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L2810-14
Report No.

AZUSA, CALIFORNIA

Copy No.

This is the fourteenth in a series of informal reports submitted in partial fulfillment of the contract.

G M M Roberts

This document has been reviewed in accordance with
OPRAT 7-000000, paragraph 2. It is hereby
classified as CONFIDENTIAL.

DATE: 1/12/59 C.E. Lundgren Cdr

CHIEF OF POLICE (Room 463)

NOTE: The information contained herein is regarded as preliminary and subject to further checking, verification, and analysis.

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Report No. L2810-14

I. OBJECTIVE

In accordance with Contract Nonr-686(00), as amended by Amendment No. 1, 1 December 1952, the following is to be performed:

The contractor shall (1) conduct research on pulsed-pressure signals; (2) design and construct an experimental vortex-ring generator of approximately prototype size for sea tests and development work; and (3) concurrently with the work required under (1) and (2), investigate the practical problems attending the use of such a device as a mine countermeasure and attempt to provide solutions to these problems, in order that the device may be readily applied to naval uses. This work shall include, but not necessarily be limited to, the following:

- A. Completion of the prototype design
- B. Construction of the prototype
- C. Mounting and testing of the prototype on a Navy-furnished vessel
- D. Concurrently with prototype development, the investigation of effects caused by non-vertical projection of the vortex, by motion of the generator during projection of the vortex, by the nature of the bottom, etc., upon the efficacy of the ring vortex in mine sweeping.

II. DESCRIPTION OF WORK

- A. The prototype unit was shipped on 8 September 1953, and should arrive at Norfolk Naval Shipyard about 1 October 1953. Delays totaling one month were encountered in making arrangements for shipment of this oversized load.
- B. The second and final shipment, consisting of the 30° exit section for the prototype generator, is to be made on 5 October, all routing and clearances having been obtained.
- C. Conferences attended by representatives of the Office of Naval Research, Bureau of Ships, Navy Mine Countermeasures Station, and Aerojet-General Corporation were held in Panama City, Florida, on 3 and 4 September 1953. At these conferences, the electrical power problem was discussed, and the following decision was reached: For the initial tests the Navy Mine Countermeasures Station will supply one 100-kw, 440-volt, a-c Hercules power unit. This unit will be mounted on the barge and connected to the power distribution board. Since 440-, 220-, and 110-volt power is required, a 45-kw transformer has been ordered to be delivered at Panama City for installation on the YC-704 barge as part of the prototype sweeper. This will simplify the power supply problem for the tests while under way, since only one voltage will need to be supplied by the towing vessel to the sweeper.

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D. The conferences also defined the instrumentation problem, and solutions were discussed. It is currently planned to use the following mechanisms for the tests: The MK 13 mine with A-3 acoustic mechanism, the MK 36 mine with A-5 acoustic mechanism, the MK 25 mine with A-6 pressure mechanism, and the MK 36 mine with A-8 pressure mechanism. In all instances, the mine firing mechanisms will have instrumentation cables installed to record the action of the various mine-firing switches under the influence of the expanding ring vortex. The initial tests will probably be performed in protected waters with depths ranging to 45 feet. As soon as the initial difficulties have been solved, testing will be continued in the Gulf of Mexico in greater depths. Final instrumentation plans, especially their extent, will necessarily be determined by the outcome of the preliminary tests.

E. The YC-704 barge, which is being modified to carry the prototype sweep gear, is undergoing the Butterworth cleaning process at the Norfolk Naval Shipyard. Upon completion of the cleaning, the barge will be overturned and set ashore so that the bottom plates may be cut and the strengthening framework let in and welded to the internal structural members. Along with the installation of the vortex generating equipment, winches will be installed forward and aft, and davits will be mounted on the sides to facilitate handling the mines to be used for test instrumentation.

F. The erection of a deck house over the operating gear appears to be too costly for this test operation. Instead, canvas covers will be furnished for all electrical devices, except the distribution switchboard, which will be covered by a sheet-metal protective box.

G. At the suggestion of the Office of Naval Research, several shapes are being fabricated for testing with the model generators in the Aerojet ring channel. Thus far, tests have been conducted with models of the MK 25 mine. It is thought that perhaps some shapes other than cylindrical should be placed in the path of an expanding ring vortex to determine each shape's particular resistance to the pressure variations. Tests will be initiated about 5 October 1953.

H. Further tests conducted with models in which the air-gas interface inside the generating cylinder was replaced by a metal piston have thus far failed to show any significant change in the formation of the ring vortex and the streamlines surrounding it. Vortices formed with colored fluid have been observed to travel short distances, 3- or 4-ring diameters, with perfect rear stagnation points; but after traveling a short distance, the rear stagnation point becomes less definite, and a stream of colored fluid begins to trail behind the ring.

III. WORK PLANNED FOR THE NEXT REPORT PERIOD

1. The 30° exit section will be shipped to the Norfolk Naval Shipyard for loading aboard the YC-704 barge. This exit section will not be installed until completion of the tests using vertical ring projection.

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2. It is expected that the prototype installation at the Norfolk Naval Shipyard will be completed about 1 November 1953.

3. Tests will be continued with a view toward making the ring vortex a more efficient method of carrying large quantities of energy for longer distances without loss to the surrounding medium in the form of a tail from the ellipsoidal envelope surrounding the ring.

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