

AN EXAMINATION OF
THE RELATIONSHIP BETWEEN
WATER CONTAMINATED OIL AND WEAR METAL ANALYSIS

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Enclosure (1)



INTRODUCTION: The Navy Oil Analysis Program (NOAP) monitors wear metals generated by an aircraft's oil-wetted components. Helicopter gearboxes are intricate and complex oil-wetted components monitored by NOAP. One of the problems associated with helicopter gearboxes is the contamination of the oil with water. This paper will illustrate that a definite relationship exists between the water content of the oil and the specific metals generated by helicopter gearboxes.

EQUIPMENT: A Baird Atomic Emission Spectrometer, Model A/E 35U-3, and a Photovolt Aquatest IV. Equipment histories were stored in a Wang 2200 Data System and obtained from other Oil Analysis Laboratories in the Department of Defense (DOD).

PROCEDURES: The techniques for sampling and analysis by emission spectroscopy are detailed in the JOAP Laboratory Manual.¹ The photovolt water analyser procedures are described in the Operations Manual.²

Initially, histories stored on a Wang in the Naval Air Rework Facility, Pensacola (NARFP) were recalled by specifying only those histories that had a water code associated with them. A total of 214 histories were recalled and 211 of these histories were of helicopter gearboxes. A water code refers to a sample containing 1,000 PPM water or greater.

These histories were segregated further by examining the histories for wear metals having abnormal and/or exceeding the threshold limits. The type of gearbox and metals associated with the water contamination were then considered.

After establishing that a relationship between contaminated oil and metals detected by emission spectroscopy existed, gearboxes exhibiting corrosion metals and water contamination of the oil verified were diagnosed as water-induced corrosion. The NARFP laboratory recommendation was to drain the oil out of the gearbox, flush the gearbox, refill with new oil, and the component placed on a shortened sampling cycle for one sample interval. A typical laboratory advice would be to resample as soon as possible; do not change oil. The subsequent sample would have the same metal levels or higher. If the metal levels exceeded the threshold limit, removal of the gearbox would have probably occurred. The histories of these gearboxes were compiled. In the case of NARFP gearboxes, attempts were made to obtain the histories of these gearboxes from other oil laboratories and NAVWESA.

RESULTS: Table 1 has the types of metals found in all the gearboxes in the initial study of 211 helicopter gearbox histories.

Table 2 defines the corrosion metals associated with the type of gearbox.

Table 3 illustrates some of the gearboxes continued in service that could have been removed based solely on spectrometric results.

Enclosure (A) is messages from the oil laboratories on helicopter gearboxes.

Enclosure (B) is engineering investigation reports on gearbox removals from the Army.

Enclosure (C) is a memorandum to HMX-1.

DISCUSSION OF RESULTS: The 211 histories of helicopter gearboxes had 81 histories fitting the criteria of having water of 1,000 PPM or greater in the oil and having abnormal and/or exceeding threshold limits for wear metals. This represents 38% of the histories examined. Table 1 clearly shows that iron is the most common metal found. Magnesium, copper, and aluminum also occur with significant frequency.

Table 2 associates the corrosion metals with the model and gearbox type. This table is based on the 81 histories initially used to establish the relationship and the 102 histories accumulated since establishing the relationship. This data demonstrates how a gearbox could be easily removed if the condition of the equipment is based solely on the spectrometric results. In the tail gearbox, iron and copper increase initially, then magnesium and aluminum begin to increase. In the H-3 tail gearbox, iron, copper, and aluminum initially increase with aluminum generally exceeding the threshold limit fairly rapidly. In the intermediate gearbox, iron and magnesium increase rapidly. The main gearbox characteristic corrosion metals are iron and copper.

If only the emission spectroscopy data is considered and the abnormal corrosion metal trends continue, the result would be the removal of the gearbox. However, if the water content of the oil is analysed and found to be 1,000 PPM or greater, the laboratory's advice should be to change the oil. That is, drain out the oil, flush the gearbox (if possible), refill with new oil, and recommend a shortened sampling period. For production samples at NARFP, i.e., helicopters at flight test; a sampling period of one hour is used. This is sufficient to determine if a failure is occurring. In helicopter gearbox oil samples from the fleet exhibiting corrosion problems again have the oil changed, but the sample cycle shortened to 10 hours. This sampling interval is used because the helicopters in the fleet utilize longer flight times than helicopters in rework. In addition, this is

a reasonable sample interval to use on fleet helicopters that would not hinder fleet readiness and operation. The resample of the oil from a gearbox suspected of corrosion should exhibit much reduced levels of the corrosion metals and the water content of the oil below 1,000 PPM. The key to recognizing a corrosion condition is that the metals occur together not by themselves.

To substantiate that this problem may be occurring fleetwide can be seen by examination of enclosure (A). A comparison of the gearbox type and the wear metals found in excess that resulted in the removal of the gearbox with Table 2 illustrates that the problem may have been water in the oil. However, the capability to analyse for water does not exist at all laboratories and the recognition of the relationship between water content in the oil and metal generation by the gearbox is not known. These only represent a small percentage of the messages issued by oil laboratories fleetwide.

Gearboxes removed by the fleet are sent to the supply system. They are overhauled and placed into service at a later date. It is not known how many of these gearboxes had corrosion problems caused by water. As discussed earlier, this could have been prevented by recognizing the relationship of water content of the oil and metal generation by helicopter gearboxes.

The problem is not limited to the Navy and Coast Guard helicopter gearboxes. Enclosure (B) demonstrates that the problem also exists in Army helicopter gearboxes. The engineering investigation states the wear metal generation by the gearbox that resulted in its removal by the laboratory was caused by water corrosion.

In enclosure (C), it appears that HMX-1 may be having the same problem. Again, tail gearboxes and intermediate gearboxes removed for high spectrometric metal readings were found not to have any problems upon disassembly and inspection. The investigating engineer noted water-induced corrosion may be the problem.

Since the recognition of this relationship, the NARFP Oil Analysis Laboratory has not removed gearboxes exhibiting corrosion symptoms since May 1983. A total of 73 gearboxes with metals exceeding threshold limits were continued in service. In addition, 29 gearboxes having abnormal metal trends that did not exceed the threshold limits, exhibiting corrosion symptoms and verified by water analysis were "cleaned up" by the same procedure. These gearboxes were restored to normal operation by changing the oil and reducing sampling time for one interval. These represent a small percentage of the gearboxes that could have been saved from premature removal.

The labor savings on the 73 gearboxes is \$352,000. If the 29 gearboxes are also included, an additional \$198,500 was saved. This is a total savings of \$550,500. Labor cost is defined as the time to remove and install a particular gearbox multiplied by the current labor rate charged by NARFP. If we consider the overhaul costs saved for 73 gearboxes, this amounts to \$1,535,183. If we include the 29 helicopter gearboxes, this amounts to an additional savings of \$718,861. This is a total overhaul cost savings of \$2,254,044. The total labor and overhaul costs saved on these 102 gearboxes is \$2,804,544.

Table 3 contains the helicopter gearboxes not removed at NARFP flight test. These gearboxes exhibited corrosion symptoms that were verified by water analysis. Histories of these gearboxes were obtained from other oil analysis laboratories, i.e., the oil laboratories responsible for analysis where the helicopter was stationed after leaving NARFP. These are not all of the gearboxes that exhibited corrosion symptoms. Gearboxes that are not in this table are lacking followup histories. This clearly shows that the problem was water-induced corrosion.

CONCLUSIONS: Water of 1,000 PPM or greater in the oil of helicopter gearboxes can and will cause the generation of corrosion metals. Tail gearboxes are more susceptible to this phenomena because of the small oil volume.

The data presented in this paper clearly demonstrates that helicopter gearboxes can be prematurely removed by basing the removal solely on spectrometric analysis. Unless water analysis is performed when characteristic corrosion metals are found by emission spectroscopy, the gearbox will be removed.

The cost of an Aquatest IV is approximately \$5,000 and the analysis time is approximately 1.5 minutes per sample. The water analysis of helicopter gearbox oil coupled with emission spectroscopy would save an enormous amount of money. The purchase and fleetwide use of this instrument would pay immediate dividends.

Water is entering helicopter gearboxes by weather conditions and cleaning procedures used by maintenance personnel. To minimize water contamination of the gearboxes, cleaning procedures should be modified. The tail gearboxes should be covered and care taken with the other gearboxes also.

The modification of cleaning procedures is only a short-term solution. A possible long-term solution would be to modify the seals. These seals are designed to keep oil in the gearbox not to prevent water from entering the gearbox.

In conclusion, corrosion costs are enormous. We cannot totally eliminate the damage caused by water-induced corrosion. By recognizing its presence we can minimize its effect on the fleet readiness, production, and economic impact.

RECOMMENDATIONS:

1. Purchase Aquatest IV for all oil analysis laboratories and train personnel to recognize the corrosion metals from helicopter gearboxes.
2. Incorporate a water limit for helicopter gearboxes into the Joint Oil Analysis Program (JOAP) Manual. The water content discussed in this paper was 1,000 PPM or greater.
3. Incorporate water analysis into helicopter gearbox technical manuals. This would have to be done by NESO.
4. Investigate the cleaning procedures on helicopters. Modify the procedures to prevent gearbox exposure to water.
5. Investigate the seals used on the gearboxes. If it is found that they are not preventing water from entering the gearbox, then a design modification may be necessary.
6. Investigate all sources of water that could contaminate the helicopter gearboxes.



TABLE 1

BASED ON 81 HELICOPTER GEAR BOX HISTORIES

<u>WEAR METAL</u>	<u>NO. OF HISTORIES THE WEAR METAL WAS FOUND AS AN AB-NORMAL INCREASE</u>	<u>NO. OF HISTORIES THE WEAR METAL EXCEEDED THE TRESH-HOLD LIMIT</u>	<u>PERCENT OF TOTAL HISTORIES</u>
Iron	58	19	95
Magnesium	32	16	59
Copper	37	6	53
Aluminum	25	3	34
Chromium	4	0	5
Titanium	3	0	4

Table 1 - Frequency of a particular wear metal occurrence with oil containing at least 1,000 ppm water.



TABLE 2

<u>Gearbox Type</u>	<u>Model</u>	<u>Corrosion Metals</u>
Tail	H-1, H-2, H-3, H-52, H-53	Fe, Cu, Mg, Al
Intermediate	H-1, H-2, H-3, H-52, H-53	Fe, Mg
Main	H-1, H-2, H-3, H-52, H-53	Fe, Cu
Aft and Forward	H-46	Fe, Mg
Nose	H-53	Fe, Cu

Fe = Iron
 Cu = Copper
 Mg = Magnesium
 Al = Aluminum

REPRODUCED AT GOVERNMENT EXPENSE

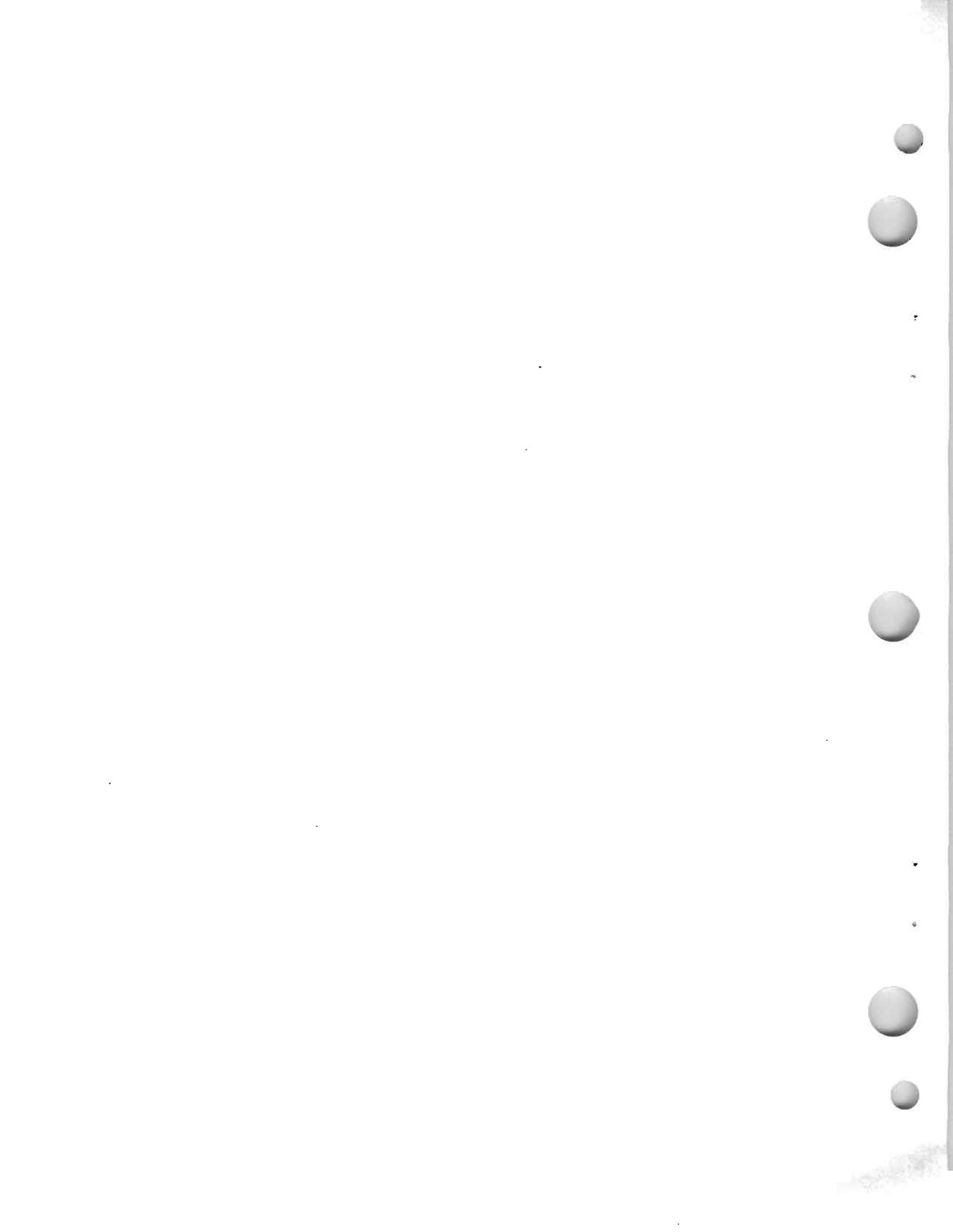
Table 2. Gearbox Type and Associated Corrosion Metals



TABLE 3
NARFP Gearboxes That Continued in Service

Gearbox Number	Aircraft Model and Gearbox Type	Julian Date Corrosion Problem Detected At NARFP	Julian Date Last Available on Normal Fleet Operation	Number of Days In Operation
A15-616	SH3HIGB	3262	4137	241
A18-211	CH53IGB	4005	4194	189
A16-815	SH3HTGB	3208	4195	351
A16-1037	SH3HTGB	3199	4081	248
A18-097	CH53AIGB	3266	3299	33
S617156-1220	HH3AMGB	3290	4216	292
A15-877	HH3AIGB	3290	4170	246
A16-875	SH3GTGB	3166	3209	43
A14E3162-426	HH3AMGB	3264	3325	61
A15-7912	SH3DIGB	3164	4187	389
A15-693	SH3DIGB	3308	4212	270

Table 3. NARFP gearboxes with supporting histories showing the days the gearboxes have remained in operation instead of being removed by spectrometric data.



LITERATURE CITED

1. "Joint Oil Analysis Program Laboratory Manual", Naval Air Systems Command March 1, 1978, pp 3-1 to 3-11, 5-1.
2. "Operating Instructions Aquatest IV", Photovolt Corporation, September, 1980



RUHSS02897 2410150-U00U--PUCLMHA.

0000

1342 AUG 84

VSHIPREFFAC BUAM

4/DIPJOAP TSC PENSACOLA FL

S 77N0473177

OIL ANALYSIS RESULTS

FT-TRANS EQUIPMENT SER NO. A11807; END TERM:

ER NO) 152498 OTO SAMPLES TAKEN 13 AUG 84/7 AUG 84

OTH SAMPLES INDICATE EXCESSIVE WEAR FOR FE (IRON) AND
CRISTUM).

PRESENT READINGS FE-63PPM AND MG-33PPM.

ADVICE CODE OF "F" IS RECOMMENDED.

JOAP

REPRODUCED AT GOVERNMENT EXPENSE

262236ZAUG84/40R

ENCLOSURE: (A)

IMMEDIATE

313/1646Z

(A)

PT00428

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P.E. Department		
	Action	Info
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OTTUZYUW RUMGSE66112 3131615-ULLU--RUCLMHA.

ZNR UUUUU

O = 091601Z NOV 83

FM USS RANGER

TO RAMPDEC/USS CAMDEN

RUMJWUA/NAVSHIPREPAC SUBIC BAY RP

INFO RUCLMHA/NAVIREWORKFAC PENSACOLA FL

RUACJVA/COMFAIRLESTPAC ATSUGI JA

RUHHWIN/COMFAIRLESTPAC DET CUBI PT RP

RUHHWIA/COMASWINGPAC LAMPS DET CUBI PT RP

BT

UNCLAS //MC4731//

SUBJ: JOINT OIL ANALYSIS PROGRAM

A. MEMO FM AMCS PEREZ, USS CAMDEN AIRDET CTE 8 NOV 83

1. IRT REF A A/C BUVO 151934 OIL ANALYZED

BY RANGER NOAP READS IRON 109 PPM AND MAGNESIUM 97 PPM.

2. SAMPLE TAKEN DATE 3313.

BT

#4112

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NARF

IMMEDIATE

S *11/70* ~~X~~ ~~D~~ *AK*

RDDE 88 NOV 83 30/DR

ROUTINE

160/1903Z

PT00544

PAGE 01

RITUZYUW RHWISGG5493 1800746-UUUU--RUCLMHA.

ZNR UUUUU

R 280746Z JUN 84

F VSHIPREPFAC SUBIC BAY RP

T HWZMBB/USS LEFTWICH

INFO RUCLMHA/NAVAIREWORKFAC PENSACOLA FL

RUADJVA/COMFAIRWESTPAC ATSUGI JA

RUHHWIN/COMFAIRWESTPAC DET CUBI PT RP

RUHHWIA/COMASWINGPAC LAMPS DET CUBI PT RP

BT

UNCLAS //NO4731//

FOR HSL-33 DET-5

SUBJ: JOINT OIL ANALYSIS PROGRAM

1. ROUTINE SAMPLE FROM SH2FTGB (S/N: C20149); A/C BUNO 151327 HAD INCREASE IN IRON (09 TO 26 PPM) AND MAGNESIUM (00 TO 18 PPM) WITH NORMAL TREND. RECOMMEND RESAMPLE AFTER 10 ADDITIONAL OPERATING HOURS TO MONITOR TREND.

2. SAMPLES FROM SH2FTGB (S/N: C2149M237) MARKED ROUTINE AND SPECIAL (HRS SINCE OVHL: 654 AND 704, RESPECTIVELY) HAD INCREASING IRON (26 TO 43 PPM). RECOMMEND DO NOT CHANGE OIL AND RESAMPLE AFTER 5 ADDITIONAL OPERATING HOURS.

3. SAMPLES RECD THIS FACILITY 4179.

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#F 03

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X ——— D ———

280746Z JUN 84 30/DR

ROUTINE

ROUTINE

200/1910Z

PT00473

PAGE 01

RTTUZYUW RHCJSGG4396 2001907-UUUU--RUCLMHA.

ZNY UUUUU

R 181429Z JUL 84

FM NAVAIWORKFAC JACKSONVILLE FL

TO RHCJJXA/HELANTISUBRON SEVENTEEN

INFO RUCLMHA/NAVAIWORKFAC PENSACOLA FL

BT

UNCLAS //NO4731//

SUBJ: OIL ANALYSIS RESULTS

A. FONECON T. MUSGRAVE NAVAIPEWORKFAC JAX CODE 96233 AND

YMI WALTERS HS-17 17 JUL 84

1. OIL FROM BELOW LISTED AIRCRAFT AS FOLLOWS:

BUNO	SER NR	TAKEN	RFCO	SAMPLE NR
5H3H/148052	T38/A16807	4197	4198	7572

2. EXTREMELY HIGH FEV AL. GROUND. DO NOT FLY. OPERATE. REMOVE FROM SERVICE & SEND TO IMA FOR EVALUATION.

3. THIS CONFIRMS REF A.

BT

~~44396~~

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ROUTINE

XD *[Signature]* -----

181429Z JUL 84/PM17

PRIORITY

040/1253Z

PT00459

PAGE 01

ZYUW RHWISGG6063 0400746-UUUU--RUCLMHA.

ZNR UUUUU

P R 090746Z FEB 84

FM NAVSHIPREPFAC SUBIC BAY RP

TO RHMPHDD/USS CAMDEN

INFO RUCLMHA/NAVAIREWORKFAC PENSACOLA FL

RUADJVA/COMFAIRWESTPAC ATSUGI JA

RUHHWIN/COMFAIRWESTPAC DET CUBI PT RP

RUHHWIA/COMASWINGPAC LAMPS DET CUBI PT RP

BT

UNCLAS //NO4731//

SUBJ: JOINT OIL ANALYSIS PROGRAM

1. FOR HC-11 DET-6. SPECIAL SAMPLE NO. 017 FROM HH46AATR (S/N: A9-1081), A/C BUNO 151918, HAD SHARP INCREASE IN IRON (12 TO 53 PPM) AND MAGNESIUM (3 TO 14 PPM) AFTER OIL CHANGE. RECOMMEND RESAMPLE AFTER FLIGHT OR 5 OPERATING HOURS. REQUEST MAINTAIN CLOSE SURVEILLANCE.

2. SAMPLE TAKEN DATE 4035 RECD THIS FACILITY DATE 4040.

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090746Z FEB 84/21A

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168/0159Z

PT00087

PAGE 01

RTTUZYUW RUCBSGG3P88 1680155-UUUU--RUCLMHA.

ZNR UUUUU

R 151106Z JUN 84

FM NAVAIREWORKFAC NORFOLK VA

TO RUEOALA/HELSUPPRON SIX

INFO RUCLMHA/NAVAIREWORKFAC PENSACOLA FL//440//

RUEOALL/COMNAVAIRLANT NORFOLK VA//527//

BT

UNCLAS //NO4731//

SUBJ: JOINT OIL ANALYSIS PROGRAM (JJAP)

A. FONECON HELSUPPRON SIX (M/C PETERSON)/NAVAIREWORKFAC NORFOLK

(A. LENOIR) OF 14 JUNE 1984

1. THIS CONFIRMS REF A. SAMPLE NR 181 CH45DATR (GB) S/N 49259

CH46D A/C BUND 154032 SUBMITTED ASAP. HAD VERY HIGH FE AND

INCREASING.

2. RECOMMEND ADVICE CODE SIERRA. DO NOT FLY/OPERATE; REMOVE COMPONENT FROM SERVICE AND SEND TO DEPOT FOR TEAR DOWN EVALUATION.

BT

#0888

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X Y D -----

151106Z JUN 84/MK/44

ROUTINE

ROUTINE

210/0423Z

PT00225

PAGE 01

RTTUZYUW RUCOSGG9259 2100300-UUUU--RUCLMHA.

ZNR UUUUU

71206Z JUL 84

NAVAIREWORKFAC NORFOLK VA
TO RUCOSAA/HELSPUPRON SIX
INFO RUCLMHA/NAVAIREWORKFAC PENSACOLA FL
RUCOSAA/COMNAVAIRLANT NORFOLK VA

BT

UNCLAS //NO4731//

SUBJ: JOINT OIL ANALYSIS PROGRAM (JOAP)

A. FONECON HELSPUPRON SIX (CPO MILLER)/NAVAIREWORKFAC NORFOLK
(A LENIOR) OF 26 JUL 84

1. THIS CONFIRMS REF A. SAMPLE NR 321 ATR (GB) S/N A91003 CH#6D A/C
BUND 152567 SUBMITTED ASAP. HAD RAPID INCREASE FE AND INCREASING.
2. RECOMMEND ADVISE CODE SIERRA. DO NOT FLY/OPERATE; REMOVE
COMPONENT FROM SERVICE AND SEND TO DEPOT FOR TEAR DOWN EVALUATION.
3. THIS MESSAGE OF INTEREST TO NAVAIREWORKFAC PENSACOLA (CODE 440)
AND COMNAVAIRLANT (CODE 527).

BT

#9259

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271206Z JUL 84/43V

ROUTINE

PRIORITY

028/07027

PT00310

PAGE 01

PTUZYUW RUWFSGG3385 0280700-UUUU--PUCLMHA.

ZNR UUUUU

Z R 251912Z JAN 84

FM NAVAIREWORKFAC NORTH ISLAND CA

TO RUWJTPA/HMM ONE SIX THREE

INFO RUWJGFB/CG THIRD MAW

RUWJTPA/MAG SIXTEEN

RUCLFCG/NAVAIREWORKFAC CHERRY PT NC

RUWFAAB/COMNAVAFAC SAN DIEGO CA

RUEDALA/NAVSAFECEN NORFOLK VA

RUCLMHA/NAVAIREWORKFAC PENSACOLA FL

BT

INCLAS //NO4731//

SUBJ: OIL ANALYSIS PROGRAM

SAMPLE NR 18 CH46EATR SER NR A9587 A/C 157655 HAD HIGH IRON AND MAGNESIU. REC REMOVE FOR ENGINEERING INVESTIGATION.

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251912Z JAN 84/49A

PRIORITY

PRIORITY

287/1042Z

PT00363

PAGE 01

PTTUZYUW RHWISGG2549 2800746-UUUU--RUCLMHA.

ZNS UUUUU

070746Z OCT 83

AVSHIPREPFAC SUBIC BAY RP

QUYNSAA/USS WHITE PLAINS

INFO RUCLMHA/NAVAIREWORKFAC PENSACOLA FL

RUADJVA/COMFAIRWESTPAC ATSUGI JA

RUHHWIN/COMFAIRWESTPAC DET CUBI PT RP

RUHHWIA/COMASWINGPAC LAMPS DET CUEI PT RP

BT

UNCLAS //NO4731//

SUBJ: JOINT OIL ANALYSIS PROGRAM

1. FOR HC-3 DET-106. ROUTINE SAMPLE ON HH46AATR (S/N: A9796), A/C BU#0 150962. HAD HIGH IRON (61 PPM) AND MARGINAL MAGNESIUM (18 PPM); PREVIOUS READOUTS WERE 22 PPM AND 4 PPM RESPECTIVELY. RECOMMEND DO NOT FLY OR OPERATE AND DO NOT CHANGE OIL. REQUEST RESAMPLE ASAP.

BT

#2549

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660 Info

S-³X-----D *llc*

070746Z OCT 83/43V

PRIORITY

ROUTINE

164/0034Z

PT00025

PAGE 01

RTTUZYUW RJCBS553570 1640033-UUUU--RJCLMHA.

ZNR UUUUU

R 111206Z JUN 84

FM NAVAIREWORKFAC NORFOLK VA

TO RUEOALA/HELSPRON SIX

INFO RUCLMHA/NAVAIREWORKFAC PENSACOLA FL//440//

RUEOALL/COMNAVAIRLANT NORFOLK VA//527//

BT

UNCLAS //NO4731//

SUBJ: JOINT OIL ANALYSIS PROGRAM (JOAP)

A. FONECON HELSPRON SIX (CHIEF MILLER)/NAVAIREWORKFAC NORFOLK (K. RIKER, CODE 61210) OF 8 JUN 84

1. THIS CONFIRMS REF A. SPECIAL SAMPLE NR 161 CH46DAP (GE) S/M AC-913 A/C BUNG 152567 SUBMITTED ASAP. HAD VERY HIGH MG WITH FE AND INCREASING.

2. RECOMMEND ADVICE CODE SIERRA. DO NOT FLY/OPERATE; REMOVE COMPONENT FROM SERVICE AND SEND TO DEFOT FOR TEAR DOWN EVALUATION.

BT

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650		✓
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ROUTINE

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111206Z JUN 84/MK

PRIORITY

173/1658Z

PT00475

PAGE 01

TTUZYUW PDWNSGG6567 1731658-UUUU--RUCLMHA.

ZNR UUUUU

P 211627Z JUN 84

NAVAIREWORKFAC ALAMEDA CA

RUWMHIA/COGARD AIRSTA HUMBOLDT BAY CA

RUCLMHA/NAVAIREWORKFAC PENSACOLA FL

BT

UNCLAS //NO4731//

SUBJ: JOINT OIL ANALYSIS PROGRAM

- 1. HH52A TAIL ROTOR BEAR BOX, S/N ST62-2737, A/C BUND 1408, SAMPLE NUMBER 2, HAS AN INCREASE IN IRON (FE) FROM 070 PPM TO 095 PPM, IN COPPER (CU) FROM 042 PPM TO 046 PPM, IN MAGNESIUM (MG) FROM 039 PPM TO 051 PPM, IN TEN HOURS RUN TIME.
- 2. RECOMMEND TANGO, DO NOT FLY OR OPERATE. EXAMINE FOR DISCREPANCY AND ADVISE LABORATORY OF FINDINGS.
- 3. THIS MESSAGE IS OF INTEREST TO NAVAIREWORKFAC PENSACOLA FL CODE 440.
- 4. ALAMEDA POC IS D. SPAIN, OAS, CODE 433, AV 686-4409 OR (415) 866-4409.

~~866-4409~~

BT

#6567

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211627Z JUN 84 BOK

PRIORITY

RCV MSG # TIME RADAY PRIORITY
 03548 2013 214/83
 10 11 12 15 16 18 19 22 30 40 70 A B C D E PSD NTGD
 11300 MATSGDET COMM HAS WHITING FIELD MILTON FL EEO CDO OOD PCB
 MED DEN NOCD NX CS CTW-5AD VT-2 VT-3 VT-6 HT-8 HT-18 GMF

PTTUZYUW RUMNSGG4987 2142012-UUUU--RUCLMHA.
 ZNR UUUUU
 P R 022106Z AUG 83
 FM HAVAIREWOKFAC ALAMEDA CA
 TO RUMNHIA/COGARD AIRSTA HUMBOLDT BAY CA
 INFO RUCLMHA/HAVAIREWOKFAC PENSACOLA FL
 BT

UNCLAS //NO4731//

SUBJ: JOINT OIL ANALYSIS PROGRAM

1. THIS MESSAGE OF INTEREST TO HAVAIREWOKFAC PENSACOLA CODE 440.
2. HM52A TAIL ROTOR GEAR BOX, S/N ST62-274, A/C BUHO 1408, SAMPLE THREE HAS CONTINUING HIGHER CONCENTRATIONS OF ALL WEAR METALS.
3. RECOMMEND ECHO. RESTRICT OPERATIONS TO LOCAL FLIGHTS OR REDUCED LOAD OPERATIONS. MAINTAIN CLOSE SURVEILLANCE AND SUBMIT CHECK SAMPLES AFTER EACH FIVE OPERATING HOURS. DO NOT DRAIN OR FLUSH OIL.
4. POC IS A. W. GRANT, QA SPEC, CODE 433, (415) 869-4409, OR AV 686-4409.

BT
 #4987

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NARF

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P.E. Department		
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660		✓

S-3-X-D-5

022106Z AUG 83/40R

PRIORITY

257/2310Z

PT00565

PAGE 01

663
90

PTTUZYUW RUWNSE03996 2572307-UUUU--RUCLMHA.

ZNR UUUUU

12106Z SEP 83

NAVAIREWORKFAC ALAMEDA CA
TO RUWMHIA/COGARD AIRSTA SAN FRANCISCO CA
INFO RUCLMHA/NAVAIREWORKFAC PENSACOLA FL
BT

UNCLAS //NO4731//

SUBJ: JOINT OIL ANALYSIS PROGRAM

1. THIS MESSAGE OF INTEREST TO NAVAIREWORKFAC PENSACOLA CODE 440.
2. HH52 A TAIL ROTOR GEAR BOX S/N ST1115, A/C BUNO 1366 SAMPLE NUMBER 840 STILL HAS AN INCREASE IN IRON "FE" FROM 61 PPM TO 65PPM IN SIX HOURS RUN TIME. WITH AN INCREASE IN OTHER WEAR METALS.
3. RECOMMEND TANGO. DO NOT FLY OR OPERATE. EXAM FOR DISCREPANCY AND ADVISE LABORATORY OF FINDINGS. DO NOT DRAIN OR FLUSH OIL.
4. POC IS D. SPAIN, QA SPEC, CODE 433, (415) 869-2697, OR AV 686-4409.

BT

#3996

NNNN

NARF

MS

P.E. Department		
	Action	Info
610		
620		
630		
640		
650		
660		✓

PRIORITY

S-25-X-1464-D-1973-142106Z SEP 83 8V/59

PRIORITY

084/0221Z

PT00166

PAGE 01

PTT:ZYUW RUWFSGB1613 0840220-UUUU--RUCLMHA.

ZNR UUUUU

P R 222342Z MAR 84

FM NAVAIREWORKFAC NORTH ISLAND CA

TO RUWJTPA/HMH FOUR SIX TWO

INFO RUWJGFB/CS THIRD MAW

RUWJTPA/MAG SIXTEEN

RUCLMHA/NAVAIREWORKFAC PENSACOLA FL

RJWFAAB/COMNAVAIRPAC SAN DIEGO CA

RJEOALA/NAVSAFECEN NORFOLK VA

BT

UNCLAS //NO4731//

SUBJ: OIL ANALYSIS PROGRAM

1. SAMPLE NR 788 CH53AMGB SER NR A76106 A/C 152403 ANALYSIS RESULTS CONFIRM HIGH IRON AND COPPER. REC REMOVAL.

BT

#1613

NNNN

NARF

P.E. Department		
	Action	Info
610		
620		
630		
640		
650		
660		✓

PRIORITY

S ~~30~~-X-----D-2if

ROUTINE

89/1345Z

PT00345

PAGE 01

TTUZYUW RUCBSGG4787 1891345-UUUU--RUCLMHA.

NR UUUUU

436Z JUL 83

NAVAIREWORKFAC NORFOLK VA

TO RUEOALA/HELMINERON SIXTEEN

INFO RUCLMHA/NAVAIREWORKFAC PENSACOLA FL//440//

RUEOALL/COMNAVAIRLANT NORFOLK VA//527//

BT

UNCLAS //NO4731//

UB JOINT OIL ANALYSIS PROGRAM (JOAP)

1. FONECON HM-16 (ADC WEXLER)/NAVAIREWORKFAC NORFOLK (L. LANDRY, COD 1210) OF 7 JULY 83

2. THIS CONFIRMS REF A. SPECIAL SAMPLE NR T-188 TGB S/N A19-528 RH530 A/C BUHO 158754 SUBMITTED ASAP. HAD VERY HIGH EE WITH CU 8 TI AND INCREASING.

3. RECOMMEND ADVICE CODE SIERRA. DO NOT FLY/OPERATE; REMOVE COMPONENT FROM SERVICE AND SEND TO DEPOT FOR TEAR DOWN EVALUATION.

BT

4787

NNN

NARF/S-5

P.E. Department		
	Action	Info
6:0		
6:30		
6:0		
6:3		
6:60		✓

~~5/11/83~~ X ~~537~~

071436Z JUL 83 30/DR

ROUTINE

PRIORITY

321/2118Z

PT00666

PAGE 01

3

PTTUZYUW RUWFSGG3483 3212104-UUUU--RUCLMHA.

ZNP UUUUU

P P 171914Z NOV 83

FM NAVAIREWORKFAC NORTH ISLAND CA

TO RUWJTPA/HMM THREE SIX ONE

INFO RUWJGFB/CE THIRD MAW

RUWJTPA/MAG SIXTEEN

RUWFAAB/COMNAVAIRPAC SAN DIEGO CA

RUEOALA/NAVSAFECEN NORFOLK VA

RUCLMHA/NAVAIREWORKFAC PENSACOLA FL

BT

UNCLAS //NO4731//

SUBJ: OIL ANALYSIS PROGRAM

1. SAMPLE NR 0391 CH53ANG6 SER NR A15266R A/C 153721 HAD HIGH IRON.

REC REMOVAL FOR ENGINEERING INVESTIGATION.

BT

#3483

NNNM

NARF

NB

N.E. Department		
	Action	Info
630		
635		
630		
640		
650		
660		✓

PRIORITY

Handwritten signature and date: 11/20/83

PRIORITY

334/0029Z

PT00026

PAGE 01

PTTUZYUW RUCRSEG9730 3340028-UUUU--RUCLMHA.

ZNR UUUU

P 291206Z NOV 83

NAVAIREWORKFAC NORFOLK VA

RUEOALA/HELMINFRON FOURTEEN

INFO RUCLMHA/NAVAIREWORKFAC PENSACOLA FL//440//

RUEOALL/COMNAVAIRLANT NORFOLK VA//527//

BT

UNCLAS //NO4731//

SUBJ JOINT OIL ANALYSIS PROGRAM (JOAP)

A. FONECON HELMINFRON FOURTEEN (CHIEF JOHNSON)/NAVAIREWORKFAC

NORFOLK (S KING, CODE 61213) OF 23 NOV 83

1. THIS CONFIRMS REF A. SP SAMPLE 85438 NOSE (GB) S/N A15-769 RH530
A/C BUONO 158746 HAS VERY HIGH FE WITH CU AND INCREASING.

2. RECOMMEND ADVISE CODE SIERRA. DO NOT FLY/OPERATE; REMOVE
COMPONENT FROM SERVICE AND SEND TO DEPOT FOR TEAR DOWN EVALUATION.

BT

#9730

NNNN

NARF

P.E. Department		
	Action	Info
610		
620		
630		
640		
650		
660		✓

PRIORITY

52-2-114

291206Z NOV 83 29T

OIL ANALYSIS RECOMMENDATION AND FEEDBACK

For use of this form, see TB 43 0106 and TB 43 0210. The proponent agency is DARCOM.

REQUIREMENT CONTROL SYMBOL
CSGLD-1818

1. TO: FIELD (Include ZIP Code and Telephone Number)

COMMANDER
A CO 7TH AVN BN
FT ORD, CA 93941*HIT
long 1208's
maintenance
recommendation
made
8/15/83*

3. LAB RECOMMENDATION NUMBER

83-019

4. END ITEM MODEL

UH1H

5. END ITEM SERIAL NUMBER

69-15334

2. FROM: LABORATORY (Include ZIP Code)

FORT ORD OIL LAB
ATTN: AFZW-DI-AO
BLDG 2390 (AOAP)
FT ORD, CA 93941

8. COMPONENT TYPE

90 Degree Gearbox

7. COMPONENT SERIAL NUMBER

A13-2443

6. COMPONENT TIME (Hours/Miles)

1204

9. RECOMMENDATION AND REASON FOR ACTION

Results indicate severe corrosion of internal parts of gearbox.
Recommend gearbox be removed and sent to depot for overhaul.

Request you enter failure Code 916 in blocks 206 of DA Form 2407.

10. SIGNATURE AND TITLE OF INITIATOR

Ethany G. Brown, Jr.
Ethany G. Brown, Jr.
Chief Oil Analysis Lab

11. DATE (Day-Month-Year)

3 March 1983

12. NOTE FOR ARMY AVIATION ONLY.

Quality Deficiency Report (QDR), SF 368, will be submitted when maintenance is performed due to impending or incipient failure indicated by oil analysis. Failure Code 916.

13. QDR NUMBER

14. FEEDBACK (Maintenance Performance/Action Taken)

SEE ATTACHED REPORT

5. FROM: FIELD/DEPOT MAINTENANCE PERSONNEL
CORPUS CHRISTI ARMY DEPOT, SDSCC-QLA
CORPUS CHRISTI, TX 78419

16. DATE (Day-Month-Year)

24 AUG 83

7. TO: LABORATORY

NOTE FOR ARMY AVIATION ONLY:

Copy of this form with SF 368 (QDR) attached will be sent to
Commander, CCAD
ATTN DRSTS-MER, Stop 56
Corpus Christi, TX 78419

A 100V NOV 80 3254-R

EDITION OF JUN 78 IS OBSOLETE.

ENCLOSURE

14. FEEDBACK

a. Disassembly and examination of the gearbox revealed evidence of moisture contamination. There was heavy purple residue throughout the interior of the gearbox, indicating probable magnesium corrosion. There was evidence of areas of rust on the interior steel components.

b. Examination showed all of the gearbox seals to be serviceable.

c. The reported possible corrosion inside gearbox, indicated by oil analysis, was confirmed by ~~teardown~~ analysis.

d. ~~Recommend~~ caution be exercised when washing aircraft not to direct high pressure stream of water at the gearbox seals or oil filter cap.

e. The exhibit is considered economically repairable and will be turned in to NICP Storage as Condition Code "F".

Fred Barcroft
FRED BARCROFT
INVESTIGATOR (ACFT)
AV. 861-2902

OIL ANALYSIS RECOMMENDATION AND FEEDBACK

REQUIREMENT CONTROL SYMBOL

Form 10 of this form is TB 43-0106 and TB 43-0210. The Department of the Army (DAR) is the issuing agency.

CSCLD-1A18

*Hit
CMB
Water
monitor*

1. TO: FIELD (Include ZIP Code and 3-letter Number)		3. LAB RECOMMENDATION NUMBER	
AOAP Monitor AAOF FLDG 101 New Orleans Lakefront Airport New Orleans, LA 70126		83-399	
2. FROM: LABORATORY (Include ZIP Code)		4. END ITEM MODEL	
Commander 5th Inf Div (M) & Ft Polk ATTN: AFEX-DI-GM-AOAP Ft Polk, LA 71459		UH-1H	
5. RECOMMENDATION AND REASON FOR ACTION		5. END ITEM SERIAL NUMBER	
Do not operate due to abnormal magnesium and lead wearmetal content detected in oil samples. Request teardown analysis of component to determine source of abnormal wear. Forward gearbox to include pitch change control mechanism to Corpus Christi Army Depot for teardown analysis in accordance with TB 43-0106 and SL 28-82. Affix 'AOAP' labels to component and container and attach copy of this form for proper identification.		66-16821	
6. COMPONENT TYPE		7. COMPONENT SERIAL NUMBER	
90° gearbox		A13-2016	
8. COMPONENT TIME (Hours/Miles)			
		785 hrs given	
10. SIGNATURE AND TITLE OF INITIATOR		11. DATE (Day Month Year)	
<i>[Signature]</i> Thomas V. Trowell Chief, Ft Polk AOAL		17 June 1983	
12. NOTE FOR ARMY AVIATION ONLY		13. OOR NUMBER	
Quality Deficiency Report (QDR), SF 362 will be submitted when maintenance is performed due to impending or incipient failure indicated by oil analysis. Failure Code 916		BH3171/1	
14. FEEDBACK (Maintenance Performed/Action Taken)			
SEE ATTACHED REPORT			
15. FROM: FIELD/DEPOT MAINTENANCE PERSONNEL		16. DATE (Day Month Year)	
CORPUS CHRISTI ARMY DEPOT, SDSCC-QLA CORPUS CHRISTI, TX 78419		19 AUG 83	
17. TO: LABORATORY		NOTE FOR ARMY AVIATION ONLY: Copy of this form with SF 362 (QDR) attached will be sent to Commander, CCAD ATTN: DRSTS-MER, Stop 55 Corpus Christi, TX 78419	

water

14. FEEDBACK

- a. Disassembly and examination of the gearbox showed heavy corrosion of the magnesium components and slight areas of rust on the steel components.
- b. The cause for the high magnesium particles in oil samples was the corrosion products in the gearbox oil system.
- c. The cause for the high lead particles could not be determined.
- d. Recommend caution be taken, when washing aircraft, not to direct high pressure stream of water at the gearbox seals or oil filter cap.
- e. The exhibit is considered economically repairable and will be turned in to NICP Storage as Condition Code "F".

Fred H. Barcroft

FRED BARCROFT
INVESTIGATOR (ACFT)
AV 861-2902

OIL ANALYSIS RECOMMENDATION AND FEEDBACK

For use of this form, see TB 43-0106 and TF 43-0210. The proponent agency is OARCOM

REQUIREMENT CONTROL SYMBOL
CSGLD-1818

1. TO: FIELD (Include ZIP Code and Telephone Number)

Commander
125th APO Bn
ATTN: Maintenance Officer
APO S.F. 96501*171F
Caird
Webb/Inventive*

3. LAB RECOMMENDATION NUMBER

82-005A

4. END ITEM MODEL

UH-1H

5. END ITEM SERIAL NUMBER

66-17002

2. FROM: LABORATORY (Include ZIP Code)

51CRS/MACIKIN
ATTN: AOAF LAB
APO S.F. 96570

6. COMPONENT TYPE

90°G/B

7. COMPONENT SERIAL NUMBER

A13-1703

8. COMPONENT TIME (Hours/Miles)

742

9. RECOMMENDATION AND REASON FOR ACTION

Laboratory recommendation code is T.
 Sample indicated abnormal iron (Fe) wear metal concentration.
 Recommend this 90°G/B along with the bevel gears and bearing
 assembly be removed from service and send to CCAD, Corpus Christi,
 Texas for teardown evaluation in accordance with TSARCOM Supply
 Letter, 3-82.

- Request you enter failure code 916 in block 20b of DA Form 2407.
- Please, leave oil in the component.

Previous contact made by telephone with SSG Ganz on 17 Nov 82.

10. SIGNATURE AND TITLE OF INITIATOR

C. I-chel, AOAF Evaluator

11. DATE (Day-Month-Year)

22 Nov 82

12. NOTE FOR ARMY AVIATION ONLY:

Equipment Improvement Recommendation (EIR), DA Form 2407, will be submitted
 when maintenance is performed due to impending or incipient failure indicated by oil
 analysis. Failure Code 916

13. EIR NUMBER

14. FEEDBACK (Maintenance Performed/Action Taken)

SEE ATTACHED REPORT

15. FROM: FIELD/DEPOT MAINTENANCE PERSONNEL

CORPUS CHRISTI ARMY DEPOT, SDSCC-QLA
CORPUS CHRISTI, TX 78419

16. DATE (Day-Month-Year)

19 AUG 83

17. TO: LABORATORY

NOTE FOR ARMY AVIATION ONLY:

Copy of this form with DA Form 2407 (EIR) attached will be sent to:
 Commander, TSARCOM
 Attn: DRSTS-OEP(2)
 4300 Goodfellow Blvd.
 St. Louis, MO 63120

COPY 3254-R

EDITION OF 1 OCT 73 IS OBSOLETE

14. FEEDBACK

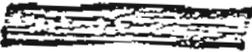
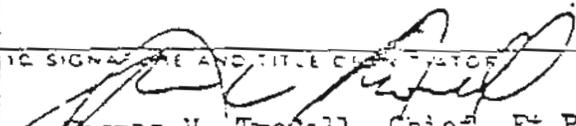
a. Disassembly and examination of the gearbox showed heavy rust on some of the internal steel components and moderate corrosion of the magnesium housings. There was evidence of moisture contamination of the gearbox oil system.

b. The rust and corrosion products inside the gearbox was the cause for high metal content in oil samples.

c. Recommend caution be taken, when washing the aircraft, not to direct high pressure stream of water at gearbox seals or oil filter cap.

d. The exhibit is considered economically repairable and will be turned in to NCP Storage as Condition Code "F".

Fred H. Barcroft
FRED BARCROFT
INVESTIGATOR (ACFT)
AV 861-2902

OIL ANALYSIS RECOMMENDATION AND FEEDBACK <small>For use of this form, see TB 43-0106 and TB 43-0210. The proponent agency is DARCOM</small>		REQUIREMENT CONTROL SYMBOL CSGLD-1F18
1. TO: FIELD (Include ZIP Code and Telephone Number) Commander 36 Med Det ATTN: Maintenance Supervisor Ft Polk, LA 71459 		3. LAB RECOMMENDATION NUMBER 83-398 4. END ITEM MODEL UH-1V 5. END ITEM SERIAL NUMBER 71-20259
2. FROM: LABORATORY (Include ZIP Code) Commander 5th Inf Div (M) & Ft Polk ATTN: AFZY-DI-GM-AOAP Ft Polk, LA 71459		6. COMPONENT TYPE 90° gearbox 7. COMPONENT SERIAL NUMBER B13-8233 8. COMPONENT TIME (Hours/Miles) 936 hrs given
9. RECOMMENDATION AND REASON FOR ACTION Do not operate due to abnormal iron, aluminum and copper wearmetal content detected in oil samples. Request teardown analysis of component to determine source of abnormal wear. Forward gearbox to include pitch change control mechanism to Corpus Christi Army Depot for teardown analysis in accordance with TB 43-0106 and EL 28-82. Affix 'AOAP' labels to component and container and attach copy of this form for proper identification.		
10. SIGNATURE AND TITLE OF INITIATOR  Thomas V. Trofoll Chief, Ft Polk AOAL		11. DATE (Day Month Year) 17 June 1983
12. NOTE FOR ARMY AVIATION ONLY: Quality Deficiency Report (ODR), SF 368, will be submitted when maintenance is performed due to impending or incipient failure indicated by oil analysis. Failure Code 918		13. ODR NUMBER 7
14. FEEDBACK (Maintenance Performed/Action Taken) SEE ATTACHED REPORT		
15. FROM: FIELD/DEPOT MAINTENANCE PERSONNEL CORPUS CHRISTI ARMY DEPOT, SDSCC-OLA CORPUS CHRISTI, TX 78419		16. DATE (Day Month Year) 25 AUG 83
17. TO: LABORATORY NOTE FOR ARMY AVIATION ONLY: Copy of this form with SF 368 (ODR) attached will be sent to Commander, CCAD ATTN: DRSTS-MER, Stop 55 Corpus Christi, TX 78419		

*HIS Command, Dept
Main Base
Recommendation*

8/15/83

14. FEEDBACK

a. Complete disassembly and examination of the 90 degree gearbox, P/N 204-040-012-13, S/N B13-8233, to include all oil wetted components parts, disclosed that the internal components were coated with a purple residue. This condition was caused from moisture being induced into the oil system over a period of time.

b. Examination of the internal components revealed that bearing, ball, thrust (annular), P/N 204-040-140, S/N 4441, was rough and binding when rotated by hand.

c. Disassembly and examination of the bearing, ball revealed that one of the bearing, balls had surface contact stress fatigue (spalling) mechanisms and accounts for the iron metal wear found in the oil sample.

d. The cutting action of the bearing, ball in its socket produced small bronze (copper) particles that were removed from the bearing, ball retainer cage during operation, and account for the reported copper particles found in the oil sample.

e. The aluminum particles found in the oil sample were caused by fine aluminum wool being ingested into the gearbox from the filler cap.

15. RECOMMENDATIONS

Inspect all filler caps to insure that there is no excessive play between the washer and retainer ring. If found, replace cap. Care should be utilized when washing the aircraft to insure no moisture enters through the filler cap breather plug.

HAROLD BARNES
INVESTIGATOR (ACFT)
AV 861-2902

DEPARTMENT OF THE NAVY
Memorandum

DATE: 13 April 1984
FROM: Ray Jancy
TO: CDR Dave Fitch USN
SUBJ: HMX-1 Oil Analysis

1. Regarding TGB and IGB that were removed due to high metal indication on spectrometric analysis of the oil, plus no problems were found on disassembly, leads me to believe that the people are seeing the results of an internal corrosion problem. This corrosion problem is attributable to water contaminated oil. The source of the water could be condensation, rain, or jetted water from cleaning. Please review the highlighted copy of enclosure 1. NAS Norfolk, VA. has the capability to check for water contamination utilizing the Photovolt Aquatest IV equipment.
2. The highlighted areas of enclosure 2 will give you the basic differences between spectrometric analysis and ferrographic analysis. With regard to the H-3 Main Gearbox (MGB), I have better results if I monitor oil samples visually or by ferrographic analysis than if I rely on spectrometric analysis. The MGB, if it has internal problems, will typically produce particles larger than 5-7 um. I believe this would be true of the other gearboxes.
3. Enclosure 3 is a visual method of oil evaluation that I have used in part over the past years. It may be of some benefit to HMX-1 to monitor their oil, along with spectrometric analysis.
4. When I have a problem with a MGB, either visible contamination or a high reading on oil analysis, I'll monitor the unit for the next 50 flight hours, taking samples at 10 flight hour intervals. Normally I try to get three samples at each interval one for the operators oil analysis lab, and two for our oil analysis lab for spectrometric and ferrographic analysis. If nothing abnormal or unusual shows up by the end of 50 hours, they go back to normal monitoring. However, if a problem is apparent, the unit is removed or monitored further. If the particles are of sufficient size, we'll determine the type of material by x-ray energy spectroscopy. This would aid us in determining the source; i.e., bearing, gear, or bolt.
5. Enclosure 4 is a sampling of equipment histories that show water water contamination problems.
6. For detailed questions regarding oil analysis, contact Gary R. Humphrey at (AV) 922-2421.

R. J. Jancy
A: 922-3359



DEPARTMENT OF THE NAVY
NAVY ENVIRONMENTAL HEALTH CENTER
NAVAL STATION
NORFOLK, VIRGINIA 23511-6655

6242
Ser 422p/06524
27 Jun 86

From: Commanding Officer, Navy Environmental Health Center
To: Commanding Officer, Naval Air Rework Facility, Naval Air Station,
Pensacola, FL 32508

Subj: REAGENTS FOR WATER ANALYSIS

Ref: (a) NAVAIREWORKFAC Pensacola ltr 4355 Code 66300 of 18 Apr 86

Encl: (1) Material Safety Data Sheet/Information Package on Seragen Aquatest Reagents.

1. As requested by reference (a), an administrative evaluation of the Seragen Aquatest Reagent Kit has been conducted. As noted in the cover letter of enclosure (1), the Material Safety Data Sheets (MSDS) for the kit are for the constituent compounds, not the mixture.

2. The manufacturer's MSDS expresses the constituents in the concentrated chemical forms. Accordingly, the recommendations made for personal protective devices are the most stringent; potential health hazards are stated as the most severe, etc.

3. The National Institute for Occupational Safety and Health recommends that 2-Methoxyethanol (ethylene glycol monomethyl ether) be regarded as having the potential to cause adverse reproductive effects in male and female workers. 2-Methoxyethanol is a component of the test kit.

4. The use of the reagent kit requires small amounts of the solutions (one kit will last approximately one year) and can be used in a semi-automated system. Irrespective of the small amounts, the potential hazards associated with the constituent chemicals would dictate adherence to the manufacturer's stringent MSDS recommendations.

5. In spite of the restrictive MSDS recommendations, there may be circumstances which would permit a relaxation of these requirements. Determination of such circumstances must be made by an on-site industrial hygienist utilizing methods such as air sampling, ventilation studies, etc., and must be made on each naval vessel where kit use is contemplated.

6. The point of contact on this subject is Mr. J. D. Drewyer, Head, Hazardous Materials Information Branch, AUTOVON: 564-4657, Commercial: (804) 444-4657.

J. D. DREWYER

J.R. Crawl
J.R. CRAWL
By direction

Enclosure (2)

663/780

4355
Code 66300
18 APR 1986

From: Commanding Officer, Naval Air Rework Facility, Pensacola
To: Commanding Officer, Navy Environmental Health Center, Naval Air Station,
Norfolk, VA 23511-6695 (Attn: Code 422)

Subj: REAGENTS FOR WATER ANALYSIS

Ref: (a) PHONCOM NAVESVIRHLTRCEN (Code 422) J. Drewyer/NAVAIRREWORKFAC
Pensacola (Code 66300) G. Humphrey of 4 Apr 86

1. In accordance with reference (a) the following information is supplied.

a. In 1985 a requirement was established by the NAVAIR 17-15-50 to test helicopter gearbox oil for water content. This will require that a water testing capability be established on Naval vessels.

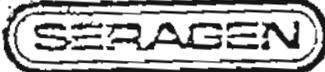
b. The Eriksen Instrument Company, Toms River, New Jersey, manufactures reagents that can be used in a semi-automated coulometric titration that analyses for water. These reagents can be purchased in kit form. A kit consists of 1L of vessel solution, 125 mL generator solution, and 30 mL neutralizing solution. The Eriksen stock number for the kit is 16-03-1. Three of these kits should support the average laboratory water testing workload for one year.

c. We are requesting that your activity evaluate the Eriksen reagents for suitability of use aboard Naval vessels.

2. The point of contact for this activity is Gary R. Humphrey, Code 66300.

J. E. AMENTLER
By direction

G. Humphrey/66300/2-2277
dc
15 Apr 86



SERAGEN DIAGNOSTICS
 P.O. Box 1210
 Indianapolis, IN 46206 U.S.A.
 (317) 256-2000

MATERIAL SAFETY DATA SHEET

AQUATEST REAGENTS

Seragen Diagnostics firmly believes that safe use of laboratory reagents requires knowledge of the physical, chemical, and hazardous properties of the substances. Material Safety Data Sheets (MSDSs) are the primary vehicle for transmitting this detailed information.

In evaluating Seragen products, a number of guidelines are observed.

1. Most Seragen reagents are mixtures, not "pure" substances. Since minimal objective scientific information is available on the hazards of the mixtures, they are assumed to have the same hazards as the component parts.
2. An individual MSDS is prepared for each component determined to be a health hazard and which comprises 1% or greater of the mixture. For chemicals identified as carcinogens, a MSDS is prepared if the concentration is 0.1% or greater.
3. An individual MSDS is prepared for each component which has been determined to present a physical hazard.
4. MSDSs are prepared in accordance with the rules presented in Hazard Communication; Final Rule, 29 CFR Part 1910, Department of Labor, Occupational Safety and Health Administration, November 25, 1983.
5. For AQUATEST REAGENTS Individual MSDSs are provided as follows:

HT972-6
5712302 } Vessel Solutions: Part A- Pyridine, Sulfur Dioxide
 Part B- Methanol, Karl Fischer Reagent (Pyridine,
 Ethylene Glycol Monomethyl Ether, Sulfur
 Dioxide, Iodine)

HT972-8
5712204 } Neutralizing Solution: Methanol

HT972-5
5712201 } Generator Solution: Methanol, Karl Fischer Reagent



SERAGEN DIAGNOSTICS
P.O. Box 1210
Indianapolis, IN 46206 USA

MATERIAL SAFETY DATA SHEET

SECTION I IDENTIFICATION OF PRODUCT

Chemical Name PYRIDINE	Formula C ₅ H ₅ N
Synonym or Cross Reference AZINE, AZABENZENE	CAS Number 110-86-1

SECTION II HAZARDOUS INGREDIENTS

Material PYRIDINE	Nature of Hazard FLAMMABLE, TOXIC
----------------------	--------------------------------------

SECTION III PHYSICAL DATA

Boiling Point 239°F (115°C)	Melting Point -41°C
Vapor Pressure (mm Hg) 760	Specific Gravity 1.0
Vapor Density (Air = 1) 2.7	Percent Volatile By Volume (%) N/A
Water Solubility YES	Evaporation Rate (NA =)

Appearance

COLORLESS LIQUID WITH SHARP, PENETRATING AND NAUSEOUS ODOR

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (closed cup) 68°F	Flammable Limits	Lower 1.8	Upper 12.4
----------------------------------	------------------	--------------	---------------

Fire Extinguishing Media
ALCOHOL FOAM, DRY CHEMICAL, CARBON DIOXIDE

Special Fire Fighting Procedures
WEAR SELF-CONTAINED BREATHING APPARATUS

Unusual Fire and Explosion Hazards
VAPOR IS HEAVIER THAN AIR AND MAY TRAVEL CONSIDERABLE DISTANCE TO A SOURCE OF IGNITION

SECTION V HEALTH HAZARD DATA

Threshold Limit Value
5 ppm

Effects of Overexposure
TOXIC BY INHALATION AND INGESTION

First Aid Procedures

SKIN: WASH WITH STRONG SOAP IMMEDIATELY. RINSE THOROUGHLY



SECTION VI REACTIVITY DATA

Stability	Unstable Stable	X	Conditions to Avoid N/A
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Incompatibility (material to avoid)
ACIDS; POWERFUL OXIDIZING MATERIALS

Hazardous Decomposition Products
N/A

Hazardous Polymerization	May Occur Will Not Occur	X	Conditions to Avoid N/A
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SECTION VII SPILL AND DISPOSAL PROCEDURES

Steps to be Taken in Case Material is Released or Spilled

COVER WITH SAND, SODA ASH MIXTURE.

Waste Disposal Method
INCINERATE OR LAND FILL IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiratory Protection (specify type)
WEAR SELF CONTAINED BREATHING APPARATUS

Ventilation	Local Exhaust	Special
	YES	N/A
Protective Gloves	Mechanical (general)	Other
	YES	N/A

Eye Protection
CHEMICAL SAFETY GOGGLES

Other Protective Equipment
N/A

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling and Storing
OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD BE IN A STANDARD
FLAMMABLE LIQUID STORAGE ROOM OR CABINET.

Other Precautions
N/A

Prepared By

Revision Date 3/20/85

Michael J. Sullivan
Manager of Regulatory Affairs
(317) 266-2080



SERAGEN DIAGNOSTICS
 P.O. Box 1210
 Indianapolis, IN 46206 USA

MATERIAL SAFETY DATA SHEET

SECTION I IDENTIFICATION OF PRODUCT

Chemical Name METHANOL	Formula CH ₃ OH
Synonym or Cross Reference METHYL ALCOHOL, WOOD ALCOHOL, COLUMBIAN SPIRIT	CAS Number 67-56-1

SECTION II HAZARDOUS INGREDIENTS

Material METHANOL	Nature of Hazard FLAMMABLE, POISONOUS
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SECTION III PHYSICAL DATA

Boiling Point 147°F (64°C)	Melting Point -97.8°C
Vapor Pressure (mm Hg) 760	Specific Gravity 0.8
Vapor Density (Air = 1) 1.1	Percent Volatile By Volume (%) N/A
Water Solubility INFINITE	Evaporation Rate (N/A = 1)
Appearance COLORLESS LIQUID	

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (closed cup) 52°F	Flammable Limits	Lower 6.0	Upper 36
Fire Extinguishing Media "ALCOHOL" FOAM			
Special Fire Fighting Procedures N/A			
Unusual Fire and Explosion Hazards N/A			

SECTION V HEALTH HAZARD DATA

Threshold Limit Value 200 ppm (Ceiling Limit)
Effects of Overexposure POISONING, HEADACHE, NAUSEA, BLINDNESS
First Aid Procedures EYES AND SKIN: IMMEDIATELY AND CONTINUOUSLY FLUSH WITH FLOWING WATER.



SECTION VI REACTIVITY DATA

Stability	Unstable Stable	X	Conditions to Avoid N/A
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Incompatibility (material to avoid)
OXIDIZING MATERIALS; PERCHLORIC ACID; SODIUM HYDROXIDE AND CHLOROFORM

Hazardous Decomposition Products
COMBUSTION MAY PRODUCE CARBON MONOXIDE

Hazardous Polymerization	May Occur Will Not Occur	X	Conditions to Avoid N/A
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SECTION VII SPILL AND DISPOSAL PROCEDURES

Steps to be Taken in Case Material is Released or Spilled

SMALL SPILL: ABSORB ON PAPER AND EVAPORATE IN HOOD

Waste Disposal Method
INCINERATE OR LAND FILL IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiratory Protection (specify type)
WEAR SELF CONTAINED BREATHING APPARATUS

Ventilation	Local Exhaust	Special
	YES	N/A
Protective Gloves	Mechanical (general)	Other
	YES	N/A
RUBBER	Eye Protection	CHEMICAL SAFETY GOGGLES AND FACE SHIELD

Other Protective Equipment
N/A

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling and Storing
OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD BE IN A STANDARD FLAMMABLE LIQUID STORAGE ROOM OR CABINET

Other Precautions
N/A

Prepared By

Revision Date 5/21/85

Michael J. Sullivan
Manager of Regulatory Affairs
(317) 266-2080



SERAGEN DIAGNOSTICS
P.O. Box 1210
Indianapolis, IN 46206 USA

MATERIAL SAFETY DATA SHEET

SECTION I IDENTIFICATION OF PRODUCT

Chemical Name SULFUR DIOXIDE	Formula SO ₂
Synonym or Cross Reference SULFUROUS ANHYDRIDE; SULFUROUS OXIDE	CAS Number 7446-09-5

SECTION II HAZARDOUS INGREDIENTS

Material SULFUR DIOXIDE	Nature of Hazard HIGHLY TOXIC
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SECTION III PHYSICAL DATA

Boiling Point -10°F (14°C)	Melting Point -105°F (-76°C)
Vapor Pressure (mm Hg) N/A	Specific Gravity 1.4
Vapor Density (Air = 1) 2.3	Percent Volatile By Volume (%) N/A
Water Solubility YES	Evaporation Rate (N/A = 1)
Appearance COLORLESS GAS AT TEMPERATURES ABOVE 14°F	

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (closed cup) N/A	Flammable Limits	Lower N/A	Upper N/A
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Fire Extinguishing Media
NON-FLAMMABLE

Special Fire Fighting Procedures
N/A

Unusual Fire and Explosion Hazards
N/A

SECTION V HEALTH HAZARD DATA

Threshold Limit Value
5 ppm

Effects of Overexposure
TOXIC, EXTREMELY IRRITATING TO EYES AND RESPIRATORY TRACT

First Aid Procedures
OBTAIN ADEQUATE VENTILATION IMMEDIATELY
EYES AND SKIN: IRRIGATE WITH COPIOUS QUANTITIES OF WARM WATER



SECTION VI REACTIVITY DATA

Stability	Unstable	X	Conditions to Avoid
	Stable		N/A

Incompatibility (material to avoid)
METALS, CHLORATES AND CARBIDES

Hazardous Decomposition Products
N/A

Hazardous Polymerization	May Occur	X	Conditions to Avoid
	Will Not Occur		N/A

SECTION VII SPILL AND DISPOSAL PROCEDURES

Steps to be Taken in Case Material is Released or Spilled

AVOID INHALATION; WASH EXPOSED AREA WITH WATER

Waste Disposal Method
INCINERATE OR LAND FILL IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiratory Protection (specify type)
WEAR SELF CONTAINED BREATHING APPARATUS

Ventilation	Local Exhaust	Special
	YES	
	Mechanical (general)	Other
	YES	N/A

Protective Gloves	Eye Protection
RUBBER	CHEMICAL SAFETY GOGGLES

Other Protective Equipment
N/A

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling and Storing
PROTECT AGAINST PHYSICAL DAMAGE, STORE OUTDOORS OR IN A WELL VENTILATED AREA OF NON-COMBUSTIBLE CONSTRUCTION

Other Precautions
N/A

Prepared By

Revision Date 3/21/85

Michael J. Sullivan
Manager of Regulatory Affairs
(317) 266-2080



MATERIAL SAFETY DATA SHEET

SECTION I IDENTIFICATION OF PRODUCT

Chemical Name IODINE	Formula I ₂
Synonym or Cross Reference IODE (FRENCH)	CAS Number 7553-56-2

SECTION II HAZARDOUS INGREDIENTS

Material IODINE	Nature of Hazard CORROSIVE, IRRITANT
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SECTION III PHYSICAL DATA

Boiling Point 363°F (184°C)	Melting Point 235°F (113°C)
Vapor Pressure (mm Hg) 0.030 (0°C)	Specific Gravity 4.93
Vapor Density (Air = 1) N/A	Percent Volatile By Volume (%) N/A
Water Solubility SLIGHTLY	Evaporation Rate (N/A = 1)
Appearance CHARACTERISTIC ODOR, SHARP ACRID TASTE, VIOLET CORROSIVE VAPOR	

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (closed cup) N/A	Flammable Limits	Lower N/A	Upper N/A
Fire Extinguishing Media N/A			
Special Fire Fighting Procedures N/A			
Unusual Fire and Explosion Hazards N/A			

SECTION V HEALTH HAZARD DATA

Threshold Limit Value 0.1 ppm
Effects of Overexposure ABDOMINAL PAIN, NAUSEA, VOMITING, DIARRHEA. SOLID FORM IS INTENSELY IRRITATING TO EYES, SKIN, AND MUCOUS MEMBRANES
First Aid Procedures EYES AND SKIN: WASH AREA THOROUGHLY WITH LARGE AMOUNTS OF WATER.



(Cont'd)

SECTION VI REACTIVITY DATA

Stability	Unstable Stable	X	Conditions to Avoid N/A
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Incompatibility (material to avoid)
HALIDES AND SOME METALS

Hazardous Decomposition Products
N/A

Hazardous Polymerization	May Occur Will Not Occur	X	Conditions to Avoid N/A
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SECTION VII SPILL AND DISPOSAL PROCEDURES

Steps to be Taken in Case Material is Released or Spilled

AVOID EYE AND SKIN CONTACT

Waste Disposal Method
INCINERATE OR LAND FILL IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiratory Protection (specify type)
WEAR SELF CONTAINED BREATHING APPARATUS

Ventilation	Local Exhaust	Special
	YES	N/A
Protective Gloves	Mechanical (general)	Other
	YES	N/A
RUBBER	Eye Protection	CHEMICAL SAFETY GOGGLES AND FACE SHIELD

Other Protective Equipment
N/A

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling and Storing
STORE IN WELL VENTILATED AREA

Other Precautions
N/A

Prepared By

Revision Date 3/21/85

Michael J. Sullivan
 Michael J. Sullivan
 Manager of Regulatory Affairs
 (317) 266-2080



SERAGEN DIAGNOSTICS
P.O. Box 1210
Indianapolis, IN 46206 USA

MATERIAL SAFETY DATA SHEET

SECTION I IDENTIFICATION OF PRODUCT

Chemical Name ETHYLENE GLYCOL MONOMETHYL ETHER	Formula C ₃ H ₈ O ₂
Synonym or Cross Reference 2-METHOXYETHANOL METHYL CELLOSOLVE	CAS Number 109-86-4

SECTION II HAZARDOUS INGREDIENTS

Material 2-METHOXYETHANOL	Nature of Hazard POISONOUS; REPRODUCTIVE TOXIN
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SECTION III PHYSICAL DATA

Boiling Point 255°F (124°C)	Melting Point -125°F (-87°C)
Vapor Pressure (mm Hg) N/A	Specific Gravity 1.0
Vapor Density (Air = 1) 2.6	Percent Volatile By Volume (%) N/A
Water Solubility YES	Evaporation Rate (N/A = 1)
Appearance COLORLESS LIQUID; MILD AGREEABLE ODOR	

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (closed cup) 102°F (39°C)	Flammable Limits	Lower 2.3	Upper 24.5
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Fire Extinguishing Media
"ALCOHOL" FOAM; CARBON DIOXIDE; DRY CHEMICAL

Special Fire Fighting Procedures
N/A

Unusual Fire and Explosion Hazards
N/A

SECTION V HEALTH HAZARD DATA

Threshold Limit Value
5 ppm

Effects of Overexposure
CHRONIC EXPOSURE MAY CAUSE ANEMIA, MACROCYTOSIS, STERILITY, BIRTH DEFECTS

First Aid Procedures
EYES AND SKIN: IMMEDIATELY AND CONTINUOUSLY FLUSH WITH FLOWING WATER



ETHYLENE GLYCOL MONOMETHYL ETHER (Cont'd)

SECTION VI REACTIVITY DATA

Stability	Unstable	Conditions to Avoid
	Stable X	

Incompatibility (material to avoid)
CAN REACT WITH OXIDIZING MATERIALS

Hazardous Decomposition Products
N/A

Hazardous Polymerization	May Occur	Conditions to Avoid
	Will Not Occur X	

SECTION VII SPILL AND DISPOSAL PROCEDURES

Steps to be Taken in Case Material is Released or Spilled

ELIMINATE ALL SOURCES OF IGNITION. NEUTRALIZE SPILL AND/OR WASHINGS WITH SODA ASH.

Waste Disposal Method

INCINERATE OR LAND FILL IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION VIII SPECIAL PROTECTION INFORMATION

Respiratory Protection (specify type)

WEAR SELF CONTAINED BREATHING APPARATUS

Ventilation	Local Exhaust	Special
	YES	N/A
	Mechanical (general)	Other
	YES	N/A

Protective Gloves	Eye Protection
RUBBER	CHEMICAL SAFETY GOGGLES AND FACE SHIELD

Other Protective Equipment
LABORATORY COAT

SECTION IX SPECIAL PRECAUTIONS

Precautions to be Taken in Handling and Storing

OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD BE IN A STANDARD FLAMMABLE LIQUID STORAGE ROOM OR CABINET

Other Precautions
N/A

Prepared By

Revision Date 5/21/85

Michael J. Sullivan
Manager of Regulatory Affairs
(317) 266-2080





DEPARTMENT OF THE NAVY

NAVY ENVIRONMENTAL HEALTH CENTER
NAVAL STATION
NORFOLK, VIRGINIA 23511-6695

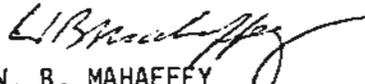
6261
Ser 422w/08089
11 Aug 86

From: Commanding Officer, Navy Environmental Health Center
To: Commanding Officer, Naval Air Rework Facility, Bldg. 52, Naval Air Station, Pensacola, FL 32508

Subj: REAGENT FOR WATER ANALYSIS

Ref: (a) NAVAIREWORKFAC Pensacola Itr 4355 Code 66300 of 30 Jul 86

1. As requested by reference (a), an administrative evaluation of water analysis reagents manufactured by Ericsen Instruments Corporation has been conducted. Evaluation included the vessel (anode) solution and the titrant and utilized manufacturer's material safety data sheets and widely available toxicological and chemical reference materials.
2. The vessel solution contains 38 percent chloroform. The National Institute for Occupational Safety and Health (NIOSH) has recommended chloroform be considered a carcinogen in laboratory animals (rats and mice) and NIOSH and the American Conference of Governmental Industrial Hygienists (ACGIH) consider chloroform a suspected human carcinogen.
3. The chemicals of this kit will be used in very small amounts. Nevertheless, the manufacturer's recommendations contained in the material safety data sheets must be followed. Additionally, an industrial hygienist should make an on-site visit to each vessel where the kit use is contemplated to ascertain the adequacy of ventilation and safety and health precautions prior to actual use.
4. Point of contact on this subject is Mr. J. D. Drewyer, Head, Hazardous Materials Information Branch, AUTOVON: 564-4657, Commercial: (804) 444-4657.


W. B. MAHAFFEY



Enclosure (3)

66013220

4355
Code 66300
30 JUL 1986

From: Commanding Officer, Naval Air Rework Facility, Pensacola
To: Commanding Officer, Navy Environmental Health Center, Naval Air Station,
Norfolk, VA 23511-6695 (Attn: Code 422)

Subj: REAGENTS FOR WATER ANALYSIS

Ref: (a) PHONCON NAVENVIRHLTCEN (Code 422) J. Dreyer/NAVAIREWORKFAC
Pensacola (Code 66300) G. Humphrey of 23 Jul 86

Encl: (1) Material Safety Data Sheets from Ericson
(2) Material Safety Data Sheet on Methanol

1. In accordance with reference (a) I am submitting enclosures (1) and (2) for use and evaluation on board ship. The kit consists of Ericson Vessel Solution Catalog Number 16-03-1-A, Titrant Catalog Number 20-05, and Neutralizing Solution Catalog Number 16-03C. The Neutralizing Solution is 99% methanol and 1% water.

2. A reply in this matter as soon as possible would be appreciated. The water analysis of used oils is scheduled to commence shortly fleetwide and the reagents for the water analyser need approval prior to program augmentation.

A. M. BAXTER
By direction

G. Humphrey/66300/2-2421
dc
24 Jul 86

SECTION V-HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE	headache, nausea, dizziness Chronic overexposure may include kidney or liver damage	THRESHOLD LIMIT VALUE TLV/TWA 10 ppm STEL 50 ppm
-------------------------	--	--

EMERGENCY AND FIRST AID PROCEDURES

If swallowed, if conscious, immediately induce vomiting
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Flush skin with water.

TOXICITY:

ID 50 (oral-rat) 1100 mg/kg
LC 50 (inhal-mouse) 28 g/m³

Chloroform is listed as a substance which may be reasonably anticipated to be carcinogenic by the National Toxicity Program (NTP).

SECTION VI-REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (materials to avoid) avoid heat, sources of ignition, flame			
HAZARDOUS DECOMPOSITION PRODUCTS:			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII-SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	Wear self-contained breathing apparatus and full protective clothing. Use water spray to reduce vapors. Take up with sand or other absorbent material. Flush area with water
WASTE DISPOSAL METHOD	Dispose in accordance with all applicable federal, state, and local environmental regulations. Consult professional disposal service

SECTION VIII-SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type)		
VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL	OTHER
PROTECTIVE GLOVES	recommended are polyvinyl alcohol gloves	EYE PROTECTION safety goggles recommended
OTHER PROTECTIVE EQUIPMENT		

SECTION IX-SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	Keep at room temperature (15-30°C) Lower temperature has no adverse effect
OTHER PRECAUTIONS	Avoid breathing of vapors

SECTION V-HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE Vapors may be irritating to eyes, nose or throat. Inhalation may be harmful or fatal.	THRESHOLD LIMIT VALUE	
	TLV/TWA:	200 ppm
	STEL	: 250 ppm

EMERGENCY AND FIRST AID PROCEDURES

CALL A PHYSICIAN

If swallowed, if conscious, immediately induce vomiting.
 If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Ingestion may cause blindness.

Toxicity: LD 50 (oral-rat) 1 g/kg

SECTION VI-REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY (materials to avoid) heat, sources of ignition, flame are to be avoided			
HAZARDOUS DECOMPOSITION PRODUCTS			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII-SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	Wear self-contained breathing apparatus and full protective clothing. Shut off ignition sources. Use water spray. Take up with absorbent material. Flush area with water
WASTE DISPOSAL METHOD	Dispose in accordance with all applicable federal, state, and local environmental regulations. Consult professional disposal service.

SECTION VIII-SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type)			
VENTILATION	LOCAL EXHAUST	X	
	MECHANICAL	X	
	SPECIAL		
	OTHER		
PROTECTIVE GLOVES	rubber recommended	EYE PROTECTION	goggles recommended
OTHER PROTECTIVE EQUIPMENT			

SECTION IX-SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	Keep at room temperature (15-30°C) lower temperatures have no adverse effect
OTHER PRECAUTIONS	Avoid breathing of vapors



DEPARTMENT OF THE NAVY
NAVY ENVIRONMENTAL HEALTH CENTER
NAVAL STATION
NORFOLK, VIRGINIA 23511-6695

6266
Ser 422r/08454
29 Aug 86

From: Commanding Officer, Navy Environmental Health Center
To: Commanding Officer, Naval Air Rework Facility, Bldg. 52, Naval Air Station, Pensacola, FL 32508

Subj: REAGENTS FOR WATER ANALYSIS

Ref: (a) NAVAIWORKFAC Pensacola ltr 4355 Code 66300 of 11 Aug 86

1. As requested by reference (a), an administrative evaluation of water analysis reagents manufactured by Riedel-de Haen, distributed by Crescent Chemical Co., Inc. has been conducted. The evaluation included Hydranal® Coulomat C and Hydranal™ Coulomat A solutions and utilized the manufacturer's DIN-Safety Data Sheet and widely available toxicological and chemical reference materials.

2. Hydranal® - Coulomat C contains 10 - 30 percent carbon tetrachloride, a chemical considered to be a probable human carcinogen by the International Agency for Research on Cancer (IARC). Hydranal™ - Coulomat A contains 10 - 30 percent trichloromethane (chloroform), which is regarded by IARC as presenting carcinogenic risk to humans.

3. It is acknowledged that these products will be used in very small amounts. Nevertheless, the manufacturer's recommendations contained in the DIN-Safety Data Sheet must be followed. Additionally, a regional medical industrial hygienist should make an on-site evaluation on each vessel where these products will be used to ascertain the adequacy of ventilation and safety and health precautions prior to actual use.

4. Future requests for evaluations of this nature should be sent to Commander, Naval Medical Command, Navy Department, Washington, DC 20372-5120.

5. Point of contact on this subject is Mr. J. D. Drewyer, Head, Hazardous Materials Information Branch, AUTOVON: 564-4657, Commercial: (804) 444-4657.

W. M. BUTLER
Acting

Copy to:
COMNAVMEDCOM (MEDCOM-24)
(with orig of ref (a))



Enclosure (4)



DEPARTMENT OF THE NAVY
 NAVAL AIR REWORK FACILITY
 BUILDING 52
 NAVAL AIR STATION
 PENSACOLA, FLORIDA 32508 5300

6d66
 ACT42
 NLT 1550886

4355 IN REPLY REFER TO
 Code 66300

1 AUG 1986

From: Commanding Officer, Naval Air Rework Facility
 To: Commanding Officer, Naval Environmental Health Center, Naval Air
 Station, Norfolk, VA 23511-6695 (Attn: Code 422)

Subj: REAGENTS FOR WATER ANALYSIS

Encl: (1) Material Safety Data Sheet - Hydranal⁽¹⁾ - Coulomat A
 (2) Material Safety Data Sheet - Hydranal⁽²⁾ - Coulomat C

I am requesting your evaluation of this reagent for use on board ship in units analysing the water content of oil. Enclosures (1) and (2) are the material safety data sheets on the reagent constituents. Your response as soon as possible in this matter would be appreciated.

[Signature]
 A. W. SALTER
 By direction





DISTRIBUTORS FOR THE UNITED STATES

Crescent Chemical Co., Inc.
1324 MOTOR PARKWAY
HAUPPAUGE, NEW YORK 11788
TELEPHONE: (516) 348-0333

Riedel-de Haën

DIN-Safety Data Sheet

Revision, substitutes MSDS

Date: 09/19/88

Company Riedel-de Haën · Wunstorfer Straße 40 · D-3016 Seelze 1			
Commercial Product Name	HYDRANAL TM - Coulomat A	-34807-	
1.1 Chemical Characterization.			
Methanolic solution, contains trichloromethane (10 - 30 %), imidazole (10 - 30 %), sulfur dioxide (5 - 10 %) and iodine (1 - 5 %)			
1.2 Form:	liquid	1.3 Colour:	colourless
		1.4 Odour:	typic
2. Physical and Technical Safety Data			
			tested in accordance with.
2.1 Change in physical state	n. a. v.	°C	
	n. a. v.	°C	
2.2 Density	(20°C)	1,01	g/cm ³
Bulk density	n. a.		kg/m ³
2.3 Vapour pressure	(55°C)	958	mbar
	(°C) n. a. v.		mbar
2.4 Viscosity	(°C) n. a. v.		
2.5 Solubility in water	(°C) miscible	g/l	
in	(°C) n. a. v.	g/l	
2.6 pH (at g/l H ₂ O)	(°C) n. a. v.		
2.7 Flash point		+ 11	°C
2.8 Ignition temperature		n. a. v.	°C
2.9 Explosion limits	lower:	upper:	n. a. v.
2.10 Thermal decomposition	n. a. v.		
2.11 Hazardous decomposition products:	n. a. v.		
2.12 Hazardous reactions:	n. a. v.		
2.13 Further information:	n. a. v.		
3	Transport	GGVSee/IMDG-Code: 3.2	UN No. 1992 ICAO/IATA-DGR:
		GGVE/GGVS: 3/20 b (1985)	RID/ADR: 3/ 20 b (1985)ADNR
	Other information:		
4	Regulations	EEc-Regulations/Arbeitsstoffverordnung: contains Methanol (83/467/EWG, 82/473/EWG, 83/265/EWG) and Trichloromethane	
		Hazard Designation: F, T (highly flammable and toxic)	
		R 11	Highly flammable
		R 23/25	Toxic by inhalation and if swallowed.
		S 7	Keep container tightly closed.
		S 24/25	Avoid contact with skin and eyes.
		S 44	If you feel unwell, seek medical advice (show the label if possible.)
		TLV: methanol: 200 ppm; trichloromethane: 10 ppm; iodine: 0,1 ppm (1984)	

DIN 52900 — The explanatory notes contained in the complete text of this standard should be observed.

Commercial Product Name		HYDRANAL TM - Coulomat	-34807-
5 Protective Measures, Storage and Handling			
5.1	Technical protective measures	Keep container tightly closed. Provide for a good ventilation.	
5.2	Personal Protective equipment	Respiratory protection: ./. Hand protection: rubber-gloves	Eye protection: goggles Other: ./.
5.3	Industrial hygiene	Before break clean hands. Keep away from food, drink and animal feeding stuffs.	
5.4	Protection against Fire and Explosion:	Keep away from sources of ignition. No smoking	
5.5	Disposal	Taking into consideration the local authority rules. The product must be given to a qualified burning plant with flue gas scrubber.	
6 Measures in case of Accidents and Fires			
6.1	After spillage/leakage/gas leak:	Take up with universal-adhesives; provide for a good ventilation.	
6.2	Extinguishing media	Suitable: Water, alcoholres. foam, halones, CO ₂ , dry chemical Not to be used:	
6.3	First aid:	After contact with skin, wash immediately with plenty of water. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. If swallowed, drink water and get medical aid.	
6.4	Further information:	In case of fire wear self-contained breathing apparatus.	
7. Information on Toxicology			
LD ₅₀ -limit -values are not available, but the essay on organic solvents cause toxic effects if swallowed, breathed in or in case of skin contact.			
Trichloromethane: IARC group 2B Possible cancer hazard based on tests with laboratory animals. Overexposure may create risk.			
8. Information on Ecology			
n. a. v.			
9. Further Advice		<u>Abbreviations:</u>	
n. a. v.		n. a. : not applicable	
		n. a. v. : Data not available	

DIN 52900

This information is based on our present state of knowledge and is intended to describe our products from the point of view of the safety requirements. It should not therefore be construed as guaranteeing specific properties.



DISTRIBUTORS FOR THE UNITED STATES

Crescent Chemical Co., Inc.
1324 MOTOR PARKWAY
HAUPPAUGE, NEW YORK 11788
TELEPHONE: (516) 348-0333

Riedel-deHaën

Revision, substitutes MSDS
dated 09/24/85
Date: 07/12/86

DIN-Safety Data Sheet

Company Riedel-de Haën · Wunstorfer Straße 40 · D-3016 Seelze 1			
Commercial Product Name		HYDRANAL ^(R) - Coulomat C	-34808
1.1 Chemical Characterization: Methanolic solution, contains carbon tetrachloride (10-30 %), diethanolamine (10-30 %) and sulfur dioxide (5 - 10 %)			
1.2 Form:	liquid	1.3 Colour:	colourless
		1.4 Odour:	typical
2. Physical and Technical Safety Data tested in accordance with			
2.1 Change in physical state	n. av.		°C
	n. av.		°C
2.2 Density	(20°C)		0,940 g/cm ³
Bulk density		n. av.	kg/m ³
2.3 Vapour pressure	(55°C)		931 mbar
	(°C)	n. av.	mbar
2.4 Viscosity	(°C)	n. av.	
2.5 Solubility in water	(°C)	miscible	g/l
in	(°C)	n. av.	g/l
2.6 pH (at g/l H ₂ O)	(°C)	n. av.	
2.7 Flash point			11 °C
2.8 Ignition temperature			n. av. °C
2.9 Explosion limits	lower	upper:	n. av.
2.10 Thermal decomposition	n. av.		
2.11 Hazardous decomposition products:	n. av.		
2.12 Hazardous reactions:	n. av.		
2.13 Further information	n. av.		
3	Transport	GGVSee/IMDG-Code: 3.2 GGVE/GGVS: 3/20b Other information: (1985)	UN No: 1992 RID/ADR: 3/20b (1985)
			ICAO/IATA-DGR: ADNR:
4	Regulations	Western Germany regulations: Arbeitsstoffverordnung Anhang I Nr. 2.1 Anhang II Nr. 2 Hazard designation: F, T (flammable and toxic) R 11 Highly flammable. R 23/24/25 Toxic by inhalation, in contact with skin and if S 7 Keep container tightly closed. swallowed. S 16 Keep away from sources of ignition - No smoking. S 24 Avoid contact with skin. S 44 If you feel unwell, seek medical advice (show the label where possible) TLV: methanol: 200 ppm, carbon tetrachloride: 10 ppm/ 8h (TWA) (1983)	

DIN 52900 - The explanatory notes contained in the complete text of this standard should be observed.

Commercial Product Name

HYDRANAL^(R) - Coulomat C

-34908-

5 Protective Measures, Storage and Handling

5.1 Technical protective measures

- Keep container tightly closed.
- Exhaust ventilation

5.2 Personal

Protective equipment

Respiratory protection: ./.

Hand protection: rubber-gloves

Eye protection.

Other: ./.

goggles

5.3 Industrial hygiene:

- Keep away from foodstuffs.
- Before break, clean hands.

5.4 Protection against Fire and Explosion.

- No smoking!
- Keep away from sources of ignition.

5.5 Disposal: - Must be given to a qualified dump or burning plant with flue gas scrubber.

6 Measures in case of Accidents and Fires

6.1 After spillage/leakage/gas/eff./

- Take up with universal adhesives and collect in tightly closed container.

6.2 Extinguishing media

Suitable: - Water-mist, foam, carbon dioxide, halones.

Not to be used:

6.3 First aid:

- After contact with skin and eyes rinse with copious quantities of water. If swallowed, drink water, induce vomiting and get medical aid.

6.4 Further information:

- In case of fire wear self-contained breathing apparatus.

7. Information on Toxicology

LD-limit values of this mixture are not available.

carbon tetrachloride IARC: 2F NTP: 1982
Possible cancer hazard based on tests with laboratory animals.
Overexposure may create cancer risk.

8. Information on Ecology

n. av.

9. Further Advice

n. av.

Abbreviation:

n.a. : not applicable

n.av.: Data not available

DIN 52 900

This information is based on our present state of knowledge and is intended to describe our products from the point of view of the safety requirements. It should not therefore be construed as guaranteeing specific properties.

4.2 For Percent Mode

For repetitive analyses with the same sample weight, begin with step 4.2.3.

	DEPRESS	DISPLAY	COMMENTS
4.2.1	%/ppm	XXXXX mg	If the number in the display is not the correct sample weight, depress CLEAR . Use the keyboard to enter the sample weight in milligrams.
4.2.2	ENTER	XXXXX ppm, or XXXXX pct	The sample weight is entered into memory. The number displayed reflects the computation based on the previous titration.
4.2.3	START	SMPLE	When SMPLE is displayed, introduce the sample immediately; titration begins automatically after a 7-second delay. If <i>WRIT</i> appears before SMPLE, the instrument is not at equivalence; inject the sample when SMPLE comes on.
4.2.4		XXXXX	After the titration, the uncorrected answer is held about one minute.
4.2.5		XXXXX ppm, or XXXXX pct	The corrected answer will be in parts per million (up to 1280) or in percent (from 0.128%). Note: above 8.129%, the display will show two decimal places (e.g. 8.193% will be displayed as 8.19 pct). To display the answer in micrograms, depress mcg

