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BRAVO FALL-OUT ANALYSIS

SEMI-ANALYTICAL ATTEMPT

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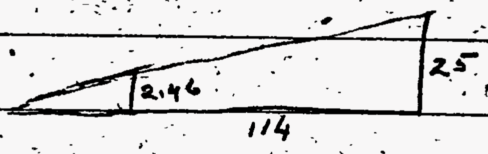
Assume that "a" is 25 mi at 32.5 Kft.

at h = 32.5 Kft, s = 17.4 knots

$a_0 = D_0/5.2 = 2.46$ from sketch $a_0^2 = 6.05$



$$\frac{25}{2.46} = \frac{s_0+114}{s_0} \qquad \frac{22.54}{2.46} = \frac{114}{s_0}$$

$$s_0 = \frac{2.46}{22.5} \times 114 = 12.45$$

$$s_0/D_0 = \frac{12.45}{12.8} \approx 1$$

h (Kft)	C_0	$D_0 = s_0$	s	s_0+s	a_0	e	a (mi)	Pk ct alt = $\frac{\pi C_0 a_0^2}{\pi}$	
90	1	12	454	466	2.3	.0007	90	5.[illegible]	
80	2	24	374	398	4.6	.007	76	42	1
70	5	30	314	344	5.8	.038	67	168	8
60	8	30	274	304	5.8	.078	59	269	16
50	10	30	243	273	5.8	.121	53	338	2
40	8	21	167	188	4.05	.100	36	131	21
30	5	12	97	109	2.3	.060	21	26	13
20	3	6	48	54	1.15	.037	10.4	4	8.
10	1	3	19	22	.575	.019	4.2	.3	4.
0	0	0	0	0	0				
						.461			99.

Much of the preceding (deleted) is wrong. Probability integral is a one dimensional distrib. → ∞ at 0 if interpreted as 2-dimensional.

Try $e^{-\frac{(x^2+y^2)}{a^2}} dx\,dy = e^{-\frac{r^2}{a^2}} r\,d\theta\,dr = e^{-\frac{r^2}{a^2}} d\theta \frac{dr^2}{2}$

$$\frac{1}{2}\int_0^{2\pi}\int_0^{b} e^{-\frac{r^2}{a^2}} d\theta\, dr^2 = \frac{2\pi a^2}{2}\int_0^{\frac{b^2}{a^2}} e^{-\frac{r^2}{a^2}} \frac{dr^2}{a^2} = \pi a^2 \left(1 - e^{-\frac{b^2}{a^2}}\right)$$

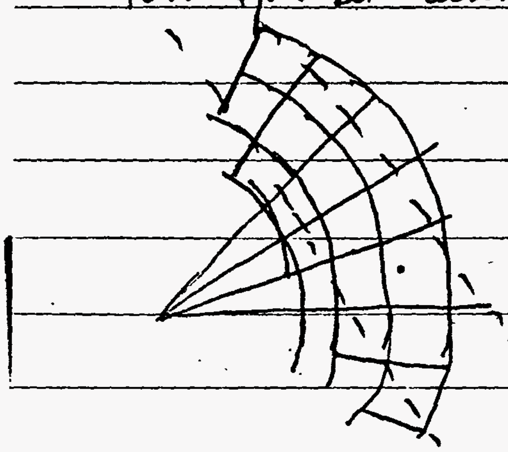
when $b \ll a$ $\quad \frac{S}{\pi b^2} \approx \frac{a^2}{b^2}\left(1 - 1 + \frac{b^2}{a^2}\right) \approx 1$ ✓

Consider the effect of pile-up.

$e^{-\frac{b^2}{a^2}} = .9$. As far as overlapping, or contributing fall at a particular point, is concerned, the 10% point of the ~~one~~ central concentration is reached at a distance $b = 1.5\,a$

Total pts at altitude $N_h = \iint_{-\infty}^{+\infty} c\, e^{-\frac{r^2}{a^2}} dx\,dy = \pi c\, a^2$

$$= \pi\, c_0 \left(\frac{s_0}{s_0+s}\right)^2 \left(a_0 \frac{s_0+s}{s_0}\right)^2 = \pi c_0 a_0^2$$



~~If a limited number of~~

If only a partial zone is used, with p = radial fractioning
q = directional ",
then the number of points to be distributed is

$n_c N p q$ where n_c is the number of cells as

It is not necessary that the partial zone should be symmetrical.

But if one wants to include all permissible particle ~~gr~~ sizes then the partial zone must cover the limits set by radial lines from the borders of the initial cloud

$$\int_0^b e^{-\frac{y^2}{a^2}}\,dy = a\int_0^b e^{-\frac{y^2}{a^2}}\,\frac{dy}{a}$$

$x = \frac{y}{a}$

$y = ax$

$dy = a\,dx$

when $y = b$, $x = \frac{b}{a}$

$$= a\int_0^{\frac{b}{a}} e^{-x^2}\,dx$$

$$= a\,\frac{\sqrt{\pi}}{2}\,P\left(\frac{b}{a}\right)$$

$$\int_{-b}^{b} e^{-\frac{y^2}{a^2}}\,dy = a\sqrt{\pi}\,P\left(\frac{b}{a}\right)$$

if $\frac{b}{a} = 1.16$, $P = .9$

½ Perp Dist (mi)

	S	N	K	E	R
90	36.5 (-21)	-41			-34.2
80	55.2	47.5			52
70	69	52			60.5
60	78.5	55			66.5
50	73.5	48			60.5
40	44.5	29			36.5
30	13.5	4.8	4.1	5.1	8.9
20	4.1	6.9			5.8

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$$\int_0^{ab} e^{-\frac{y^2}{a^2}}\, dy = \frac{\sqrt{\pi}}{2}\, a\, P(ab)$$

$$\int_0^{q} e^{-\frac{y^2}{a^2}}\, dy = \frac{\sqrt{\pi}}{2}\, a\, P(q)$$

$$\sqrt{\pi}\, a q c_0 \left(\frac{s_0}{s+s_0}\right)^2 \left(\frac{x}{R}\right)^3$$

$\sqrt{\pi}\, ac$ per mile

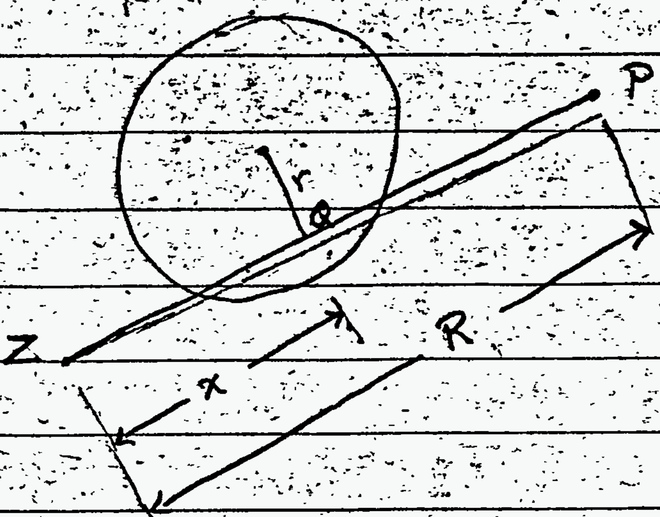
.95 1.386

1.163

$$.9 = \frac{2}{\sqrt{\pi}} \int_0^{1.163} e^{-x^2}\, dx$$

$$\frac{.9\sqrt{\pi}}{2a} = \frac{1}{2}\int_{-1.16a}^{+1.16a} e^{-\frac{x^2}{a^2}}\, \frac{dx}{a}$$

~~Distances in miles~~



a strip of unit width.

Amount that can fall along ZP is

$$c e^{-\frac{r^2}{a^2}} \int_{-x}^{\infty} e^{-\frac{y^2}{a^2}} dy = c e^{-\frac{r^2}{a^2}} \left[\frac{\sqrt{\pi}}{2} a + \int_0^x e^{-\frac{y^2}{a^2}} dy \right]$$

$$= \frac{\sqrt{\pi}}{2} a c e^{-\frac{r^2}{a^2}} \left[1 + P\left(\frac{x}{a}\right) \right]$$

$$\doteq \sqrt{\pi}\, a c e^{-\frac{r^2}{a^2}}$$ within 5% if

$x > 1.5a$

To get an average concentration to assign to the point Q, we must divide by the measure of spread

$$\frac{\int_{-b}^{b} e^{-\frac{y^2}{a^2}} dy}{\int_{-\infty}^{\infty} \text{"}} = \frac{a\sqrt{\pi}\, P\left(\frac{b}{a}\right)}{a\sqrt{\pi}} = .9 \text{ if } \frac{b}{a} = 1.16$$

an appropriate length would be $2b = 2.32a$

We can say that the avg conc is $.765\, c e^{-\frac{r^2}{a^2}}$

	Sifo R = 35		Naen		Rongelap R = 52	
	r	x	r	x	r	x
90	36.5	−21	41	−7.8	39.2	−14
80	55.2	15	47.5	32	52	24.5
70	69	41.5	52	62	60.5	53
60	78.5	59	55	82	66.5	72
50	73.5	66	48	87	60.5	79
40	44.5	40.5	29	53	36.5	48
30	13.5	24.2	4.8	27.5	8.9	26.2
20	4.1	8.4	6.9	6.6	5.8	7.4

	R
N	43
K	54.2
E	67.4

$$\frac{2}{\sqrt{\pi}} \int_0^\infty e^{-x^2}\,dx = 1$$

$$\int_0^\infty e^{-x^2}\,dx = \frac{\sqrt{\pi}}{2}$$

$$\int_0^b e^{-x^2}\,dx = \frac{\sqrt{\pi}}{2} P(b) \qquad x = \frac{y}{a} \quad x = b, \quad a\,dx = dy \quad y = ab$$

$$\int_0^{ab} e^{-\frac{y^2}{a^2}} \frac{dy}{a} = \frac{\sqrt{\pi}}{2} P(ab)$$

	SIFO R= 70			NAEN R= [illegible]								
	r	x	$\frac{x}{a}$	r/a	$e^{-\frac{r^2}{a^2}}$	corr'n factor		x 100c =	$\left(\frac{x}{R}\right)^3$			
90	73	−42										
80	110	30	.40	1.45	.11	.72	.08	.0006	1/13	.000		
70	138	83	1.24	2.05	.015	.96	014	.05	1.2	.06		
60	157	118	2.00	2.65	–				5			
50	147	132	2.5	2.78	–							
40	89	81	2.25	2.48	–							
30	27	48	2.3	1.28	.17		.17	1.0	1/30	.03		
20	8.2	16.8	1.62	.79	.54		.54	2.0	1/70	.03		
										.12		
NAEN N	R= 86							Obs		.40		
						corr'd for $\bar{E}$+3 day						
	r	x							NAEN	KABELLE	ENIAE	TA
90	82	−15.6										
80	95	64	.84	1.25	.21	.88	.18	.13	~~.4~~ .5	.21	.11	.7
70	104	124	1.85	1.55	.09		.09	.34	3.0	1.52	.8	5.3
60	110	164	2.8	1.86	.03		03	.53	7.0	3.5	1.8	12
50	96	174	3.3	1.81	.04		04	.50	8.4	4.2	2.3	14
40	58	106	3.0	1.61	.08		08	.80	1.9	1.03	.5	3
30	9.6	55	2.6	.46	.81		81	4.90	.27	.13	.07	[illegible]
20	13.8	13.2	1.27	1.33	.17	.96	16	.59	.004	.002	.001	.0[illegible]
KABELLE	R= 108							90	.05	.03	.01	
ENIAETAK	R= 135							70	1.0	.52	.27	
								60	3.7	1.85	.96	
								50	4.2	2.1	1.2	
								40	1.5	.8	.4	
								30	1.3	.6	.3	
RONGELAP	R= 105							20	.00	.0	.0	
									11.7	5.9	3.1	
	r	x							14	6.0	1.15	
90	78	−28										
80	104	49	.64	1.37	.15	.82	.12	.08	.10	.0		
70	121	106	1.58	1.80	04		04	.15	1.0	.2		
60	133	144	2.45	2.25	006		006	.04	2.6	.1		
50	121	158	3.0	2.28	005		005	.06	3.4	.2		
40	73	96	2.7	2.03	02		02	.20	.8	.2		
30	17.8	52	2.5	.85	48		48	2.90	.12	.3		
20	11.6	14.8	1.42	1.11	29	.98	28	1.04	.003	.0		
										1.0		
										1.3		

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