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Author

Corporate Author

Report/Article Title Draft Memorandum from D. Flanders to Dr. Layde regarding TCDD Exposure, possible extreme case, single encounter, with attached article; reports and tables related to Herbicide Applications by the military in Vietnam, dated March 27, 1986

Journal/Book Title

Year 1986

Month/Day

Color



Number of Images 25

Description Notes Alvin L. Young filed these documents together with others under the label, "Agent Orange Exposure Project." Duplicate is only of Draft Memorandum. See Item 1073 for article.

From, Dana Flanders
3/31/86

MEMO, DRAFT, to Dr. Layde, 3/27/86

FROM: D. Flanders

RE: TCDD Exposure, possible extreme case, single encounter

Dr. A. Foye
Office Science & Technol
Room 5005
New Executive Office
Bldg
WASH. DC.

Potential TCDD exposure from Agent Orange, such as that which might have resulted from having been directly sprayed, is illustrated for a potentially extreme case. Since much of the information which would be required to accurately estimate dose is not available, many assumptions have been made and each assumption involves substantial uncertainty. The cumulative effect of the many uncertainties may well result an error of many orders of magnitude between the actual and the estimated TCDD exposure. The assumptions made are probably consistent with an extreme case, and therefore may over-estimate typical exposures. To illustrate a different approach and to point out the highly uncertain nature of projections such as these, an article by Kingsley Stevens (Human Toxicology, 1981) is attached.

I. EXTREME CASE ASSUMPTIONS

1. Agent Orange contained up to 47 ppm of TCDD.

One sample of Agent Orange from the Johnston Island inventory showed 47 ppm TCDD. This assumption is probably consistent with an extreme-case scenario, since some investigators speculated that the samples with the highest levels were actually Agent Purple and since the level of TCDD was estimated to average about 2ppm in Agent Orange.

2. Application resulted in up to 5 gal of herbicide per acre.

Ranch Hand sprays were estimated to deliver about 3 gal/acre. Use of the higher figure allows for more intensive application under some conditions, and for some spray applications such as helicopter sprays.

3. Each gal. of herbicide weighed 12.7 lbs. (VA Review, vol. 2).

4. Man weighed 70 kg, with a 1.86 m² surface area.

5. The amount of herbicide on a man was the same (per unit area) as the amount of herbicide reaching ground level.

It is assumed that a protective canopy did not absorb herbicide. This assumption may also represent an extreme-case, since much of the spraying was done in areas with an overhead, protective canopy. Moreover, only part of a man who was directly sprayed, might typically be covered by herbicide (e.g. his head, shoulders, and arms.), particularly if clothing was worn.

6. 3% of the dermal load would be absorbed.

In one animal study, 14% of a dermal dose of TCDD administered in methanol was found in the liver 24-hours later. Since only part of a dose is localized in the liver, the total percentage absorbed was probably higher. Use of the lower figure (3%) allows for lower absorption which might result from a protective effect of clothing and reduced contact time (e.g. from washing), etc. In a recent article directed at estimating risk associated with TCDD, dermal absorption of TCDD from residential soil was estimated to be 1% (Kimbrough RD, Falk H Stehr P, "Health implications of

MEMO, DRAFT, to Dr. Layde, 3/27/86

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2,3,7,8-tetrachlorodibenzodioxin (TCDD) contamination of residential soil." J. Toxicol. and Environ. Health 1984; 14:47-93). The 1% figure may not apply to the present situation for several reasons. For example, TCDD absorption from soil may be different from that which occurs when applied in Agent Orange. Because of the uncertainties involved, the 3% figure could be in error by an order of magnitude, or more.

II. CALCULATION OF DOSE BASED ON POSSIBLY EXTREME CASE ASSUMPTIONS

1. Amount of TCDD/m² residing around:

NOTE: g = gallons; a = acres; m = meters; kg = kilograms; lbs = pounds;
mcgm = micrograms; gm = grams;

$$(5 \text{ g/a}) (10.7 \text{ lbs/g}) (45 \text{ g/lbs}) (1/4047 \text{ m}^2/\text{a}) (47 \times 10^{-7} \text{ g TCDD/g}) = 28 \text{ mcgm/m}^2$$

2. Amount TCDD on man's surface:

$$(28 \text{ micrograms/m}^2) (1.85 \text{ m}^2/\text{man}) = 522 \text{ micrograms/man}$$

3. Amount TCDD absorbed:

$$(522 \text{ mcgm/man}) (.03 \text{ absorbed}) = 16 \text{ mcgm/man}$$

4. Amount TCDD absorbed per kilogram:

$$(16 \text{ micrograms/man}) (1/70 \text{ kg/man}) = 0.22 \text{ micrograms/kg}$$

III. COMPARISON WITH TOXICITY IN ANIMALS

Assessment of risk associated with ambient levels of TDD must be based on animal studies. In the case of TDD, studies are available on both rats and mice. The results of these studies are summarized in Table 1. The results of these studies are summarized in Table 1. The results of these studies are summarized in Table 1.

Extrapolation of results from animals to humans is necessarily uncertain so that adverse effects of TDD may be identifiable at much lower doses, or recovery only at much higher doses. Further complicating any comparison are the possibly adverse consequences of TDD in relation to potential TDD exposure. Nevertheless, the above calculations suggest that the TDD exposure of man exposed directly would, conceivably, have been similar to that of the animals. Thus, to the extent that the results observed in these studies are applicable to man, it is possible that

HERBICIDE APPLICATIONS, SOUTHEAST ASIA
 NUMBER OF MISSIONS AND SUMS OF GALLONS (NOT ALL MISSIONS HAVE GALLONS)
 FOR INDICATED AGENTS; TYPES ARE "ALL" OR "P"-PERIMETER
 TIME PERIOD: OCT 1966 THROUGH MAR 1969

TYPES	ZONE	AGENTS	SOURCE	N_MISS	SUM_GALS
ALL	ALL	ALL	BOTH	4880	12434645
ALL	ALL	ALL	HERB	3906	11819690
ALL	ALL	ALL	SV3	974	614955
ALL	ALL	ALL	BOTH	6	.
ALL	ALL	B	BOTH	483	796179
ALL	ALL	O	BOTH	2391	6867444
ALL	ALL	U	BOTH	401	119217
ALL	ALL	W	BOTH	1599	4651805
ALL	ALL	ALL	SV3	6	.
ALL	ALL	B	HERB	329	723435
ALL	ALL	B	SV3	154	72744
ALL	ALL	O	HERB	2169	6598835
ALL	ALL	O	SV3	222	268609
ALL	ALL	U	SV3	401	119217
ALL	ALL	W	HERB	1408	4497420
ALL	ALL	W	SV3	191	154385
ALL	WAR ZONE C	ALL	BOTH	468	1287956
ALL	WAR ZONE D	ALL	BOTH	860	2983202
ALL	IRON TRIANGLE	ALL	BOTH	26	91090
ALL	RUNG SAT SPECIAL	ALL	BOTH	233	857190
ALL	OTHER III CTZ	ALL	BOTH	908	2365774
ALL	OUTSIDE III CTZ	ALL	BOTH	2385	4849433
P	ALL	ALL	BOTH	516	146583
P	ALL	ALL	HERB	329	100369
P	ALL	ALL	SV3	187	46214
P	ALL	B	BOTH	97	41432
P	ALL	O	BOTH	191	33903
P	ALL	U	BOTH	67	10690
P	ALL	W	BOTH	161	60558
P	ALL	B	HERB	48	24425
P	ALL	B	SV3	49	17007
P	ALL	O	HERB	145	24466
P	ALL	O	SV3	46	9437
P	ALL	U	SV3	67	10690
P	ALL	W	HERB	136	51478
P	ALL	W	SV3	25	9080

HERBICIDE APPLICATIONS, SOUTHEAST ASIA
 NUMBER OF MISSIONS AND SUMS OF GALLONS (NOT ALL MISSIONS HAVE GALLONS)
 FOR INDICATED AGENTS; TYPES ARE "ALL" OR "P"-PERIMETER
 TIME PERIOD: OCT 1966 THROUGH MAR 1969

TYPES	ZONE	AGENTS	SOURCE	N_MISS	SUM_GALS
P	WAR ZONE C	ALL	BOTH	20	7040
P	WAR ZONE D	ALL	BOTH	6	6120
P	OTHER III CTZ	ALL	BOTH	80	32120
P	OUTSIDE III CTZ	ALL	BOTH	410	101303
P	WAR ZONE C	ALL	HERB	6	4390
P	WAR ZONE C	ALL	SV3	14	2650
P	WAR ZONE D	ALL	HERB	3	3700
P	WAR ZONE D	ALL	SV3	3	2420
P	OTHER III CTZ	ALL	HERB	17	18410
P	OTHER III CTZ	ALL	SV3	63	13710
P	OUTSIDE III CTZ	ALL	HERB	303	73869
P	OUTSIDE III CTZ	ALL	SV3	107	27434
P	WAR ZONE C	B	BOTH	6	3365
P	WAR ZONE C	U	BOTH	7	.
P	WAR ZONE C	W	BOTH	7	3675
P	WAR ZONE D	B	BOTH	2	2600
P	WAR ZONE D	U	BOTH	3	2420
P	WAR ZONE D	W	BOTH	1	1100
P	OTHER III CTZ	B	BOTH	18	8435
P	OTHER III CTZ	O	BOTH	7	3865
P	OTHER III CTZ	U	BOTH	32	2770
P	OTHER III CTZ	W	BOTH	23	17050
P	OUTSIDE III CTZ	B	BOTH	71	27032
P	OUTSIDE III CTZ	O	BOTH	184	30038
P	OUTSIDE III CTZ	U	BOTH	25	5500
P	OUTSIDE III CTZ	W	BOTH	130	38733
P	WAR ZONE C	B	HERB	2	2100
P	WAR ZONE C	B	SV3	4	1265
P	WAR ZONE C	U	SV3	7	.
P	WAR ZONE C	W	HERB	4	2290
P	WAR ZONE C	W	SV3	3	1385
P	WAR ZONE D	B	HERB	2	2600
P	WAR ZONE D	U	SV3	3	2420
P	WAR ZONE D	W	HERB	1	1100
P	OTHER III CTZ	B	HERB	9	4515
P	OTHER III CTZ	B	SV3	9	3920
P	OTHER III CTZ	O	HERB	1	445
P	OTHER III CTZ	O	SV3	6	3420
P	OTHER III CTZ	U	SV3	32	2770
P	OTHER III CTZ	W	HERB	7	13450
P	OTHER III CTZ	W	SV3	16	3600
P	OUTSIDE III CTZ	B	HERB	35	15210
P	OUTSIDE III CTZ	B	SV3	36	11822
P	OUTSIDE III CTZ	O	HERB	144	24021
P	OUTSIDE III CTZ	O	SV3	40	6017
P	OUTSIDE III CTZ	U	SV3	25	5500
P	OUTSIDE III CTZ	W	HERB	124	34638
P	OUTSIDE III CTZ	W	SV3	6	4095

28 MAR 1986

III CORPS UNITS IN CP LISTING

HQDA, (DAAG-ESG)
Room 210
1730 K St., N.W.
Washington, D.C. 20006-3888

Unit approx # CP pages available

I Field Force	2
1 Air Cav Div	2
1 Cav Div	34
1 Inf Div	95
1 Log Cmd	13
II Field Force	161
2 Art, 5 Bn	41
4 Inf Div <i>BRIGADE OF 4TH DIV</i>	7
5 SFG	20
6 Trans Bn	1
9 Inf Div	32
<hr/>	
9 Inf, 4 Bn	2
11 ACR	140
11 Avn Bn	1
11 Trans Bn	1
12 Art, 2 Bn	8
14 Trans Bn	3
23 Art Gp	49
25 Inf Div	139
27 Eng Bn	5
32 Art, 6 Bn	13
82 Abn	29
27 Art	10
101 Abn	4
168 Eng Bn	4
173 Abn	37
Total	890

TEST

The 196 Inf Bde and the 199 Inf Bde have not been completed and therefore are not part of the CP list at this time.

CP INPUT TIME PROJECTIONS

1. # CP pages	890
2. Approx. # entries per page (pages included from 5 to 50 entries per page)	10
3. Approx. total entries	8900
4. Approx. input time estimated time is 20 entries per hour	449 hours (11.2 weeks)

Note

1. Records used for this CP list are division ORLL or COAAR.
2. Although most higher H Q in III Corps represented, no guarantee that all required battalions will be named.

COMMAND POST ENTRIES

LOCATION:

GRID LOCATION:

RPT UNIT UIC:

RECORD:

ACC#:

DATE:

REMARKS:

LOCATION:

GRID LOCATION:

RPT UNIT UIC:

RECORD:

ACC#:

DATE:

REMARKS:

LOCATION:

GRID LOCATION:

RPT UNIT UIC:

RECORD:

ACC#:

DATE:

REMARKS:

28 MAR 1986

HQDA, (DAAG-BSG)

Room 210

1730 K St., N.W.

Mar 25 19:26 1986 9 inf cp list by date, type, loc Washington, D.C. 20006-3889

location	grid	rpt_unit_uic	record	acc#	date	remark
alfa	XS281569	1008600	22	387514	06/16/67	lz
tan an	XS550640	1008600	22	389810	11/16/67	
rudgel	XS085520	1008600	22	389693	11/17/67	fsb
mace	XS065613	1008600	22	389693	11/17/67	fsb
alice	XS135602	1008600	22	389693	11/19/67	lz
barbara	XS117598	1008600	22	389693	11/19/67	lz
brown	XS094612	1008600	22	389693	11/19/67	lz
cora	XS116570	1008600	22	389693	11/19/67	lz
delores	XS123584	1008600	22	389693	11/19/67	lz
elle	XS150603	1008600	22	389693	11/19/67	lz
flora	XS137595	1008600	22	389693	11/19/67	lz
wildcat	YS810960	1008600	22	389810	12/01/67	fsb
brown	YS225804	1008600	22	389692	01/11/68	fsb
green	YS200835	1008600	22	389692	01/11/68	fsb
hammer	YS267872	1008600	22	389692	01/11/68	fsb
nails	YS275804	1008600	22	389692	01/11/68	fsb
pliers	YS341871	1008600	22	389692	01/11/68	lz
screwdriver	YS223834	1008600	22	389692	01/11/68	lz
long thanh	YS138918	1008600	22	389692	01/19/68	
xuan loc	YT468084	1008600	22	389815	01/20/68	
puma	YT895990	1008600	22	389815	01/20/68	fsb
wildcat	YT817966	1008600	22	389815	01/20/68	fsb
bearcat	YT151009	1008600	22	389692	01/30/68	
cougar	YS735000	1008600	22	389815	01/30/68	fsb
ben luc	XS630759	1008600	22	389810	01/31/68	
dong tam	XS423442	1008600	22	389810	01/31/68	
tan an	XS540650	1008600	22	389810	01/31/68	
tan an	XS547652	1008600	22	389810	01/31/68	
xuan loc	YT460090	1008600	22	389810	01/31/68	
dong tam	XS410440	1008600	22	389810	01/31/68	bc
dong tam	XS415440	1008600	22	389810	01/31/68	bc
martin cox	YS170990	1008600	22	389810	01/31/68	camp
martin cox	YT160000	1008600	22	389810	01/31/68	camp
nail	YS282836	1008600	22	389810	01/31/68	fsb
wildcat	YS817965	1008600	22	389810	01/31/68	fsb
alabama	XS944503	1008600	22	391511	02/01/68	fsb
florida	XS990551	1008600	22	391511	02/01/68	fsb
dong tam	XS410430	1008600	22	392633	02/10/68	bc
martin cox	YS170990	1008600	22	392633	02/10/68	camp
thuy dong	XS282775	1008600	22	391511	03/20/68	
martin cox	YS170990	1008600	22	392633	03/31/68	camp
nha be	XS916822	1008600	22	394187	04/07/68	
tan an	XS546649	1008600	22	392316	04/07/68	
bearcat	YS160990	1008600	22	392633	04/30/68	
bearcat	YS170990	1008600	22	392633	04/30/68	
bearcat	YT160000	1008600	22	392633	04/30/68	
ben luc	XS630760	1008600	22	392633	04/30/68	
dong tam	XS410430	1008600	22	392633	04/30/68	
long thanh	YS120920	1008600	22	392633	04/30/68	
nha be	XS910820	1008600	22	392633	04/30/68	
tan an	XS550650	1008600	22	392633	04/30/68	
french	XS890620	1008600	22	392633	04/30/68	fort
apple	YT280100	1008600	22	391511	04/30/68	fsb
arkansas	WS910400	1008600	22	391511	04/30/68	fsb

grey	YS200930	1008600	22	392633	04/30/68	fsb
parker	XS200510	1008600	22	392633	04/30/68	fsb
smoke	XS790770	1008600	22	392633	04/30/68	fsb
binh phuoc	XS615550	1008600	22	394187	05/06/68	
cat lai	XS956895	1008600	22	394187	05/06/68	
nha be	XS916823	1008600	22	394187	05/06/68	
smoke	XS789769	1008600	22	394187	05/06/68	fsb
an nhut tan	XS665674	1008600	22	394187	05/07/68	
cat lai	XS958895	1008600	22	394187	05/07/68	
rach kien	XS740669	1008600	22	394187	05/07/68	
tan tru	XS654623	1008600	22	394187	05/07/68	
ben luc	XS618748	1008600	22	394187	05/07/68	bidge
french	XS665674	1008600	22	394187	05/07/68	fort
smoke	XS789769	1008600	22	394187	05/13/68	fsb
tan tru	XS650620	1008600	22	395142	07/15/68	
thu thua	XS540720	1008600	22	395142	07/15/68	
moore	XS260500	1008600	22	395142	07/15/68	fsb
bearcat	YS120890	1008600	22	394511	07/30/68	
bearcat	YS160990	1008600	22	394511	07/30/68	
bearcat	YS170990	1008600	22	394511	07/30/68	
bearcat	YT100000	1008600	22	394511	07/30/68	
bearcat	YT150020	1008600	22	394511	07/30/68	
bearcat	YT160000	1008600	22	394511	07/30/68	
bearcat	YT170000	1008600	22	394511	07/30/68	
ben luc	XS630760	1008600	22	394511	07/30/68	
binh chanh	XS720790	1008600	22	394511	07/30/68	
binh phuoc	XS610550	1008600	22	394511	07/30/68	
binh son	YS210930	1008600	22	394511	07/30/68	
can giouc	XS870710	1008600	22	394511	07/30/68	
dong tam	XS410420	1008600	22	394511	07/30/68	
dong tam	XS410430	1008600	22	394511	07/30/68	
my phou tay	XS200600	1008600	22	394511	07/30/68	
nha be	XS910820	1008600	22	394511	07/30/68	
nha be	XS920810	1008600	22	394511	07/30/68	
rach kien	XS740690	1008600	22	394511	07/30/68	
tan an	XS550650	1008600	22	394511	07/30/68	
tan tru	XS660630	1008600	22	394511	07/30/68	
vinh kim	XS360440	1008600	22	394511	07/30/68	
vinh kim	XS430430	1008600	22	394511	07/30/68	
lambert	XS320490	1008600	22	394511	07/30/68	fsb
machete	XS650620	1008600	22	394511	07/30/68	fsb
moore	XS260500	1008600	22	394511	07/30/68	fsb
tak	XS120890	1008600	22	394511	07/30/68	fsb
bearcat	YS120890	1008600	22	394511	07/31/68	
binh phuoc	XS610550	1008600	22	394511	07/31/68	
binh son	YS210930	1008600	22	394511	07/31/68	
can giouc	XS820710	1008600	22	394511	07/31/68	
dong tam	XS410430	1008600	22	394511	07/31/68	
my phou tay	XS200600	1008600	22	394511	07/31/68	
nha be	XS910820	1008600	22	394511	07/31/68	
rach kien	XS740690	1008600	22	394511	07/31/68	
tan an	XS550650	1008600	22	394511	07/31/68	
tan tru	XS660630	1008600	22	394511	07/31/68	
vinh kim	XS360440	1008600	22	394511	07/31/68	
lambert	XS320490	1008600	22	394511	07/31/68	fsb
machete	XS650620	1008600	22	394511	07/31/68	fsb

tak	XS120890	1008600	22	394511	07/31/68	fsb
ben tre	XS510320	1008600	22	395142	10/31/68	
binh phuoc	XS610550	1008600	22	395142	10/31/68	
can tho	WS830100	1008600	22	395142	10/31/68	
dong tam	XS410430	1008600	22	395142	10/31/68	
dong tam	XS840430	1008600	22	500939	10/31/68	
rach kien	XS740690	1008600	22	395142	10/31/68	
soc trang	XR060620	1008600	22	395142	10/31/68	
tan an	XS550650	1008600	22	395142	10/31/68	
tan tru	XS660630	1008600	22	395142	10/31/68	
thu thua	XS540700	1008600	22	395142	10/31/68	
vinh long	XS070330	1008600	22	395142	10/31/68	
martin cox	YS170990	1008600	22	500939	10/31/68	camp
moore	XS260500	1008600	22	395142	10/31/68	fsb
ben tre	XS510320	1008600	22	501469	12/01/68	erfld
ap an vinh	XS460180	1008600	22	503258	01/31/69	
ap binh long (2)	WS880540	1008600	22	503258	01/31/69	
ap truong	XS760670	1008600	22	503258	01/31/69	
binh phuoc	XS610550	1008600	22	503258	01/31/69	
can giouc	XS620710	1008600	22	503258	01/31/69	
can tho	WS830100	1008600	22	503258	01/31/69	
chien trapeang	VS950480	1008600	22	503258	01/31/69	
dong tam	XS410430	1008600	22	503258	01/31/69	
ghua kom	VS960450	1008600	22	503258	01/31/69	
rach kien	XS740690	1008600	22	503258	01/31/69	
tan an	XS550650	1008600	22	503258	01/31/69	
tan an south	XS550640	1008600	22	503258	01/31/69	
tan tru	XS650620	1008600	22	503258	01/31/69	
thoi lai	WS620120	1008600	22	503258	01/31/69	
thon tri dien	VS970430	1008600	22	503258	01/31/69	
thu thua	XS530720	1008600	22	503258	01/31/69	
tranh lam	YD810160	1008600	22	503258	01/31/69	
ben tre	XS470350	1008600	22	501469	01/31/69	af
ben luc	XS620750	1008600	22	503258	01/31/69	bdge
dizzy	WS990550	1008600	22	503258	01/31/69	fsb
dizzy	WS990560	1008600	22	503258	01/31/69	fsb
khaki	XS560270	1008600	22	503258	01/31/69	fsb
klaw II	XS600270	1008600	22	503258	01/31/69	fsb
kord	XS410340	1008600	22	503258	01/31/69	fsb
ludwig	XS420760	1008600	22	503258	01/31/69	fsb
moore	XS260500	1008600	22	503258	01/31/69	fsb
klaw	XS600290	1008600	22	506325	06/18/69	fsb
tan tru	XS650620	1008600	22	506325	06/25/69	
thu thua	XS540720	1008600	22	506325	06/25/69	
key	XS510310	1008600	22	506325	06/25/69	fsb
moore	XS260500	1008600	22	506325	06/25/69	fsb
key	XS510310	1008600	22	506325	07/15/69	fsb
klaw	XS600290	1008600	22	506325	07/15/69	fso
binh phuoc	XS609553	1008600	22	508091	10/31/69	
rach kien	XS744698	1008600	22	508091	10/31/69	
tan tru	XS655624	1008600	22	508091	10/31/69	
tan an	XS524656	1008600	22	508091	10/31/69	af
tan an	XS546648	1008600	22	508091	10/31/69	bc
can giouc	XS825717	1008600	22	511070	02/28/70	
cho ky son	XS606616	1008600	22	511070	04/09/70	
cho ky son	XS606616	1008600	22	522070	04/09/70	

binh phuoc	XS609553	1008600	22	511070	04/18/70	
rach kien	XS744698	1008600	22	511070	04/22/70	
rach kien	XS744698	1008600	22	511070	04/22/70	
thu thua	XS539720	1008600	22	511070	04/24/70	
ben luc	XS617759	1008600	22	511070	04/28/70	
tan tru	XS655624	1008600	22	511070	04/30/70	
tan an	XS524656	1008600	22	511070	04/30/70	af
tan an	XS546648	1008600	22	511070	04/30/70	bc
binh phuoc	XS609553	1008600	22	514461	05/02/70	
binh phuoc	XS610551	1008600	22	514461	05/02/70	
jamie	XT482715	1008600	22	514461	05/04/70	fsb
chamberlain	XS555964	1008600	22	514461	05/05/70	fsb
gettysburg	XS358878	1008600	22	514461	05/05/70	fsb
seminole	XS277028	1008600	22	514461	05/07/70	fsb
seminole	XT278600	1008600	22	514461	05/12/70	fsb
darn	XT088768	1008600	22	514461	05/18/70	fsb
tan tru	XS654623	1008600	22	514461	05/21/70	
tan tru	XS655634	1008600	22	514461	05/21/70	
hilltop	XU349293	1008600	22	514461	05/22/70	fsb
gettysburg	XS358878	1008600	22	514461	05/26/70	fsb
jarrett	XT418125	1008600	22	514461	05/30/70	fsb
keaton	XS630760	1008600	22	514461	06/01/70	fsb
shakey	YU213317	1008600	22	514461	06/02/70	fsb
ben luc	XS618734	1008600	22	514461	06/25/70	
che tay yen	XS465631	1008600	22	514461	06/25/70	
thu thua	XS537720	1008600	22	514461	06/25/70	
binh phuoc	XS609552	1008600	22	514461	06/26/70	
jackson	XT425168	1008600	22	514461	06/30/70	fsb
chamberlain	XS554983	1008600	22	514461	07/01/70	fsb
tan tru	XS659623	1008600	22	514461	07/20/70	
ben luc	XS617759	1008600	22	514461	07/31/70	
tan an	XS524656	1008600	22	514461	07/31/70	af
tan an	XS546648	1008600	22	514461	07/31/70	bc
keaton	XS635757	1008600	22	514461	07/31/70	camp
julie	YS111631	1008600	22	514461	07/31/70	fsb

The following tables summarize results of crossclassifications of the Herbs and the Service Herbs tapes for "sprays"

A "spray" generally corresponds to a mission, and each record with a unique mission number was considered to be a separate spray. In a few instances, generally when a mission covered more than one day, a mission was considered to consist of several sprays, one for each day during which the mission was taking place.

Sprays for which relevant information is missing have been excluded from the tables, with one major exception. The combat tactical zone for about 10% of the sprays was not recorded. For this 10%, we crudely estimated the CTZ by using the grid squares as indicated on the attached map.

LIST OF TABLES

TABLES RELEVANT TO ALL OF VIETNAM, 1964 (and later):

- A1. Number of sprays by: type and combat tactical zone
- A2. Number of sprays by: agent and combat tactical zone
- A3. Number of sprays by: agent and year
- A4. Number of sprays by: type and year

A5. Number of sprays by: agent and type

TABLES RELEVANT TO III CORPS ONLY, 10/66-3/69

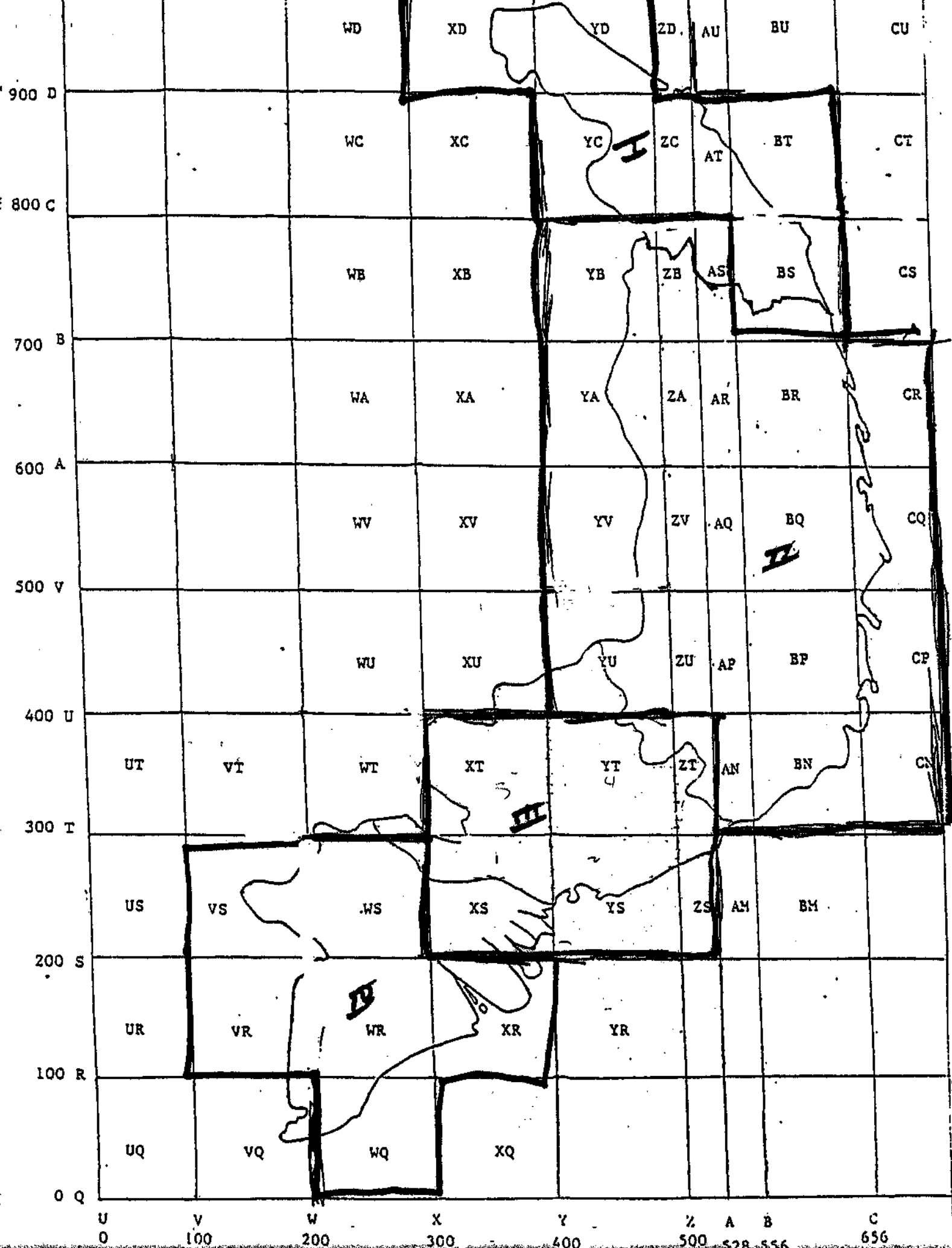
B1. Number of sprays by: agent and type

B2. Number of sprays by: type and year

B3. Number of sprays by: agent and year

TABLES RELEVANT TO III CORPS ONLY, 10/66-3/69, PERIMETER SPRAYS ONLY

C. Number of sprays by: agent and year



U 0 V 100 W 200 X 300 Y 400 Z 500 A 528 B 556 C 656

A1

ALL VIETNAM ; 1964+

SAS

11:24 FRIDAY, APRIL 18, 1986 1

TABLE OF TYPES BY C

TYPES	C				TOTAL
FREQUENCY	11	12	13	14	
PERCENT	CTZ				
ROW PCT					
COL PCT					
<i>C rop</i>	355	509	142	2	1008
	4.07	5.83	1.63	0.02	11.54
	35.22	50.50	14.09	0.20	
	17.62	21.16	4.07	0.24	
<i>D. ofol</i>	1032	1092	2639	397	5160
	11.82	12.50	30.22	4.55	59.09
	20.09	21.16	51.14	7.69	
	51.22	45.39	75.60	48.12	
<i>O ther</i>	281	190	373	239	1083
	3.22	2.18	4.27	2.74	12.40
	25.95	17.54	34.44	22.07	
	13.95	7.90	10.70	28.97	
<i>P ermate</i>	343	585	250	96	1274
	3.93	6.70	2.86	1.10	14.59
	28.92	45.92	19.62	7.54	
	17.02	24.31	7.17	11.64	
<i>S upply</i>	4	30	83	91	208
	0.05	0.34	0.95	1.04	2.38
	1.92	14.42	39.90	43.75	
	0.20	1.25	2.38	11.03	
TOTAL	2015	2406	3487	825	8733
	23.07	27.55	39.93	9.45	100.00

ALL VIETNAM; 1964+

A2

1964+; ALL TYPES(DEFOL, CROP DESTRUCT., PERIMETER, ETC.)
SAS

10:38 FRIDAY, APRIL 1

TABLE OF AGENTS BY C

AGENTS	C				TOTAL
	1	2	3	4	
<i>B line</i>	337	323	244	61	965
	3.86	3.70	2.80	0.70	11.06
	34.92	33.47	25.28	6.32	
	16.74	13.43	7.01	7.40	
<i>Orange</i>	1161	1382	1716	384	4643
	13.31	15.84	19.67	4.40	53.23
	25.01	29.77	36.96	8.27	
	57.68	57.46	49.31	46.60	
<i>Purple</i>	10	6	17	7	40
	0.11	0.07	0.19	0.08	0.46
	25.00	15.00	42.50	17.50	
	0.50	0.25	0.49	0.85	
<i>Unknown</i>	280	163	343	116	902
	3.21	1.87	3.93	1.33	10.34
	31.04	18.07	38.03	12.86	
	13.91	6.78	9.86	14.08	
<i>White</i>	225	531	1160	256	2172
	2.58	6.09	13.30	2.94	24.90
	10.36	24.45	53.41	11.79	
	11.18	22.08	33.33	31.07	
TOTAL	2013	2405	3480	824	8722
	23.08	27.57	39.90	9.45	100.00

CTZ

FREQUENCY MISSING = 63

ALL VIETNAM, 1964+

ALL TYPES (CROP DEST, DEFOLIATION, PERIMETER, ETC)

10:38 FRIDAY, APR 1

TABLE OF AGENTS BY YEARS

AGENTS	YEARS								
FREQUENCY									
PERCENT									
ROW PCT									
COL PCT	1964	1965	1966	1967	1968	1969	1970	1971	TOTAL
<i>Blue</i>	0	0	6	198	214	268	262	18	966
	0.00	0.00	0.07	2.26	2.44	3.05	2.99	0.21	11.01
	0.00	0.00	0.62	20.50	22.15	27.74	27.12	1.86	
	0.00	0.00	0.54	10.17	10.86	10.84	28.08	43.90	
<i>Orange</i>	0	188	758	1125	871	1296	426	0	4664
	0.00	2.14	8.64	12.82	9.93	14.77	4.86	0.00	53.16
	0.00	4.03	16.25	24.12	18.67	27.79	9.13	0.00	
	0.00	74.90	68.35	57.78	44.19	52.41	45.66	0.00	
<i>Purple</i>	38	3	0	0	0	0	0	0	41
	0.43	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.47
	92.68	7.32	0.00	0.00	0.00	0.00	0.00	0.00	
	77.55	1.20	0.00	0.00	0.00	0.00	0.00	0.00	
<i>Unlabeled</i>	11	60	141	172	166	314	49	8	921
	0.13	0.68	1.61	1.96	1.89	3.58	0.56	0.09	10.50
	1.19	6.51	15.31	18.68	18.02	34.09	5.32	0.87	
	22.45	23.90	12.71	8.83	8.42	12.70	5.25	19.51	
<i>White</i>	0	0	204	452	720	595	196	15	2182
	0.00	0.00	2.33	5.15	8.21	6.78	2.23	0.17	24.87
	0.00	0.00	9.35	20.71	33.00	27.27	8.98	0.69	
	0.00	0.00	18.39	23.22	36.53	24.06	21.01	36.59	
TOTAL	49	251	1109	1947	1971	2473	933	41	8774
	0.56	2.86	12.64	22.19	22.46	28.19	10.63	0.47	100.00

FREQUENCY MISSING = 11

A4

ALL VIETNAM; 1964+

11:24 FRIDAY, APRIL 18, 1986 2

TABLE OF TYPES BY YEARS

TYPES	YEARS								TOTAL
FREQUENCY	1964	1965	1966	1967	1968	1969	1970	1971	
PERCENT									
ROW PCT									
COL PCT									
<i>Crop</i>	1	104	122	264	120	207	190	1	1009
	0.01	1.18	1.39	3.01	1.37	2.36	2.16	0.01	11.49
	0.10	10.31	12.09	26.16	11.89	20.52	18.83	0.10	
	2.04	41.43	11.00	13.55	6.09	8.34	20.32	2.44	
<i>Defol</i>	0.08	1.63	10.35	16.73	14.83	12.32	3.16	0.08	59.18
	0.13	2.75	17.48	28.27	25.06	20.81	5.35	0.13	
	14.29	56.97	81.97	75.46	66.11	43.61	29.73	17.07	
<i>Other</i>	36	1	45	154	201	533	119	6	1095
	0.41	0.01	0.51	1.75	2.29	6.07	1.35	0.07	12.46
	3.29	0.09	4.11	14.06	18.36	48.68	10.87	0.55	
	75.47	0.40	4.06	7.91	10.20	21.48	12.73	14.63	
<i>Perimeter</i>	5	3	33	60	329	526	295	23	1274
	0.06	0.03	0.38	0.68	3.75	5.99	3.36	0.26	14.50
	0.39	0.24	2.59	4.71	25.82	41.29	23.16	1.81	
	10.20	1.20	2.98	3.08	16.69	21.20	31.55	56.10	
<i>Supply</i>	0	0	0	0	18	133	53	4	208
	0.00	0.00	0.00	0.00	0.20	1.51	0.60	0.05	2.37
	0.00	0.00	0.00	0.00	8.65	63.94	25.48	1.92	
	0.00	0.00	0.00	0.00	0.91	5.36	5.57	9.76	
TOTAL	49	251	1109	1948	1971	2481	935	41	8785
	0.56	2.86	12.62	22.17	22.44	28.24	10.64	0.47	100.00

SAS

11:24 FRIDAY, APRIL 18, 1986 3

A5

ALL VIETNAM; 1964+

SAS

11:26 FRIDAY, APRIL 10, 1986 1

TABLE OF AGENTS BY TYPES

AGENTS	TYPES					TOTAL
FREQUENCY						
PERCENT						
ROW PCT						
COL PCT	IC _{prop}	ID _{refl}	ID _{ther}	IP _{arrest}	IS _{supply}	TOTAL
<i>Blue</i>	414	199	119	217	17	966
	4.72	2.27	1.36	2.47	0.19	11.01
	42.86	20.60	12.32	22.46	1.76	
	41.03	3.03	10.98	17.03	8.17	
<i>Orange</i>	492	3291	259	510	112	4664
	5.61	37.51	2.95	5.81	1.28	53.16
	10.55	70.56	5.55	10.93	2.40	
	48.76	63.30	23.89	40.03	53.85	
<i>Purple</i>	1	4	31	5	0	41
	0.01	0.05	0.35	0.06	0.00	0.47
	2.44	9.76	75.61	12.20	0.00	
	0.10	0.08	2.86	0.39	0.00	
<i>Unknown</i>	31	249	463	178	0	921
	0.35	2.84	5.28	2.03	0.00	10.50
	3.37	27.04	50.27	19.33	0.00	
	3.07	4.79	42.71	13.97	0.00	
<i>White</i>	71	1456	212	364	79	2182
	0.81	16.59	2.42	4.15	0.90	24.87
	3.25	66.73	9.72	16.68	3.62	
	7.04	28.01	19.56	28.57	37.98	
TOTAL	1009	5199	1084	1274	208	8774
	11.50	59.25	12.35	14.52	2.37	100.00

FREQUENCY MISSING = 11

All ✓

B1

III. CORPS ONLY

10/66 - 3/69

TABLE OF AGENTS BY TYPES

AGENTS	TYPES					TOTAL
FREQUENCY:						
PERCENT :						
ROW PCT :						
COL PCT :	<i>IC</i>	<i>rop</i>	<i>ID</i>	<i>efol</i>	<i>ID</i>	<i>ther</i>
					<i>IP</i>	<i>errata</i>
						<i>IS</i>
						<i>prop</i>
<i>Blue</i>	20	92	32	23	0	167
	0.87	4.02	1.40	1.01	0.00	7.30
	11.98	55.09	19.16	13.77	0.00	
	44.44	4.70	17.30	23.00	0.00	
<i>Orange</i>	18	909	15	6	1	949
	0.79	39.73	0.66	0.26	0.04	41.48
	1.90	95.79	1.50	0.63	0.11	
	40.00	46.45	8.11	6.00	100.00	
<i>Unknown</i>	3	29	95	43	0	170
	0.13	1.27	4.15	1.88	0.00	7.43
	1.76	17.06	55.88	25.29	0.00	
	6.67	1.48	51.35	43.00	0.00	
<i>White</i>	4	927	43	28	0	1002
	0.17	40.52	1.88	1.22	0.00	43.79
	0.40	92.51	4.29	2.79	0.00	
	0.89	47.37	23.24	28.00	0.00	
TOTAL	45	1957	185	100	1	2288
	1.97	85.53	8.09	4.37	0.04	100.00

FREQUENCY MISSING = 6

SAS

11:24 FRIDAY, APRIL 18, 1986 4

B2

III CORPS ONLY ; 10/66 - 3/69

TABLE OF TYPES BY YEARS

TYPES	YEARS				TOTAL
FREQUENCY:					
PERCENT :					
ROW PCT :					
CUR. PCT :	1966:	1967:	1968:	1969:	
<i>Crop</i>	13	32	0	0	45
	0.57	1.39	0.00	0.00	1.96
	28.89	71.11	0.00	0.00	
	4.58	3.05	0.00	0.00	
<i>Defol</i>	270	720	682	85	1757
	11.77	40.10	29.73	3.71	85.31
	13.80	47.01	34.85	4.34	
	95.07	87.79	84.41	55.19	
<i>Other</i>	1	65	76	49	191
	0.04	2.83	3.31	2.14	8.33
	0.52	34.03	39.79	25.65	
	0.35	6.20	9.41	31.82	
<i>Parasite</i>	0	31	50	19	100
	0.00	1.35	2.18	0.83	4.36
	0.00	31.00	50.00	19.00	
	0.00	2.96	6.19	12.34	
<i>Supply</i>	0	0	0	1	1
	0.00	0.00	0.00	0.04	0.04
	0.00	0.00	0.00	100.00	
	0.00	0.00	0.00	0.65	
TOTAL	284	1048	808	154	2294
	12.38	45.68	35.22	6.71	100.00

SAS

11:24 FRIDAY, APRIL 18, 1986 5

B3

III CORPS ONLY ; 10/66 - 3/69

TABLE OF AGENTS BY YEARS (ALL TYPES : PERIMETER + DEFOLIATION + ...)

AGENTS	YEARS				
FREQUENCY:					
PERCENT :					
ROW PCT :					
COL PCT :	1966:	1967:	1968:	1969:	TOTAL
<i>Blue</i>	4	86	63	14	167
	0.17	3.76	2.75	0.61	7.30
	2.40	51.50	37.72	8.38	
	1.41	8.21	7.80	9.40	
<i>Orange</i>	142	568	190	49	949
	6.21	24.83	8.30	2.14	41.48
	14.96	59.85	20.02	5.15	
	50.00	54.25	23.51	32.89	
<i>Unknown</i>	0	89	76	5	170
	0.00	3.89	3.32	0.22	7.43
	0.00	52.35	44.71	2.94	
	0.00	8.50	9.41	3.36	
<i>White</i>	138	304	479	81	1002
	6.03	13.29	20.94	3.54	43.79
	13.77	30.34	47.80	8.08	
	48.59	29.04	59.28	54.36	
TOTAL	284	1047	800	149	2288
	12.41	45.76	35.31	6.51	100.00

FREQUENCY MISSING = 6

III CORPS ONLY ; 10/66 - 3/69
PERIMETER SPRAYS ONLY

SAS

11:24 FRIDAY, APRIL 19, 1986

TABLE OF AGENTS BY YEARS

AGENTS	YEARS			
FREQUENCY:				
PERCENT :				
ROM PCT :				
CUL PCT :	1967:	1968:	1969:	TOTAL
<i>B blue</i>	0	21	2	23
	0.00	21.00	2.00	23.00
	0.00	91.30	8.70	
	0.00	42.00	10.53	
<i>O orange</i>	0	3	3	6
	0.00	3.00	3.00	6.00
	0.00	50.00	50.00	
	0.00	6.00	15.79	
<i>Unknown</i>	31	11	1	43
	31.00	11.00	1.00	43.00
	72.09	25.58	2.33	
	100.00	22.00	5.26	
<i>Wht</i>	0	15	13	28
	0.00	15.00	13.00	28.00
	0.00	53.57	46.43	
	0.00	30.00	68.42	
TOTAL	31	56	19	100
	31.00	50.00	19.00	100.00