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DO CONSULTING LTD
ENVIRONMENTAL & OCCUPATIONAL SERVICES

INDUSTRIAL HYGIENE SURVEY OF C - 123 AIRCRAFT

FOR THE PRESENCE OF

2,4 - D: (2,4 - DICHLOROPHENOXY) ACETIC ACID
&
2,4,5 - T: (2,4,5 - TRICHLOROPHENOXY) ACETIC ACID

FOR

AEROSPACE MAINTENANCE AND REGENERATION CENTER
4855 S. WICKENBURG AVENUE
DMAFB ARIZONA 85707 - 4334

Samples taken by
David Cronk
Director of Env Planns
at Univ. of Texas Austin
512-232-2757

ON

AUGUST 16, 1996

NOW A FIRE STATION

3831 WEST SUNNY HILLS PLACE, TUCSON, ARIZONA 85741 (520) 579-7107 • FAX (520) 579-0631

Table of Contents

General Inventory

The following list provides the identification numbers of aircraft that were selected for testing. *(This list was transmitted via facsimile from Ron Black of AMARC to David Cronk of DO Consulting LTD on 08-14-1996 at 13:22 hours.)*

Aircraft Identification Number	To Be Tested
540618	Yes
540532	Yes
540520	Yes
540635	Yes
540585	Yes
540701	Yes
540544	Yes
540577	Yes
540571	Yes
540607	Yes
540685	Yes
5604371	Yes
540693	Yes
540583	Yes
540628	Yes
540547	Yes
540605	Not to be tested *
540586	Yes

* This identification number was noted :
★ 090 with tank this acft not required for test.

Summary of Results

2,4 - Dichlorophenoxyacetic Acid

Sample Number	Result in Micrograms Per Wipe	"LT" indicates less than the limit of quantitation *see discussion*
618A	1.9	LT
618B	1.9	LT
532A	25.0	
532B	15.0	
520A	5.6	
520B	50.0	
635A	30.0	
635B	1.9	LT
585A	* see note	
585B	1.9	LT
701A	180.0	
701B	2.4	
544A	1.9	LT
544B	1.9	LT
577A	880.0	
577B	3.3	
571A	3.1	
571B	14.0	
607A	78.0	
607B	1.9	LT
685A	7.3	
685B	1.9	LT
371A	21.0	LT
371B	1.9	LT
693A	* see note	
693B	72.0	
583A	2.6	
583B	2.2	
628A	1.9	LT
628B	1.9	LT
547A	1.9	LT
547B	1.9	LT
586A	200.0	
586B	10.0	
BLANK 1	1.9	LT
BLANK 2	1.9	LT

* These samples had multiple interfering peaks which made the identification and quantification of the two analytes not possible. Dilution performed on these samples did not resolve the peaks in question.

SUMMARY OF RESULTS

2,4,5 - TRICHLOROPHENOXYACETIC ACID

SAMPLE NUMBER	RESULT IN MICROGRAMS PER WIPE	"LT" INDICATES LESS THAN THE LIMIT OF QUANTITATION *SEE DISCUSSION*
618A	3.0	
618B	2.2	LT
532A	13.0	
532B	10.0	
520A	6.7	
520B	33.0	
635A	29.0	
635B	2.2	LT
585A	24.0	LT
585B	2.2	LT
701A	24.0	LT
701B	2.2	LT
544A	2.2	LT
544B	2.2	LT
577A	960.0	
577B	5.0	
571A	2.2	LT
571B	15.0	
607A	60.0	
607B	2.2	LT
685A	9.2	
685B	2.2	
371A	35.0	
371B	5.1	
693A	* SEE NOTE	
693B	61.0	
583A	17.0	
583B	2.2	LT
628A	2.2	LT
628B	2.2	LT
547A	2.2	LT
547B	2.2	LT
586A	32.0	
586B	6.4	
BLANK 1	2.2	LT
BLANK 2	2.2	LT

* These samples had multiple interfering peaks which made the identification and quantification of the two analytes not possible. Dilution performed on these samples did not resolve the peaks in question.

COMBINED SUMMARY OF RESULTS

2,4-D & 2,4,5-T

B = FLOOR SAMPLES
A = SPRAY LINE SAMPLES

SAMPLE NUMBER	2,4-D	2,4,5-T	"LT" 2,4-D	"LT" 2,4,5-T
618A L	1.9	3.0	LT	
618B R	1.9	2.2	LT	LT
532A R	25.0	13.0		
532B R	15.0	10.0		
520A L	5.6	6.7		
520B L	50.0	33.0		
635A R	30.0	29.0		
635B R	1.9	2.2	LT	LT
585A R	*SEE NOTE	24.0		LT
585B R	1.9	2.2	LT	LT
701A R	180.0	24.0		LT
701B R	2.4	2.2		LT
544A R	1.9	2.2	LT	LT
544B R	1.9	2.2	LT	LT
577A R	880.0	960.0		
577B R	3.3	5.0		
571A R	3.1	2.2		LT
571B R	14.0	15.0		
607A R	78.0	60.0		
607B R	1.9	2.2	LT	LT
685A R	7.3	9.2		
685B R	1.9	2.2	LT	
371A R	21.0	35.0	LT	
371B L	1.9	5.1	LT	
693A R	*SEE NOTE	* SEE NOTE		
693B L	72.0	61.0		
583A ER	2.6	17.0		
583B R	2.2	2.2		LT
628A L	1.9	2.2	LT	LT
628B R	1.9	2.2	LT	LT
547A R	1.9	2.2	LT	LT
547B R	1.9	2.2	LT	LT
586A R	200.0	32.0		
586B R	10.0	6.4		
BLANK 1	1.9	2.2	LT	LT
BLANK 2	1.9	2.2	LT	LT

R & L IDENTIFY WHICH SIDE OF THE AIRCRAFT, WHEN FACING FRONT. THE SAMPLE WAS TAKEN FROM. ER IDENTIFIES EXTERNAL RIGHT WING CAP.

* These samples had multiple interfering peaks which made the identification and quantification of the two analytes not possible. Dilution performed on these samples did not resolve the peaks in question.

Sample Procedures and Process

Equipment Required

One of each of the following were required for each wipe to be taken:

Disposable Vinyl Gloves

Glass Fiber Filter, 37mm

Plastic Petri Dish

Small Bottle of Distilled Water

Procedure:

While wearing a pair of vinyl gloves, an approximately 6 inch by 6 inch area of floor located under the spray line caps *(see figure A)* was wiped with a Whatman filter. The filter was wetted with a small amount of distilled water in order to improve particulate collection from the surface being wiped.

When the area was wiped, the filter was folded in half and placed into one of the petri dishes. The petri dish was marked with the letter B, the sample identification number, and placed in a zip-lock bag.

One spray line cap on each aircraft was removed by a staff member. *(See figure B)* While wearing a pair of vinyl gloves, the inside of the spray line was wiped with a Whatman filter. The filter was wetted with a small amount of distilled water in order to improve particulate collection from the surface being wiped.

When the spray line was wiped, the filter was folded in half and placed into one of the petri dishes. The petri dish was marked with the letter A, the sample identification number, and placed in a zip-lock bag.

Two unused filters were placed into clean petri dishes and marked blank 1 and blank 2.

The sample submittal sheets were filled out and the samples were shipped to the laboratory for analysis.

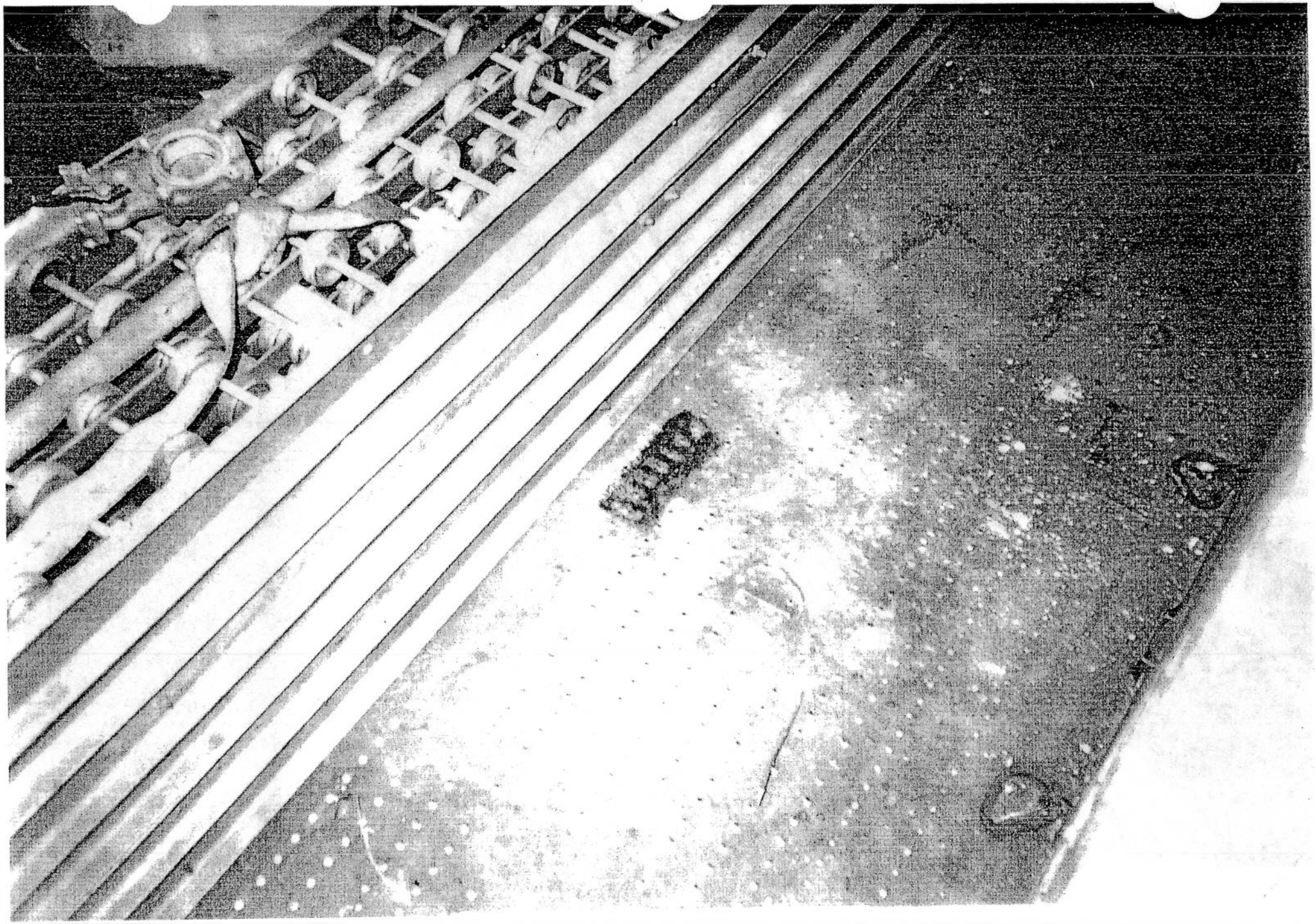


FIGURE A

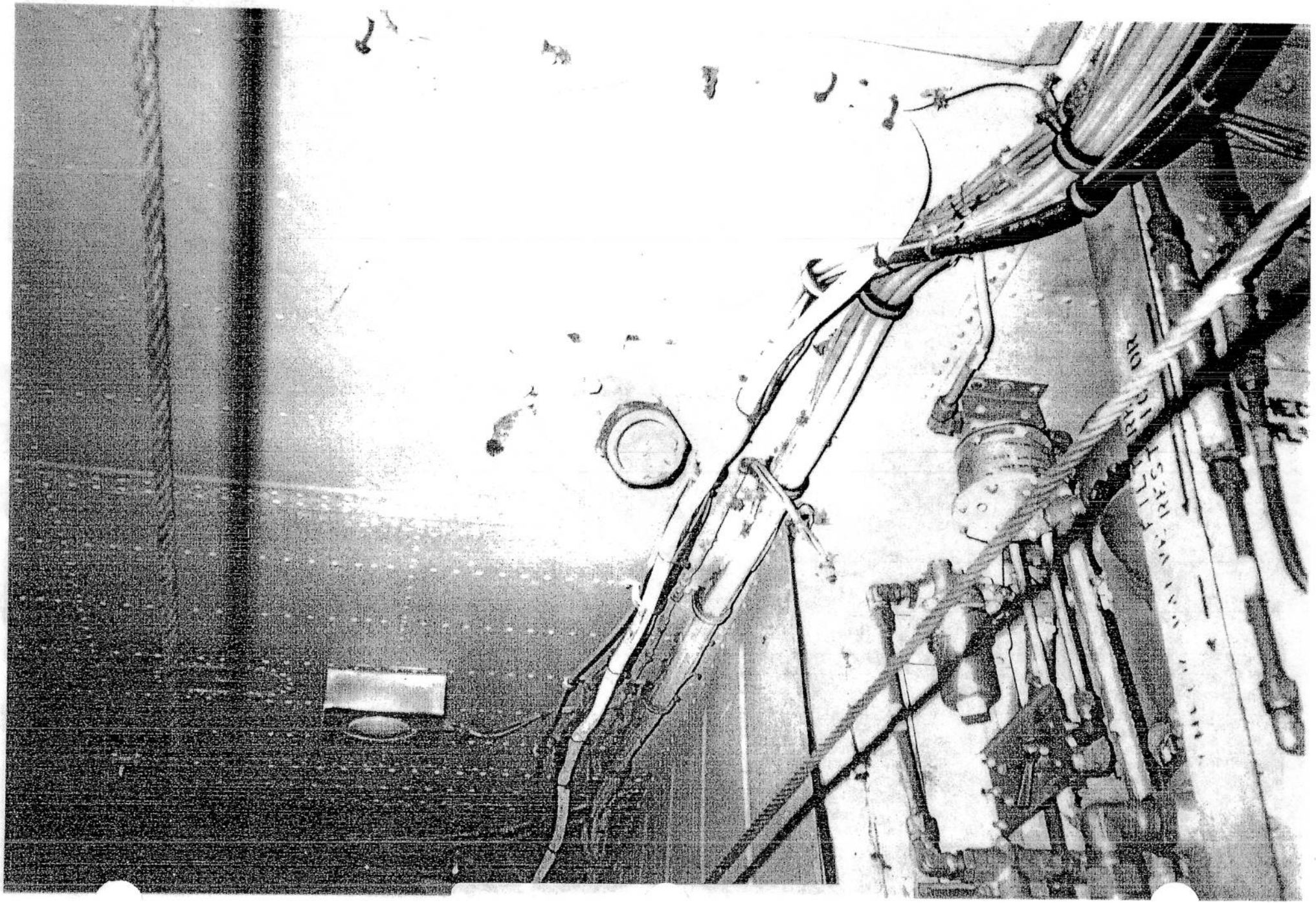


FIG. 2B

Laboratory Report

TRAVELERS / AETNA
LOSS PREVENTION & ENGINEERING
ANALYTICAL LABORATORY

Phone: 800-842-0355 or 860-277-3495

DO Consulting LTD.
3831 W. Sunny Hills Place
Tuscon, AZ 85741

Facility: Tuscon, AZ 85741
Samples Taken By: David Cronk

Attn: David Cronk
Invoice Number:

Order #: 96-08-210
Date: 09/03/96 12:11
Work ID: Do Consulting Ltd.
Date Received: 08/22/96
Date Completed: 08/30/96

Client Code: DOCONS

SAMPLE IDENTIFICATION

Sample Number	and Description
618A	618A
618B	618B
532A	532A
532B	532B
520A	520A
520B	520B
635A	635A
635B	635B
585A	585A
585B	585B
701A	701A
701B	701B
544A	544A
544B	544B
577A	577A
577B	577B
571A	571A
571B	571B

Sample Number	and Description
607A	607A
607B	607B
685A	685A
685B	685B
371A	371A
371B	371B
693A	693A
693B	693B
583A	583A
583B	583B
628A	628A
628B	628B
547A	547A
547B	547B
586A	586A
586B	586B
BLANK1	Blank
BLANK2	Blank

The reported data relate only to the samples as received by Travelers/Aetna Loss Prevention & Engineering Analytical Lab.The reported air concentrations have been calculated using information supplied by the customer and have NOT been adjusted to represent a Time Weighted Average (TWA).
"LT" - Indicates less than the limit of quantitation (LOQ). The contaminant may or may not be present at levels below this concentration.

Thomas Surveski
Approved By
Thomas Surveski

2,4,5-T
Method: HPLC

Sample #	Sample Description		Result	Units	Analyzed	By
618A	618A		3.0	micrograms	08/30/96	MJN
618B	618B	LT	2.2	micrograms	08/30/96	MJN
532A	532A		13.	micrograms	08/30/96	MJN
532B	532B		10.	micrograms	08/30/96	MJN
520A	520A		6.7	micrograms	08/30/96	MJN
520B	520B		33.	micrograms	08/30/96	MJN
635A	635A		29.	micrograms	08/30/96	MJN
635B	635B	LT	2.2	micrograms	08/30/96	MJN
585A	585A	LT	24.	micrograms	08/30/96	MJN
585B	585B	LT	2.2	micrograms	08/30/96	MJN
701A	701A	LT	24.	micrograms	08/30/96	MJN
701B	701B	LT	2.2	micrograms	08/30/96	MJN
544A	544A	LT	2.2	micrograms	08/30/96	MJN
544B	544B	LT	2.2	micrograms	08/30/96	MJN
577A	577A		960.	micrograms	08/30/96	MJN
577B	577B		5.0	micrograms	08/30/96	MJN
571A	571A	LT	2.2	micrograms	08/30/96	MJN
571B	571B		15.	micrograms	08/30/96	MJN
607A	607A		60.	micrograms	08/30/96	MJN
07B	607B	LT	2.2	micrograms	08/30/96	MJN
,85A	685A		9.2	micrograms	08/30/96	MJN
685B	685B		2.2	micrograms	08/30/96	MJN
371A	371A		35.	micrograms	08/30/96	MJN
371B	371B		5.1	micrograms	08/30/96	MJN
693A	693A	*a	SEE NOTE		08/30/96	MJN
693B	693B		61.	micrograms	08/30/96	MJN
583A	583A		17.	micrograms	08/30/96	MJN
583B	583B	LT	2.2	micrograms	08/30/96	MJN
628A	628A	LT	2.2	micrograms	08/30/96	MJN
628B	628B	LT	2.2	micrograms	08/30/96	MJN
547A	547A	LT	2.2	micrograms	08/30/96	MJN
547B	547B	LT	2.2	micrograms	08/30/96	MJN
586A	586A		32.	micrograms	08/30/96	MJN
586B	586B		6.4	micrograms	08/30/96	MJN
BLANK1	Blank	LT	2.2	micrograms	08/30/96	MJN
BLANK2	Blank	LT	2.2	micrograms	08/30/96	MJN

2,4-D
Method: HPLC

Sample #	Sample Description		Result	Units	Analyzed	By
618A	618A	LT	1.9	micrograms	08/30/96	MJN
618B	618B	LT	1.9	micrograms	08/30/96	MJN
532A	532A		25.	micrograms	08/30/96	MJN
532B	532B		15.	micrograms	08/30/96	MJN
0A	520A		5.6	micrograms	08/30/96	MJN

Sample #	Sample Description		Result	Units	Analyzed	By
520B	520B		50.	micrograms	08/30/96	MJN
635A	635A		30.	micrograms	08/30/96	MJN
635B	635B	LT	1.9	micrograms	08/30/96	MJN
585A	585A	*a	SEE NOTE		08/30/96	MJN
585B	585B	LT	1.9	micrograms	08/30/96	MJN
701A	701A		180.	micrograms	08/30/96	MJN
701B	701B		2.4	micrograms	08/30/96	MJN
544A	544A	LT	1.9	micrograms	08/30/96	MJN
544B	544B	LT	1.9	micrograms	08/30/96	MJN
577A	577A		880.	micrograms	08/30/96	MJN
577B	577B		3.3	micrograms	08/30/96	MJN
571A	571A		3.1	micrograms	08/30/96	MJN
571B	571B		14.	micrograms	08/30/96	MJN
607A	607A		78.	micrograms	08/30/96	MJN
607B	607B	LT	1.9	micrograms	08/30/96	MJN
685A	685A		7.3	micrograms	08/30/96	MJN
685B	685B	LT	1.9	micrograms	08/30/96	MJN
371A	371A	LT	21.	micrograms	08/30/96	MJN
371B	371B	LT	1.9	micrograms	08/30/96	MJN
693A	693A	*a	SEE NOTE		08/30/96	MJN
693B	693B		72.	micrograms	08/30/96	MJN
583A	583A		2.6	micrograms	08/30/96	MJN
583B	583B		2.2	micrograms	08/30/96	MJN
628A	628A	LT	1.9	micrograms	08/30/96	MJN
628B	628B	LT	1.9	micrograms	08/30/96	MJN
547A	547A	LT	1.9	micrograms	08/30/96	MJN
547B	547B	LT	1.9	micrograms	08/30/96	MJN
586A	586A		200.	micrograms	08/30/96	MJN
586B	586B		10.	micrograms	08/30/96	MJN
BLANK1	Blank	LT	1.9	micrograms	08/30/96	MJN
BLANK2	Blank	LT	1.9	micrograms	08/30/96	MJN

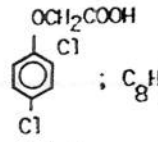
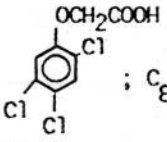
2,4,5-T -2,4,5-Trichlorophenoxyacetic Acid - Modified NIOSH 5001/HPLC

2,4-D -2,4-Dichlorophenoxyacetic Acid - Modified NIOSH 5001/HPLC

*a These samples had multiple interfering peaks which made the identification and quantitation of the two analytes not possible. Dilutions performed on these samples did not resolve the peaks in question.

Analytical Method

2,4—D AND 2,4,5—T

FORMULA:  ; $C_8H_6Cl_2O_3$  ; $C_8H_5Cl_3O_3$

	2,4-D	2,4,5-T
M.W.:	221.04	255.49

METHOD: 5001
ISSUED: 2/15/84

OSHA: 10 mg/m³ (2,4-D or 2,4,5-T)
NIOSH: Group I, II and II Pesticides [1]
ACGIH: 10 mg/m³, STEL 20 mg/m³

PROPERTIES: solid;
MP 153 °C (2,4,5-T); MP 138 °C (2,4-D);
VP not significant

SYNONYMS: 2,4-D: (2,4-dichlorophenoxy)acetic acid; CAS #94-75-7.
2,4,5-T: (2,4,5-trichlorophenoxy)acetic acid; CAS #93-76-5.

SAMPLING

SAMPLER: FILTER
(glass fiber, binderless)

FLOW RATE: 1 to 3 L/min

VOL-MIN: 15 L @ 10 mg/m³
-MAX: 200 L

...IPMENT: routine

SAMPLE STABILITY: at least 1 week @ 25 °C

BLANKS: 2 to 10 field blanks per set

ACCURACY

RANGE STUDIED: 5 to 20 mg/m³ [2,3]
(100-L samples)

BIAS: not significant [2,3]

OVERALL PRECISION (s_r): 0.051 (2,4-D) [2];
0.053 (2,4,5-T) [3]

MEASUREMENT

!TECHNIQUE: HPLC, UV DETECTION
!
!ANALYTE: 2,4-D or 2,4,5-T anion
!
!DESORPTION: 15 mL CH_3OH; stand 30 min
!
!INJECTION VOLUME: 50 µL
!
!ELUENT: 0.001 M $NaClO_4$-0.001 M $Na_2B_4O_7$ (2,4-D)
! 0.003 M $NaClO_4$-0.001 M $Na_2B_4O_7$ (2,4,5-T)
!
!FLOW RATE: 1.7 mL/min
!
!DETECTOR: UV @ 289 nm (2,4,5-T); 284 nm (2,4,-D)
!
!COLUMN: stainless steel, 50 cm x 2 mm ID, packed
! with Zipax SAX (DuPont); ambient
! temperature; 6900 kPa (1000 psi)
!
!CALIBRATION: solutions of analyte in methanol
!
!RANGE: 0.15 to 2 mg per filter
!
!ESTIMATED LOD: 0.015 mg per filter (2,4-D) [2];
! 0.030 mg per filter (2,4,5-T) [3]
!
!PRECISION (s_r): 0.01 (2,4-D) [2];
! 0.025 (2,4,5-T) [3]
!

APPLICABILITY: The working range is 1.5 to 20 mg/m³ of either compound for a 100-L air sample. This method determines 2,4-D, 2,4,5-T, and their salts, but not their esters.

INTERFERENCES: High concentrations of esters of either compound do not interfere but require the use of a precolumn to prevent degradation of the HPLC column.

OTHER METHODS: This method combines and replaces Methods S279 [4] and S303 [4] which are the ...e except for eluent composition and UV detector wavelength.

REAGENTS:

1. 2,4-dichlorophenoxyacetic acid.*
2. 2,4,5-trichlorophenoxyacetic acid.*
3. Methanol, HPLC grade.
4. LC eluent:
   a. 2,4-D: 0.001 M $NaClO_4$ and 0.001 M $Na_2B_4O_7$. Add 0.122 g $NaClO_4$ and 0.381 g $Na_2B_4O_7 \cdot 10H_2O$ to a 1-L volumetric flask. Bring to volume with distilled water. Mix, filter and degas the solution.
   b. 2,4,5-T: 0.003 M $NaClO_4$ and 0.001 M $Na_2B_4O_7 \cdot 10H_2O$. Add 0.366 g $NaClO_4$ and 0.381 g $Na_2B_4O_7 \cdot 10H_2O$ to a 1-L volumetric flask. Bring to volume with distilled water. Mix, filter and degas the solution.
5. Compressed, filtered air or nitrogen for drying syringes.
6. Ethanol, absolute.
7. Acetone.
8. Calibration stock solution, 400 µg/mL. Dissolve 0.400 g 2,4-D or 2,4,5-T in methanol and dilute to 1 L with methanol.
9. Recovery stock solution:
   a. Dissolve 0.248 g 2,4-D in ethanol. Dilute to 10 mL with ethanol.
   b. Dissolve 0.250 g 2,4,5-T, triethylamine salt, in acetone (or 0.250 g 2,4,5-T in methanol). Dilute to 10 mL with acetone.

   NOTE: Use the same form (e.g., acid or salt) of 2,4,5-T as in the air sample. Recovery may vary with the chemical form.

   *See special precautions.

EQUIPMENT:

1. Sampler: filter, glass fiber, binderless, in a 37-mm polystyrene two-piece cassette filter holder (Gelman type AE or equivalent).
2. Personal sampling pump, 1 to 3 L/min, with flexible connecting tubing.
3. High pressure liquid chromatograph, UV detector at 284 nm (2,4-D) and 289 nm (2,4,5-T), integrator and column (page 5001-1).
4. Filter, PTFE, 5-µm, 13-mm diameter in Swinny stainless (13-mm) filter holder.
5. Tweezers.
6. Syringes, 20-mL luer-lock.*
7. Vials, glass, 20-mL.*
8. Volumetric flasks, convenient sizes for preparing standard solutions.*

*Wash all glassware with detergent, thoroughly rinse with tap water and distilled water.

SPECIAL PRECAUTIONS: 2,4-D and 2,4,5-T are suspected animal carcinogens [1]. 2,3,7,8-Tetrachlorodibenzo-1,4-dioxin has been identified as an impurity in 2,4,5-T. Avoid any contact with these substances.

SAMPLING:

1. Calibrate each personal sampling pump with a representative filter in line.
2. Sample at an accurately known flow rate between 1 and 3 L/min for a total sample size of 15 to 200 L. Do not exceed a total dust loading of 2 mg on the filter.
3. Obtain information on the chemical form of the analyte (i.e., ester, salt or free acid) likely to be present in the air sample.

SAMPLE PREPARATION:

4. Remove the filter from the cassette with clean tweezers and place it in a 20-mL vial.
5. Add 15 mL methanol and mix by swirling. Allow to stand at least 30 min.
6. Filter the sample.
   a. Pour the sample solution into a 20-mL syringe which is fitted with a 5-µm PTFE filter.
   b. Filter the sample into a clean vial.
   c. Clean the PTFE filter by backflushing with methanol. Rinse the syringe and plunger with methanol. Dry with air or nitrogen.

CALIBRATION AND QUALITY CONTROL:

7. Calibrate daily with at least five working standards.
   a. Dilute aliquots of calibration stock solution to 10 mL with methanol in volumetric flasks.
   b. Analyze working standards (steps 9 and 10).
   c. Prepare calibration graph (peak area vs. mg 2,4-D or mg 2,4,5-T).
8. Check recovery with at least four spiked media blanks at each of four levels.
   a. Add aliquot of recovery stock solution to media blank.
   b. Analyze using standards prepared from the recovery stock solution.
   c. Calculate R (mg recovered/mg added).

MEASUREMENT:

9. Establish chromatographic conditions listed on page 5001-1 for either 2,4-D or 2,4,5-T.
10. Inject 50 µL of sample in duplicate. Rinse and dry the syringe between samples.
    NOTE 1: The analyte is the chlorinated phenoxyacetate, whether the air sample contained salts or free acid forms of 2,4-D and 2,4,5-T.
    NOTE 2: Esters of 2,4-D and 2,4,5-T will not elute from the HPLC column and may, if present in large amounts, degrade the HPLC column. Protect the main column with a precolumn of Zipax SAX if esters are known to be present. The sample preparation conditions are sufficiently mild so as to preclude hydrolysis of the esters.

CALCULATIONS:

11. Read the mass of analyte, mg (corrected for recovery), in the sample (W) and average media blank (B) from the calibration curve.
12. Calculate the concentration, C (mg/m^3), of 2,4-D or 2,4,5-T in air volume, V (L), taken:

$$C = \frac{(W - B) \cdot 10^3}{V}, \ mg/m^3.$$

EVALUATION OF METHOD:

Methods S279 (2,4-D) and S303 (2,4,5-T) were issued on February 17, 1978, and March 17, 1978, respectively [4], and validated using 100-L air samples [2,3,5]. Atmospheres were generated using 2,4-D dimethylamine salt for S279 and Weedar Amine BK (Amchem; equal parts of 2,4-D dimethylamine salt and 2,4,5-T triethylamine salt) for S303. Overall precision and recovery for 100-L samples were as shown, representing non-significant bias in each method:

Method	Overall Precision (s_r)	Range Studied mg/m³	Range Studied mg per sample	Recovery @ 0.5 mg	7-Day Storage Stability, % of Day 1
S279	0.051	5 to 20	0.5 to 2	0.97	99
S303	0.053	5 to 21	0.5 to 2	0.86 to 0.99	104

REFERENCES:

[1] Criteria for a Recommended Standard...Occupational Exposure During Manufactur and Formulation of Pesticides, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 78-174 (1978).

[2] Backup Data Report S279 for 2,4-D prepared under NIOSH Contract No. 210-76-0123 (unpublished, 1976), available as "Ten NIOSH Analytical Methods, Set 6," Order No. PB 288-629 from NTIS, Springfield, VA 22161.

[3] Backup Data Report S303 for 2,4,5-T prepared under NIOSH Contract No. 210-76-0123 (unpublished, 1976), available as "Ten NIOSH Analytical Methods, Set 6," Order No. PB 288-629 from NTIS, Springfield, VA 22161.

[4] NIOSH Manual of Analytical Methods, 2nd ed., V. 5, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 79-141 (1979).

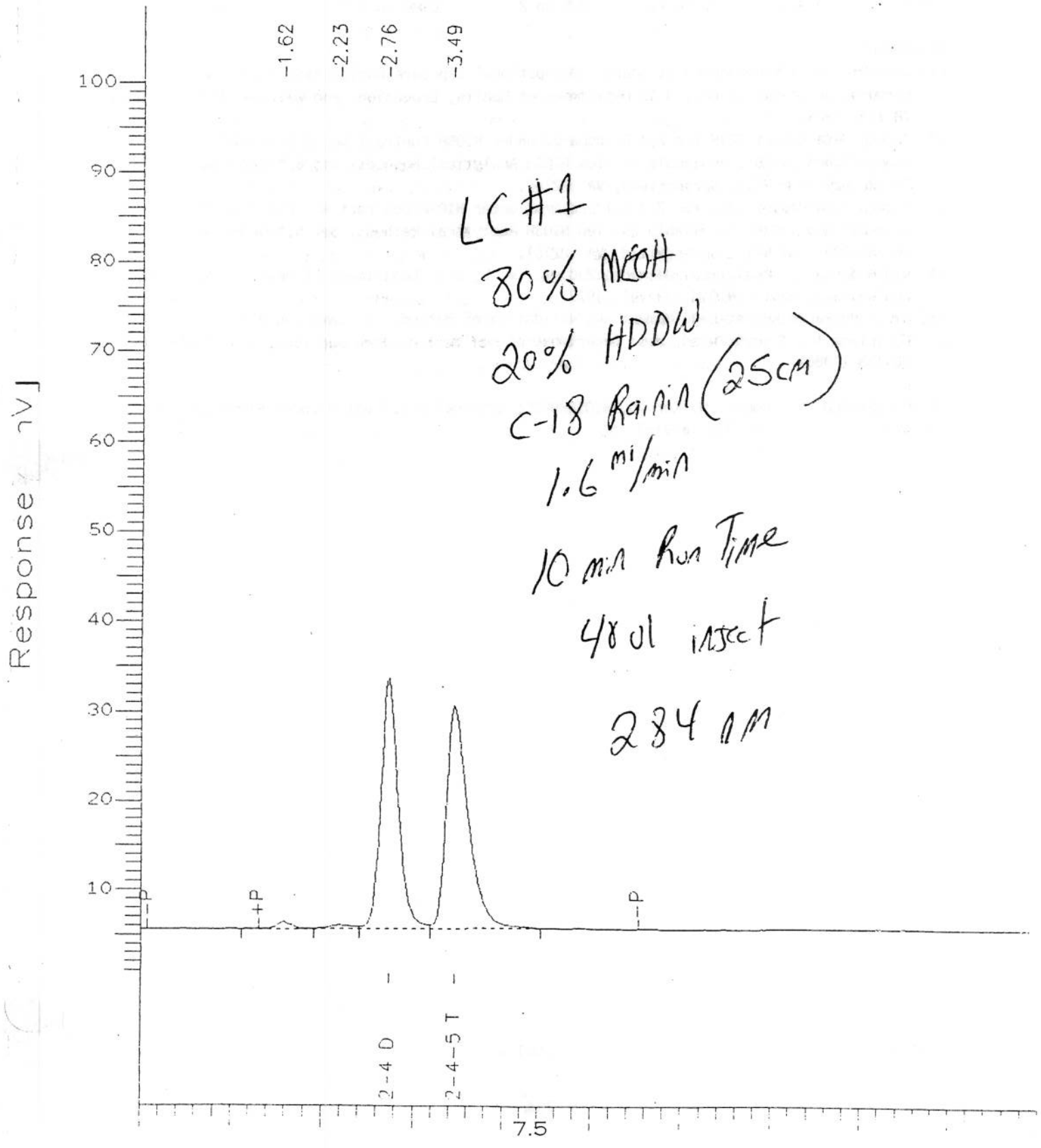
[5] NIOSH Research Report-Development and Validation of Methods for Sampling and Analysis of Workplace Toxic Substances, U.S. Department of Health and Human Services, Publ. (NIOSH) 80-133 (1980).

METHOD REVISED BY: Robert W. Kurimo, NIOSH/DPSE; originally validated under NIOSH Contract No. 210-76-0123.

Chromatogram

Sample Name :
FileName : c:\turbo3\lc\lc1data\qs010028.raw
: PHEN.ins
S Time : 0.00 min End Time : 10.00 min
Scale Factor: -1 Plot Offset: 1 mV

Sample #: Page 1 of 1
Date : 8/25/96 08:02 AM
Time of Injection: 8/27/96 07:51 AM
Low Point : 0.62 mV High Point : 100.6
Plot Scale: 100 mV



LC #1
80% MeOH
20% HDDW
C-18 Rainin (25cm)
1.6 ml/min
10 min Run Time
48 ul inject
284 nm

Dear Tate:

For 2,4-D, we use the NIOSH sampling parameters in method 5001 but have modified the LC column and solvent since they were using an ion exchange column and mixed buffers. Our conditions are as follows;

COND. : Methanol extraction, u Bondapak, C18 column; 55% Methanol
44% water 1% acetic acid; 1.3 mL/min; UV det: 254,280;
Retention time, 14 min.

SAMPLING MEDIA: Glass Fiber Filter (Gelman Type AE or equivalent)
REC V: 200 Liters REC F: 3.0 L/min
ANL 1: High Performance Liquid Chromatography; HPLC/UV
. REF: 1,2 (OSHA modified NIOSH 5001) SAE: 0.08
. CLASS: Fully Validated

The following informaiton is all we have for the MCPP. Appears we had just received samples for analysis but due to the infrequency, we went no further than getting analytical condidtions.

NM : MCPP
SYN : Mecoprop; CMPP; 2-((4-Chloro-o-tolyl)oxy)propionic acid;
2-(2-Methyl-4-chlorophenoxy)propanoic acid
CAS : 93-65-2
NIOSH : RTECS UE9750000; 67771
SLC1 : MEDIA: Glass Fiber Filter (37 mm)
REC V: 240 Liters REC F: 1.0 L/min
ANL 1: High Performance Liquid Chromatography; HPLC/UV

separate Glass fiber filter
Bulk MCPP — 4 or 5 ml

1 l/min for 200-240 mins

DISCUSSION

Several topics need to be addressed. The first is sampling methodology. The sample or wipe area was predetermined by the staff of AMARC. It was decided that one wipe would be taken inside the spray tube (Figure B), and one sample would be taken from the floor area. David Cronk of DO Consulting LTD decided to sample the floor area directly under the spray tube. There was some inconsistency in both test locations. Some spray tube caps could not be removed from the right side of the aircraft resulting in the left spray tube cap being removed. One aircraft (583) was tested in the outer fill cap due to failure to remove either inside fill caps. (Figure D)

It should be noted that it was difficult maintaining consistency in the floor sample areas due to various equipment being stored in most of the aircraft. The floor area to be wiped was dirty and some was covered with an anti-slip surfacing making wipe sampling difficult. (Figure C)

Great effort was made to maintain consistency in sampling location and a variance of a few square feet was achieved.

LT or LOQ is the limit of detection, or the smallest concentration of analyte reliably identified by the assay, and specificity of all qualitative methods should be well documented. The laboratory must demonstrate that the assay responses to blank or negative calibrators do not overlap with response of the lowest positive calibrator. Sections 6 and 7 of this report identify these requirements.

Attention must be paid to the Combined Summary of Results, section 4. It should be noted that only three of the aircraft tested (544, 528, 547, , resulted in both analytes of both test sites to be reported LT. For all remaining aircraft, at least one analyte from at least one test site was reported above the LT.

With regards to Toxicology consider the following:

In almost all experimental studies in toxicology, an agent, generally a single chemical substance, is administered in known amounts to an organism. It is universally acknowledged that the chemical under study must be pure, or the nature of any contaminants known, to interpret the experimental results with validity. Yet it is common practice to proceed with the experimental study without verification of the purity of the compound. Not only does this practice lead to errors in establishing an accurate dose, erroneous conclusions may be drawn…(Saady *et al.*, 1981).

These tests did not identify dioxins. Dioxins are the analytes suspected of causing adverse health effects. Dioxins may be present in mixtures of 2,4 -D and 2,4,5 - T. The presence of either of these analytes may suggest, but, do not prove the presence of dioxins. It is impossible to know what proportions of 2,4 -D and 2,4,5 - T were combined in the aircraft at the time of use.

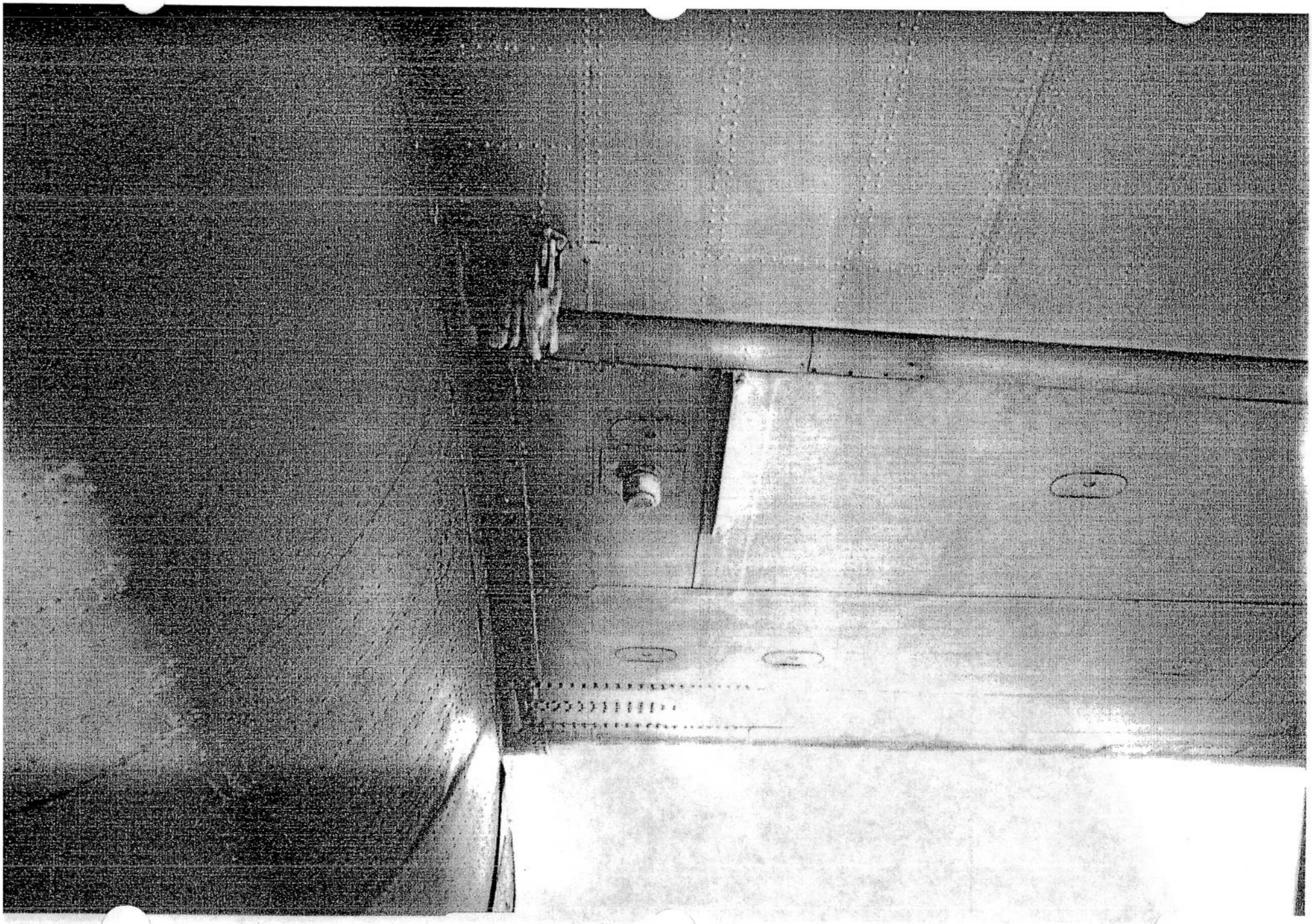
David O. Cronk

David O. Cronk PIH

07/12/96

Date

FIGURE C



FIGL)

Laboratory Certification

The American Industrial Hygiene Association

is proud to acknowledge that

The Travelers Insurance Company

Hartford, CT

Laboratory ID# 6944

has fulfilled the requirements for Industrial Hygiene Laboratory Accreditation and has earned distinguished recognition as an

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December 1, 1994

Date Prepared

President
American Industrial Hygiene Association

Mark A. Puskar

080

Certificate Number

Chairman
Laboratory Accreditation Committee