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O T T A W A March 27, 1945.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1823.

Corrosion Resistance of an Anti-Corrosion
Oil for Aircraft Engines.

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Origin of Material and Object of Investigation:

On March 20, 1945, a sample of Aeroshell Fluid 2XX was submitted by A/C A. L. Johnson, for Chief of the Air Staff, Department of National Defence for Air, Ottawa, Ontario. The covering letter (File No. 832-33C-11, AMSO DAI) requested that a complete series of tests (with a few exceptions agreed upon) be carried out on this oil to determine its value as a corrosion preventive oil for aircraft engines. Specification C-27-587 was to be followed in making the test.

Test Work Performed:

The Aeroshell fluid was mixed, in the proportion of 1 to 3, with lubricating oil (supplied by the R.C.A.F.) conforming to Specification 3-GP-4. The mixture was first given the Hydrobromic Acid Neutralization Test. When the results of this test were communicated verbally to the Air Force, permission was granted to omit all of the other tests.

One purpose of this Hydrobromic Acid Neutralization Test was to compare the result obtained from a 10 per cent emulsion measured by weight with that obtained from a 10 per cent emulsion measured by volume. The amount of hydrobromic acid in the emulsion is less in the former case than in the latter case.

Three panels were tested in emulsion made up by volume and three were tested in emulsion made up by weight.

Results:

1. All six panels showed considerable signs of corrosion.
2. The three panels tested in the emulsion which was made up by volume showed approximately the same amount of corrosion as the three panels tested in the emulsion which was made up by weight. (See Figures 1 and 2).

Conclusions:

1. The sample of Aeroshell Fluid 2XX which was submitted did not fulfill the specifications with regard to hydrobromic acid neutralization.
2. As far as could be judged by the results of this test, the emulsion made up by volume gives approximately the same results as the emulsion made up by weight.

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Figure 1.



TYPICAL OF THE THREE PANELS TESTED WITH THE
EMULSION MADE UP BY VOLUME.

Corrosion occurred as small spots. Dark areas
and lines are to be disregarded.

(Size of panel, 2 x 4 inches).

Figure 2.



TYPICAL OF THE THREE PANELS TESTED WITH THE
EMULSION MADE UP BY WEIGHT.

Corrosion occurred as small spots. Dark areas
and lines are to be disregarded.

(Size of panel, 2 x 4 inches).

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APPENDIX TO REPORT OF INVESTIGATION

NO. 1822.

Two additional base plates have been fabricated by welding to the same general design as those previously described in this report. Material thickness was increased to 0.190 inch and the heat treatment was changed slightly.

The material was obtained in the annealed or normalized condition, cut and bent to shape by the R.C.E.M.E. workshop in Ottawa. The sections were then forwarded to these Laboratories and heat-treated in a controlled-atmosphere furnace as follows:

- (1) Heated to 1550° F. for 1 hour.
- (2) Quenched in oil.
- (3) Drawn for 1 hour at 1050° F. and cooled in furnace.

All welding was done with 1/8-inch diam. Planeweld electrodes (Lincoln Electric Co.), operating on straight polarity at 105 amperes welding current. The assembly was lightly tacked together and then welded without preheat in the identical sequence previously reported. All welding was in the downhand position and the weld size increased to 1/4-inch fillets. This size weld was produced by a slight weaving action, particular care being taken to ensure complete root penetration.

After welding, the plates were allowed to cool in still air. Due to an error in arrangements a furnace stress-relief was not obtained on either plate prior to proof testing. One plate was partially stress-relieved by oxy-acetylene

torch and the second received no stress-relieving treatment.

Tensile test pieces heat-treated with the material gave the following results:

<u>Test No.</u>	<u>Yield strength, p.s.i.</u>	<u>Ultimate strength, p.s.i.</u>	<u>Elongation, per cent in 2 inches</u>	<u>Reduction of area, per cent</u>
1	139,800	151,000	13.0	38.8
2	142,900	151,800	13.0	51.0

Design proof trials on both plates on hard and soft ground were satisfactory.

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Ottawa, Ont.
May 1, 1945.
HJN:LB.
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