DRAFT PROPOSAL

Preliminary Design

of a

Deployment Structure

for the

DUMAND Array

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Construction of the DUMAND array requires the deployment of 36 vertical strings of photomultiplier tubes and other instruments in a 6x6 array on the ocean floor at a depth of 4.5 km. These strings are spaced 50 m apart horizontally.

It is proposed to prepare the preliminary design of a deployment structure which will facilitate emplacement and recovery of the underwater array, and which will substantially reduce the requirements for shore-to-site power and signal cables and for drill ship time.

One proposed deployment scheme is shown in Figs 1 and 2. Module A, consisting of four vertical sensor strings separated by steel tubes a and braced by cables b, would be placed in phase 1. This 2x2 array would substitute for the 1x6 row contemplated in the DUMAND proposal, section 3.4.2, step 6.

Four 3x3 modules B, similar in construction to module A, would be emplaced later to complete the 6x6 array. This scheme would require a connector at each corner of module A to provide mechanical attachment, along with power and signal couplings.

Deployment of each module would be accomplished as shown in Fig 2. Each Cannister C would be held in horizontal position by the tubes a and cables b, and supported vertically by cables d which attach to a lifting cable e. Each module could be assembled ashore, floated to the site, and lowered from a semi-submersible platform or drill ship. Surface controlled thrusters and video cameras could be attached to each module to maintain proper alignment during descent and emplacement on the sea floor. After emplacement and connection of the modules, cables d and e could be retrieved for reuse. Retrieval of the entire array could be accomplished by grappling from the surface under control of the same thrusters and video cameras described above.

A critical element in this structure is the strut a, which will carry compression and bending loads during the deployment process. These tubular members will be filled with a lighter-than-water fluid under pressure, and sized to provide a stable structure of minimum material.

Advantages of using a deployment structure of the type indicated include:

1. Positive control of the array geometry;

2. Reduction of shore-to site cable requirements (assuming that satisfactory power and signal connections can be made);

3. Easy retrieval, in whole or part, of the array, and

4. Simplification of the cannister design by eliminating reinforced concrete ballast.

Preliminary design of the structure proposed would require the following tasks to be accomplished:

1. Synthesize and evaluate a number of deployment structure configurations;

2. Define the loading environment for different stages of deployment and retrieval;

3. Define appropriate limiting values for stresses and deflections;

4. Select materials and determine member sizes and other parameters for the most promising configurations;

5. Detail structural connections;

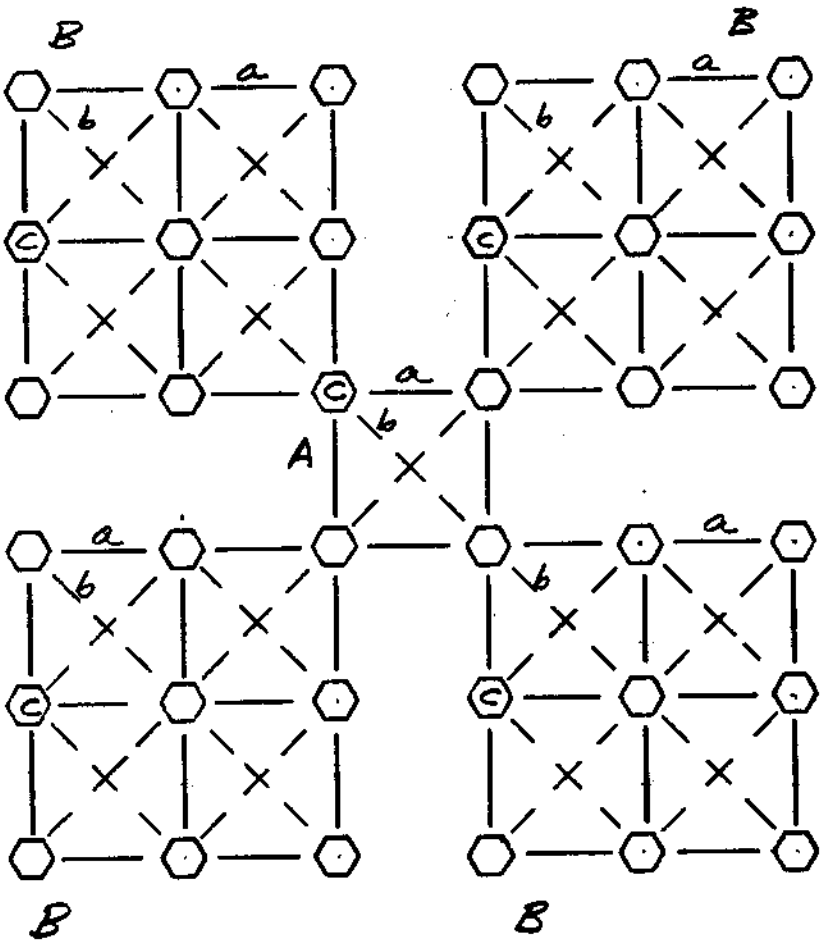
6. Estimate procurement costs;

7. Determine time, manpower and equipment requirements for delivery and deployment; and

8. Estimate delivery and deployment costs.

This work could be done in one calendar year, beginning September, 1983, at a cost of about $50,000, including salaries (principal investigators, research assistants, and clerical staff, all part-time), expenses (computing, travel, publications, etc), overhead and fringe benefits.

The end product would consist of an engineering report describing the most promising system in sufficient detail that shop drawings and bid estimates could be prepared and cost-effectiveness comparisons could be made with other deployment schemes.



ⓒ = sensor string cannister

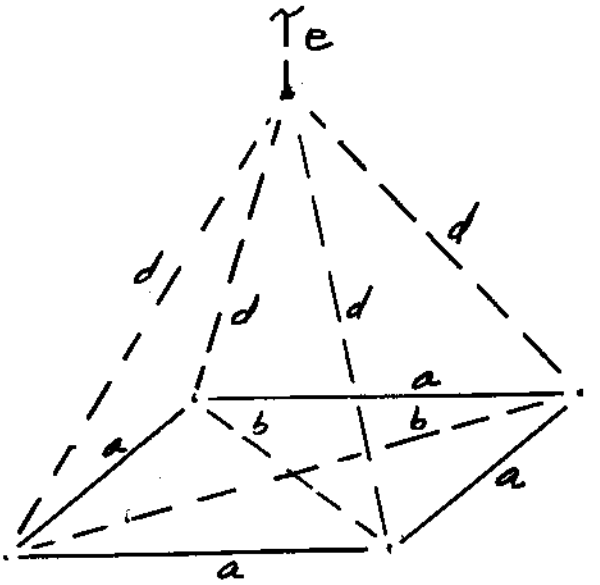
a = steel tube

b = steel cable

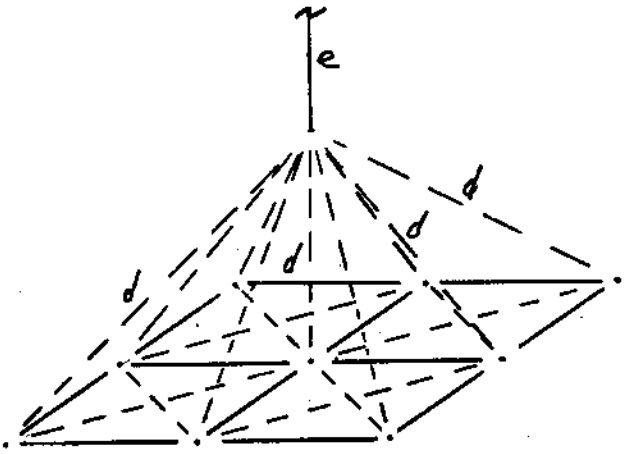
A & B = deployment modules

FIG 1

DEPLOYMENT MODULES



(a) Module A



(b) Module B

$\frac{d}{e}$ = lifting cables

FIG 2

MODULE DEPLOYMENT