MICROSCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS (1968)
SONAR DOME COATINGS
DEVELOPED UNDER NAVY CONTRACT
WITH NEW YORK UNIVERSITY.

Material Sciences Division

U.S. NAVAL APPLIED SCIENCE LABORATORY
BROOKLYN, NEW YORK

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SONAR DOME COATINGS
DEVELOPED UNDER NAVY CONTRACT
WITH NEW YORK UNIVERSITY

Lab. Project 930-59, Technical Memorandum 2
SF 101-03-17, Task 8213

29 MAR 1966

MATERIAL SCIENCES DIVISION

Approved: D. H. KALLAS
Associate Technical Director

U.S. NAVAL APPLIED SCIENCE LABORATORY
FLUSHING AND WASHINGTON AVENUES
BROOKLYN, NEW YORK 11251
The U.S. Naval Applied Science Laboratory is monitoring the reference (a) contract, currently funded by NAVSEC under Sub-project SF013-13-01, Task Sub-project SF013-13-01, Task 12415, for the development of sonar dome coating systems which have good erosion resistance, good antifouling properties, and are able to remain adhered when exposed to high level sonic pulses generated by high power sonar transducers.

Under a similar development program at NASL, described in reference (b), a high sonic pulse facility was constructed which permitted evaluation of sonar dome coatings in service simulating conditions. This development program was not funded in FY1968.

A request was made by NAVSEC, under reference (c), that monitoring of the NYU contract include evaluation of the more promising NYU coatings, using the NASL high sonic pulse facility. Accordingly, this evaluation is being conducted in FY1968 under reference (d).

This report presents data on four coating systems prepared by Prof. Kronstein under the above contract (reference a) and submitted with descriptions of the formulations, under reference (e), for screening in the NASL high sonic pulse facility.

The coating systems submitted for evaluation were applied to sandblasted steel panels provide by NASL and are described in enclosure (1). The facility and test procedure, described in reference (g), used for screening of the
coating systems, consists of a test tank and a single SQS-26 sonar transducer as the high pulse generator.

6. The results of tests on the four coating systems are tabulated in Table 1, enclosure (2), with the resulting erosion patterns shown in enclosure (3).

7. The results of tests indicate that the experimental coating system applied to Panel I and submitted by New York University, is the most promising of the latest four coating systems submitted. However, although this coating system is an improvement over the three systems previously reported in reference (f), complete erosion down to the metal base still occurs, and the coating is, therefore, not considered suitable for use on sonar domes.

8. In discussing the results of tests with Prof. Kronstein of New York University, he has advised the Laboratory that further improvement will be made of the Panel I formulation. In this respect, Prof. Kronstein's attention was further directed to the possible reduction of the high film thickness (26.0 mils) of coating on Panel I.
Dear Mr. Cizek:

In continuing our development work we would appreciate your exposing the accompanying panels in your test device to guide us in the further development. They are:

A. PANEL I.
V-5-61 MODIFICATION OF TEST PAINT V-4-152 BY INCREASING THE POLYAMIDE RESIN CONTENT ACCORDING TO TABLE 28 of REPORT No. 4.

PANEL PREPARATION:
1) SANDBLASTED AT THE BROOKLYN NASL.
2) WASHPRIMER MIL-P-15328 B (FORMULA 117) .................. 0.35 mil
3) RED LEAD VINYL PRIMER MIL-P-15929 B (FORMULA 119) .......... 2.85 mil
4) NINE COATS OF PAINT V-5-61 ..................................... 14.80 mil

TOTAL ............. 18.00 mil.

B. PANEL II.
V-5-57 MODIFICATION OF TEST PAINT V-4-152 BY INCREASING THE CONTENT OF STYRENE BUTADIENE ELASTOMER AND POLYAMIDE RESIN BUT DECREASING THE RATIO OF POLYISOPRENE IN THE TEST PAINT (ACCORDING TO TABLE 27 of REPORT No. 4.)

PANEL PREPARATION:
1) SANDBLASTED AT THE BROOKLYN NASL.
2) WASHPRIMER MIL-P-15328 B (FORMULA 117) .................. 0.35 mil
3) RED LEAD VINYL PRIMER MIL-P-15929 B (FORMULA 119) .......... 2.65 mil
4) EIGHT COATS OF THE TOP COAT V-5-57 .......................... 17.00 mil

TOTAL ............. 20.00 mil
B. PANEL III.
MODIFICATION OF TEST PAINT V-5-38, MAINTAINING THE GRADE OF POLYURETHANE (ADIPRENE L 167) BUT INCREASING THE AMOUNT OF POLYAMIDE RESIN IN THE NEW TEST PAINT V-5-53 OF TABLE 23 IN REPORT No. 4.

PANEL PREPARATION:
1) SANDBLASTED AT BROOKLYN NASL.
2) WASHPRIMER MIL-P-15328 B (FORMULA 117) ....................... 0.35 mil
3) RED LEAD VINYL PRIMER MIL-P-15929 B (FORMULA 119) ........... 2.95 mil
4) EIGHT COATS OF TEST PAINT V-5-53 ............................... 16.70 mil
TOTAL .... 20.00 mil

PANEL IV.
MODIFICATION OF THE TEST PAINT V-5-38 BY FURTHER INCREASING THE CONTENT OF FREE ISOCYANATE IN THE POLYURETHANE COMPONENT, BY USING THE ADIPRENE L-200 MATERIAL.
NEW TEST PAINT: V-5-60 OF TABLE 13 IN REPORT No. 4.

PANEL PREPARATION:
1) SANDBLASTED AT THE BROOKLYN NASL.
2) Washprimer MIL-P-15328 B (FORMULA 117) ......................... 0.45 mil
3) RED LEAD VINYL PRIMER MIL-P-15929 B (FORMULA 119) ........... 4.05 mil
4) SEVEN COATS OF TOP COAT V-5-60 ................................ 15.50 mil
TOTAL .... 20.00 mil

Yours very truly,

[Signature]
Max Kronstein
Senior Research Scientist

Enclosure (1)
## TABLE 1

**TEST RESULTS OF SONIC EROSION OF EXPERT PANELS** (USING NASL HIGH SONIC PULSE FACILITY-POWER I)

<table>
<thead>
<tr>
<th>Panel No. (1)</th>
<th>Paint Coating System (2)</th>
<th>Dry Film Thickness (3)</th>
<th>Test Period Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total Thickness MILS</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Wash Primer F117 - 0.35 MIL</td>
<td>26.0</td>
<td>4 1/2</td>
</tr>
<tr>
<td></td>
<td>Vinyl Red Lead F119 - 2.85 MILS</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>9 Coats Paint V-5-61 - 14.80 MILS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Wash Primer F117 - 0.35 MIL</td>
<td>27.0</td>
<td>4 1/2</td>
</tr>
<tr>
<td></td>
<td>Vinyl Red Lead F119 - 2.65 MILS</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>8 Coats Topcoat V-5-57 - 17.0 MILS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Wash Primer F117 - 0.35 MIL</td>
<td>25.0</td>
<td>4 1/2</td>
</tr>
<tr>
<td></td>
<td>Vinyl Red Lead F119 - 2.95 MILS</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>8 Coats Paint V-5-53 - 16.7 MILS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Wash Primer F117 - 0.45 MIL</td>
<td>27.0</td>
<td>4 1/2</td>
</tr>
<tr>
<td></td>
<td>Vinyl Red Lead F119 - 4.05 MILS</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>7 Coats Topcoat V-5-6-15.50 MILS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**
1. Panel No. designation and coating system description were supplied.
2. Dry Film Thickness Measured by NASL.
<table>
<thead>
<tr>
<th>Eroded Area, Sq. In.</th>
<th>Topcoat Paint Removed</th>
<th>Paint Removed</th>
<th>To Bare Metal</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.020</td>
<td>0.006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.027</td>
<td>0.009</td>
<td></td>
<td></td>
<td>After 23 hours, erosion of outercoats in 3 small areas in approx. center of panel. Eroded to metal base in one of these areas.</td>
</tr>
<tr>
<td>0.097</td>
<td>0.025</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.188</td>
<td>0.079</td>
<td></td>
<td></td>
<td>After 23 hours, substantial scattered erosion of outercoats. Severe erosion to metal base in 3 areas.</td>
</tr>
<tr>
<td>0.231</td>
<td>0.152</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.333</td>
<td>0.205</td>
<td></td>
<td></td>
<td>After 23 hours, substantial erosion of outercoats. Severe erosion to metal base in 3 areas.</td>
</tr>
<tr>
<td>0.080</td>
<td>0.071</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.110</td>
<td>0.088</td>
<td></td>
<td></td>
<td>After 23 hours, severe erosion to metal base in 12 scattered areas.</td>
</tr>
</tbody>
</table>

Lab. Project 030-59
Technical Memorandum 2
Enclosure (2)

**EXPERIMENTAL COATING SYSTEMS**
**LEVEL 235 VOLT-AMPERES AVERAGE**

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ENCLOSURE 3 - VIEW SHOWING DEGREE OF EROSION OF N.Y.U. EXPERIMENTAL SONAR DOME COATING SYSTEMS

U.S. NAVAL APPLIED SCIENCE LABORATORY

PHOTO 21495

LAB. PROJECT 930-59
Technical Memorandum 2