL ARRAY DESIGN CONSIDERATIONS.

1. NUMBER AND SPACING OF STRINGS.

These numbers can still be changed, but only on the demonstration of strong and overriding reasons.

2. NUMBER AND SPACING OF MODULES ON STRINGS.

Same considerations; here a second look at what is optimum, in view of redundancy and long-term reliability, is indicated. The Vanderbilt proposal for ocean-bottom coincidences should be either adopted or finally laid to rest. In my opinion any discarding of data in the ocean rather than on shore is a mistake. The data-handling capabilities of the array will be far greater than SPS, and individual string noise rates of 10^6 or more will be readily handled. Data-handling problems on shore now appear to be readily soluble. Discarding singles rates will seriously diminish the capability of the array to study bioluminescence.

3. ORIENTATION OF MODULES.

The advantage of downward-looking orientation are clear. Unless there are good reasons for changing, this should be retained.

B. STRING DESIGN.

1. MECHANICAL DESIGN.

The string design needs to be carefully considered with a view to reliability, ease of replacement of faulty units, and the reinstallation on the bottom of repaired strings. It will be highly desirable to be able to unplug optical modules and controller units and replace them on shipboard; e.g. using the string container as a lab for replacing and testing, so that a faulty string could be recovered, repaired and reinstalled on the bottom all within a day or less. For this purpose, it would also be desirable to be able to design the string so that when it needs to be recovered, it leaves behind an inert anchor.

The feasibility of such an operation depends on several factors: these include the need to design all string components for easy and rapid replacement, and the possibility of outfitting the container as a test laboratory with adequate facilities for complete testing of a repaired string. In addition, it must be shown that it is economically justified to do this rather than returning the recovered string to shore for repair, which implies the added cost of operating the Kaimalino longer and keeping the ROV waiting while the repair is done.

2. CHOICE OF STRING SUBDIVISION AND DATA CHANNELS.

As pointed out in my memo HDC 1-89, the choice of how to subdivide the string controller has important implications in the number of data channels needed, the number of optical fibers in the shore cable, the technology of data communication to shore, the overall system reliability, and frequency and ease of string repair and replacement. It is accordingly one of the most - perhaps THE most significant choice to be made. In order to make it, it requires a considerable number of Monte Carlo calculations to determine the relative frequency of repair that each possible choice entails.

C. PROVISION FOR OTHER SCIENTIFIC DATA FROM DUMAND.

It is important not to lose sight of the fact that the support we have received from the oceanographic community is based on the implicit assumption that DUMAND will provide significant oceanographic data. It will be desirable to include in the array such obvious items as current, temperature and salinity meters, but to provide bioluminescence data. It must now be considered whether we should include such items as TV cameras and their accompanying lights. These could be useful in the event of unexplained interruptions to array operation; they could also have publicity value; suppose we were to see a hitherto unknown sea-monster.

To ascertain just what should be included, and who will pay for it, the oceanographic community related to DUMAND needs to be polled. In this regard the oceanographic community should be understood as including geology, so that seismographs are considered as well as current meters. If these are located on the ocean bottom, they may affect junction box design rather than string design. Provisions for hydrophones, both within the array and outside it, may be required. This brings up the question of possible Navy interest; perhaps Wilkins could find out about this.

D. POSSIBLE INCLUSION OF A BUILT-IN MINI-ROV.

The simplicity of the undersea operation of the ROV is such that one is compelled to ask whether there may perhaps be some way to avoid the complication, expense, and most importantly the delay involved in obtaining the use of someone else's ROV for the sole purpose of plugging and unplugging underwater cable connections. Can we afford our own captive ROV, attached permanently to the junction box?

At first sight this seems like a considerable complication. But let us recall that there is available at the junction box several kilowatts of power, which would be available for the ROV if the array is switched off. We need in addition TV and lighting for watching the manipulation, a manipulator, and a thruster capable of moving the ROV around the array. It is the latter two items that will determine the feasibility of such a device.

The requirements for the thruster have been outlined by Becker-Szendy in the Proceedings of the 1988 Deployment Workshop (p. 51). A 1-HP thruster gives the choice of 652 to 65 lb of thrust at water effluent speeds from 1 to 10 knots, at a cost of \$10K. The manipulator design can be copied from existing devices. If, as now seems likely, FOCUS is approved for HIG, the design of our mini-ROV could perhaps be coordinated with that of FOCUS - possibly even subcontracted to HIG.

While this is a considerable project, the potential benefits in cost and time savings are so high that it should not be ignored; it deserves careful evaluation. Over the assumed five- to ten-year lifetime of the array, one can assume that at least four repair operations will be required. If the cost of the ROV for this operation averages \$75K, that gives a total cost of \$300K for ROV rental. An investment of \$200-250K for the ROV would then be economically justified, quite aside from the savings of several months of delay for each operation before the ROV might be available.