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MATERIAL - PRESERVATIVE OIL - HYDRAULIC
EQUIPMENT - SCREENING TEST

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GENERAL DYNAMICS | FORT WORTH

MATERIAL - PRESERVATIVE OIL -
HYDRAULIC EQUIPMENT - SCREENING TEST

PURPOSE:

It was anticipated that component parts of the B-58 hydraulic system would be shipped and/or stored in preservative oil. Since petroleum base preservative fluids are incompatible with Oronite High Temperature Hydraulic Fluid 8515, it was necessary to determine what synthetic base oils would be satisfactory. Some information was also desired on the ability of these oils to furnish protection against rust and corrosion.

SUMMARY:

In order to establish the degree to which preservative oils would protect B-58 hydraulic equipment from rusting and corrosion, two of these oils, Monsanto OS-80 and Oronite Preservative Oil No. 53839-R, were tested as per Military Specification MIL-O-6083A. This specification, while not applicable to these oils, was used as a guide since no other standards were available.

The results were that Monsanto OS-80 was capable of protecting hydraulic equipment from rusting and corrosion, was compatible with Oronite 8515 Hydraulic Fluid, and had no deleterious effects on rubber O-rings. Oronite Preservative Oil No. 53839-R was also compatible with Oronite Hydraulic Fluid 8515, as would be expected, and also had little effect on the rubber O-rings. However, it did not completely protect steel panels from rusting.

As noted in the Recommendations Section at the end of this report, this test was a preliminary evaluation. A complete qualification, including compatibility with the hydraulic fluid in use, would be necessary for final selection of a suitable preservative oil.

MATERIAL - PRESERVATIVE OIL
HYDRAULIC EQUIPMENT - SCREENING TEST

OBJECT:

The object of this test request was two-fold.

1. To determine if hydraulic system preservative oils, Oronite No. 53839R or Monsanto OS-80, will protect B-58 hydraulic systems against corrosion; and be compatible with the system components and Oronite High Temperature Hydraulic Fluid 8515.
2. To determine qualitatively, the principal components in the two preservative oils.

DESCRIPTION OF MATERIALS:

Test Fluids:

- | | |
|---|---|
| 1. Oronite Preservative Oil
No. 53839R | Oronite Chemical Company
200 Bush Street
San Francisco, Calif. |
| 2. Monsanto OS-80*
Lot #Z -2048 | Monsanto Chemical Company
800 N. Twelfth Blvd.
St. Louis 1, Mo. |

Support Materials:

- | | |
|--|---|
| 1. Oronite High Temperature
Hydraulic Fluid 8515 | Oronite Chemical Company
200 Bush Street.
San Francisco, Calif. |
| 2. Rubber O-Rings*
(Cmpd. No. 363-70) | Plastic & Rubber Products Co.
2100 Hyde Park Blvd.
Los Angeles 47, Calif. |
| 3. Steel panels, Specification
QQ-S-636, Non-copper bearing,
cold rolled strip, bright
finish | Convair Stock |

PROCEDURE:

The procedures used in the testing of these materials were as called out in the test request. Where at all possible, standard procedures were used.

The following is a list of tests and their source:

- * Per Convair Standards Q2715 and Q2717 (identical in sizes to AN6227 and AN6290 respectively).

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1. Corrosion Test - Military Specification MIL-O-6083A - except panels prepared in accordance with Para. 4.3.2.4.1 then polished and tested as per Para. 4.3.2.4.2 except length of test is 25 hours.
2. Cold Storage - Oil held at -65°F for 24 hours and visually checked.
3. Viscosity - A.S.T.M. D445-46T.
4. High Temperature Storage - Oil held at 350°F for 25 hours (inert atmosphere), then given visual check and viscosity change determined.
5. Compatibility with Convairstock, Q2715-19, Q2715-28, Q2717-5 O-rings. - O-ring seals were immersed in the test oils for 46 hours at ambient temperature (inert atmosphere), then removed and placed in Oronite Hydraulic Fluid 8515 for 2 hours at 350°F . At the end of the 48 hour period, the seals were tested for volume change, hardness, flexibility and temperature of retraction (TR-10).
6. Evaporation - Military Specification MIL-O-6083A, Para. 4.2.2.4.

It should be pointed out that Military Specification MIL-O-6083A does not apply to these preservative oils since they are synthetic base oils and Specification MIL-O-6083A specifically calls out a petroleum base hydraulic preservative oil. No Military Specification has been released yet on a synthetic base preservative oil.

In general, the methods used to determine the components of these oils were analysis by infrared spectrometer and x-ray fluorescence. Also, a literature and patent search and general knowledge aided in identifying the components.

RESULTS:

Table I is a summary of the data compiled on the two preservative oils as compared with Oronite Hydraulic Fluid 8515.

Table II is a list of the components of the test fluids.

Figure 1 is a photograph of the steel panels after the corrosion test.

DISCUSSION:

Since it was anticipated that component parts of the B-58 hydraulic system may be shipped and/or stored in preservative oils, it was desired to have some information on the ability

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of these oils to act as preservatives. As indicated in Reference 2, petroleum base oils would not be satisfactory due to possible contamination of the Oronite Hydraulic Fluid 8515.

To eliminate this difficulty, Oronite Chemical Company agreed to furnish a preservative oil which would be compatible with their hydraulic fluid. Monsanto Chemical Company also indicated that they had a preservative oil which would be satisfactory. Both companies forwarded samples and these were tested for their compatibility with Oronite Hydraulic Fluid 8515 and rubber O-rings which are used in the B-58 hydraulic system. Tests were also run to determine the ability of these oils to prevent corrosion and/or rust.

The data from the test work is contained in Table I. A detailed look at this data discloses that:

1. The compatibility of both preservative oils in Oronite Hydraulic Fluid 8515 is satisfactory. Initial appearance of the blends was excellent. No stratification was evident. Low and high temperature storage of these blends (4 and 5 in Table I) did not produce any incompatibility.
2. Viscosity changes of blends 1, 2 and 4 were excessive during the high temperature storage test. If evaporation had occurred, the viscosity would have increased; but in this instance the viscosity decreased, indicating a thermal rupture of the compounds. Blends 3 and 5 were satisfactory with regard to viscosity change.
3. Monsanto OS-80 passed the corrosion test; Oronite Preservative Oil No. 53839R (in its present formulation) did not.
4. Both test fluids passed the evaporation and rubber compatibility tests.

The Oronite preservative material, as determined from conversations with the vendor and subsequent infrared and x-ray inspections, is definitely a modified version of Oronite Hydraulic Fluid 8515. One percent of a calcium petroleum sulfonate has been added as a rust and corrosion inhibitor.

The Monsanto material (OS-80) was more difficult to classify. Inspection of this oil was by infrared methods, x-ray fluorescence, etc.

Time and facilities were not available to further separate these fluids into their components. The compositions (tentative) of these oils can be found in Table II.

CONCLUSIONS:

Based on laboratory tests conducted by the Chemistry Section, Engineering Test Laboratory, the following conclusions can be drawn.

1. Monsanto OS-80 is satisfactory as a preservative oil for protecting B-58 hydraulic systems from corrosion and/or rusting.
2. Oronite Preservative Oil No. 53839R is not satisfactory as a preservative oil for B-58 hydraulic systems.
3. Oronite No. 53839R and Monsanto OS-80 are both compatible with B-58 system components and Oronite High Temperature Hydraulic Fluid 8515.
4. Qualitative data on the composition of Oronite Preservative Oil No. 53839R and Monsanto OS-80 hydraulic systems preservative oils, is shown in Table II.

RECOMMENDATIONS:

Inasmuch as this test was conducted for preliminary evaluation only, it is recommended that any selection of a preservative oil be based on a complete qualification to an applicable specification. It is further stressed that compatibility would be of prime concern with regard to the present hydraulic fluid and a new preservative fluid.

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REFERENCES:

1. Convair Procurement Specification JMS-0006
2. FTDM-1539
3. FGT-1498
4. Military Specification MIL-O-6083A, Oil, Preservative, Hydraulic Equipment

TABLE I
 HYDRAULIC PRESERVATIVE OILS - SCREENING TEST RESULTS

	TEST OILS				
	1	2	3	4	5
Granite High Temperature Hydraulic Fluid 8515	100.0	-	-	90.0	90.0
Sample No. 53695-R, Rec'd 5-2-56					
Granite Preservative Oil Rec'd 3-19-56 # 339-R	-	100.0	-	10.0	-
Granite Preservative Oil Rec'd 3-28-56	-	-	100.0	10.0	10.0
Inspection Data					
Cold Storage (-45°F for 24 hours)					
Telling	None	None	None	None	None
Crystallization	None	None	None	None	None
Separation	None	None	None	None	None
Remarks	None	None	Opaque	None	None
Hot Storage (350°F for 24 hours) (inert atmosphere)					
Precipitates	None	None	None	None	None
Color Change	Darkened	Red to Black	None	Red to Black	None
Remarks	None	None	None	None	None
Viscosity	24.68	22.72	14.73	24.48	22.70
Cs @ 100°F (Control)	8.25	7.62	4.38	8.15	7.23
Cs @ 210°F (Control)	17.00	20.21	15.02	22.01	21.12
Cs @ 100°F (350°F for 24 hours)	5.28	6.64	4.50	7.38	6.85
Cs @ 210°F (350°F for 24 hours)	31.12	11.05	1.93	10.09	6.96
Change in Viscosity @ 100°F	36.00	-12.86	+2.67	-9.56	-5.26
Change in Viscosity @ 210°F					
Corrosion Test (Humidity Cabinet)					
25 hours @ 120°F, 7-9 cu ft air/hr. sat.	Surface Scuffs	Completely Rusted	No Rust	Not Required	
Condition of QQ-S-636 Polished Panels (Steel)	OK Pass	OK Pass	OK Pass	OK Pass	
Evaporation Test (MIL-O-6083A para. 4.2.2.4.)	OK Pass	OK Pass	OK Pass	OK Pass	
Rubber Compatibility					
46 hours @ Room Temperature					
Volume Change of Rubber O-rings	4.86	6.55	8.04		
2715-19 (%)	6.11	4.98	4.71		
2715-28 (%)	7.31	8.54	7.03		
2717-5 (%)					

ANALYSIS
 PREPARED BY _____
 CHECKED BY _____
 REVISED BY _____

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TABLE I (Cont'd)
 HYDRAULIC PRESERVATIVE OILS - SCREENING TEST RESULTS

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	TEST OILS				
	1	2	3	4	5
Change in Hardness (Gm./sq.in.) (Rubber O-rings)					
02715-19	None	None	None	Not Required	
02715-28	None	None	None	"	
02717-05	None	None	None	"	
Change in Flexibility (Qualitative) (Rubber O-rings)					
02715-19	None	None	None	"	
02715-28	None	None	None	"	
02717-05	None	None	None	"	
Temperature of Retraction (CR 10)					
02715-19 Before soiling (°F)	-35	-35	-35	"	
02715-19 After soiling (°F)	-47	-46	-45	"	

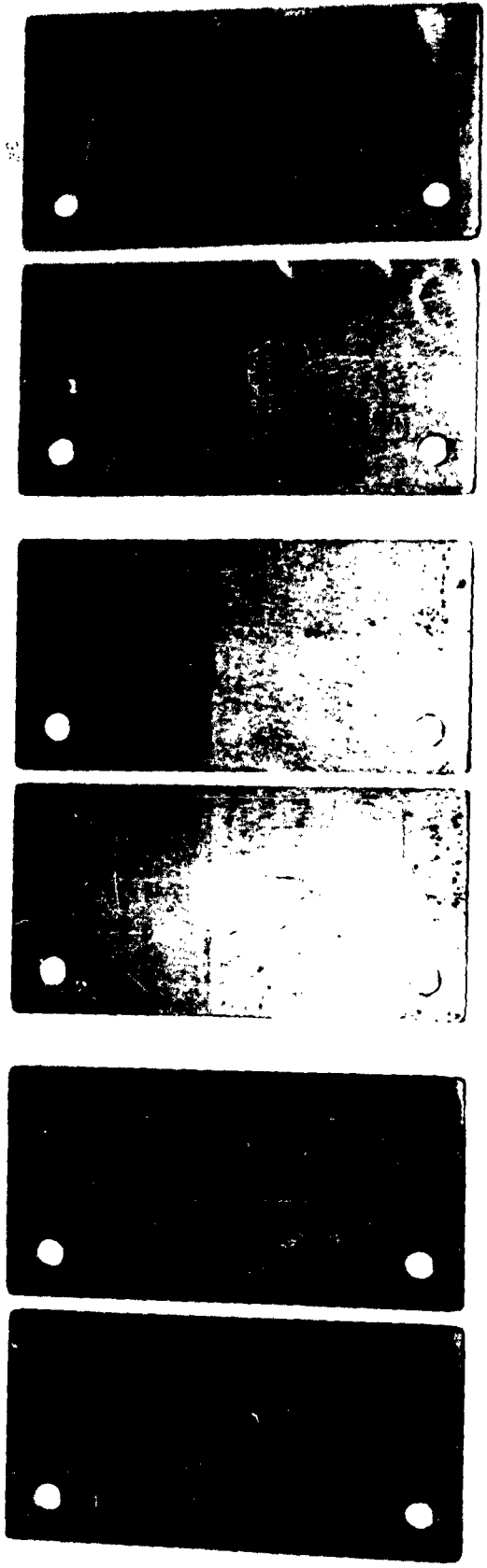
TABLE II

HYDRAULIC PRESERVATIVE OILS - COMPONENTS

	<u>COMPONENTS</u>	<u>% (BY VOL.)</u>
Oronite Preservative Oil #53839R, Rec'd 3-19-56	Hexa (2-ethyl butoxyl) disiloxane	79.0
	Di-2-ethyl hexyl sebacate	15.0
	Methyl ethyl silicone	4.0
	pp' dioctyl diphenylamine	2.0
	Quinizarin	0.02*
	Calcium petroleum sulfonate	1.0*
Monsanto OS-80 Lot #Z-2048, Rec'd 3-28-56	Silicone base oil	
	A silicate or methacrylate polymer	
	Phenyl α naphthylamine	
	Calcium petroleum sulfonate	

* % by weight added.

8-10-56
17-506-17-506



17-506-17-506
8-10-56

2-17101
 HUMIDITY CABINET TEST
 SPECIMENS - F-5712
 CONVAIR FT. WORTH TEXAS

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FIGURE NO.

NEGATIVE NO.

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