

CALIBRATE

YOUR



AGRICULTURAL

SPRAY

PLANE

CALIBRATE YOUR
AGRICULTURAL SPRAY PLANE

By:

DARRYL RESTER
ASSOCIATE SPECIALIST
(Ag. Engineering)

May, 1982

TABLE OF CONTENTS

	PAGE NO.
AIRCRAFT CALIBRATION	2
Nozzle Selection	3
Static Calibration with Existing Nozzles	4
TABLE I: ACRES PER MINUTE	5
TABLE II: AIRCRAFT FLOW RATE: .25 GPA	7
TABLE III: AIRCRAFT FLOW RATE: 1.0	8
TABLE IV: AIRCRAFT FLOW RATE: 2.0	9
TABLE V: AIRCRAFT FLOW RATE: 3.0	10
TABLE VI: AIRCRAFT FLOW RATE: 5.0	11
TABLE VII: AIRCRAFT FLOW RATE: 10.0 GPA	12
TABLE VIII: NOZZLE FLOW RATES FOR #13, #23 & #25 CORES	13
TABLE IX: NOZZLE FLOW RATES FOR #45 CORE	14
TABLE X: NOZZLE FLOW RATES FOR #46 & #56 CORES	15
TABLE XI: NOZZLE FLOW RATES FOR NOZZLES WITHOUT CORES	16
TABLE XII: NOZZLE FLOW RATES FOR WHIRL JET NOZZLES	17
FIELD CALIBRATION CHECK	18
Aircraft Speed is Known	18
Flying a Known Area	19
Computing Pressure Changes	19
Computing Nozzle Flow Rates	20
ULV (Ultra Low Volume) Calibration	21
TABLE XIII: ACRES FOR CALIBRATION RUNS	23
TABLE XIV: ACRES FOR CALIBRATION RUNS	24

AIRCRAFT CALIBRATION

1. NOZZLE SELECTION

- A. Compute the aircraft productivity in acres per minute (ac/min)

$$\text{AC/MIN} = \frac{(\text{AIRSPEED} - \text{MPH}) \times (\text{SWATH WIDTH} - \text{FEET})}{495}$$

EXAMPLE: 110 mph airspeed with 65' swath width

$$\text{AC/MIN} = \frac{110 \text{ mph} \times 65'}{495} = 14.44 \text{ ac/min}$$

NOTE: Refer to Table 1 for acres per minute.

- B. Compute aircraft flow rate in gallons per minute (gpm)

$$\text{GPM} = (\text{AC/MIN}) \times (\text{GPA})$$

NOTE: GPA is finished spray rate in gallons per acre.

EXAMPLE: AC/MIN = 14.44
Finished spray rate is 2.0 GPA. Compute aircraft flow rate in gallons per acre.

$$\text{GPM} = (14.44 \text{ AC/MIN}) \times (2.0 \text{ GPA})$$

$$\text{GPM} = 28.88 \text{ GPM}$$

NOTE: Refer to Table II through VII on pages 7-12 for aircraft flow rates.

- C. Desired nozzle size is known, how many nozzles will be required?

$$\text{NUMBER OF NOZZLES} = \frac{\text{AIRCRAFT FLOW RATE (GPM)}}{\text{FLOW RATE PER NOZZLE (GPM)}}$$

NOTE: Refer to table VIII through XII on pages 13 through 17 for nozzle flow rates

EXAMPLE: From Table X on page 15 a #D4-46 nozzle has a flow rate of .48 gpm (gallons per minute) at 30 psi. Aircraft flow rate is 28.88 gpm.

$$\text{NUMBER OF NOZZLES} = \frac{28.88 \text{ GPM}}{.48 \text{ GPM}}$$

$$\text{NUMBER OF NOZZLES} = 60.2 \text{ nozzles}$$

NOTE: Use 60 nozzles at 30 psi.

- D. Number of nozzles is known. Select proper nozzle size.

$$\text{FLOW RATE PER NOZZLE (GPM)} = \frac{\text{AIRCRAFT FLOW RATE (GPM)}}{\text{NUMBER OF NOZZLES}}$$

EXAMPLE: Aircraft is equipped with 60 nozzles and has a flow rate of 28.88 GPM

$$\text{FLOW RATE PER NOZZLE (GPM)} = \frac{28.88 \text{ GPM}}{60 \text{ NOZZLES}}$$

$$\text{FLOW RATE PER NOZZLE (GPM)} = .481 \text{ GPM}$$

NOTE: Refer to Table IX on page 14. A #D6-45 nozzle has a flow rate of .48 gpm at 28 psi. Table X on page 15 shows a #D4-46 nozzle with a flow rate of .48 gpm at 30 psi. The D6-45 nozzle can be used at 28 psi or the #D4-46 nozzle can be used at 30 psi. Other nozzles can also be used at various spray pressures.

2. STATIC CALIBRATION WITH EXISTING NOZZLES

- A. Compute aircraft productivity in acres per minute (ac/min)

$$\text{AC/MIN} = \frac{(\text{AIR SPEED-MPH}) \times (\text{SWATH WIDTH-FEET})}{495}$$

EXAMPLE: 110 mph airspeed with 65' swath width

$$\text{AC/MIN} = \frac{(110 \text{ MPH}) \times (65')}{495}$$

$$\text{AC/MIN} = 14.44$$

NOTE: Refer to Table 1 for acres per minute

- B. Compute aircraft flow rate in gallons per minute (gpm) with existing nozzles

$$\text{GPM} = (\text{FLOW RATE PER NOZZLE-GPM}) \times (\text{NO. OF NOZZLES})$$

EXAMPLE: Aircraft is flown on a 65' swath with 60 #D4-46 nozzles at 30-psi spray pressure

$$\text{GPM} = (.48 \text{ GPM}) \times (60 \text{ NOZZLES})$$

$$\text{GPM} = 28.88 \text{ gallons per minute}$$

NOTE: Refer to Table X. Flow rate for one #D4-46 nozzle at nozzle at 30 psi is .48 gpm.

- C. Compute gallons per acre (GPA)

$$\text{GPA} = \frac{\text{AIRCRAFT FLOW RATE (GPM)}}{\text{AIRCRAFT PRODUCTIVITY (AC/MIN)}}$$

EXAMPLE: Compute GPA if aircraft flow rate is 28.88 GPM and aircraft productivity is 14.44 AC/MIN

$$\text{GPA} = \frac{28.88 \text{ GPM}}{14.44 \text{ AC/MIN}} = 2.0 \text{ GPA}$$

NOTE: If aircraft is equipped with two or more different size nozzles the flow rates for each nozzle size should be computed. Total aircraft flow rate can be computed by combining flow rates for each nozzle size.

TABLE I

ACRES PER MINUTE FOR SPECIFIED AIR SPEEDS AND SWATH WIDTHS

USEFUL FORMULA: ACRES PER MINUTE = $\frac{(\text{AIR SPEED-MPH}) \times (\text{SWATH WIDTH-FEET})}{495}$

AIR SPEED (MILES/HOUR)	SWATH WIDTH (FEET)									
	30	35	40	45	50	55	60	65	70	75
30	1.82	2.12	2.42	2.73	3.03	3.33	3.64	3.94	4.24	4.55
35	2.12	2.47	2.83	3.18	3.54	3.89	4.24	4.60	4.95	5.30
40	2.42	2.83	3.23	3.64	4.04	4.44	4.85	5.25	5.66	6.06
45	2.73	3.18	3.64	4.09	4.55	5.00	5.45	5.91	6.36	6.82
50	3.03	3.54	4.04	4.55	5.05	5.56	6.06	6.57	7.07	7.58
55	3.33	3.89	4.44	5.00	5.55	6.11	6.67	7.22	7.78	8.33
60	3.64	4.24	4.85	5.45	6.06	6.67	7.27	7.88	8.48	9.09
65	3.94	4.60	5.25	5.91	6.57	7.22	7.88	8.54	9.19	9.85
70	4.24	4.95	5.66	6.36	7.07	7.78	8.48	9.19	9.90	10.61
75	4.55	5.30	6.06	6.82	7.58	8.33	9.09	9.85	10.61	11.36
80	4.85	5.66	6.46	7.27	8.08	8.89	9.70	10.51	11.31	12.12
85	5.15	6.01	6.87	7.73	8.59	9.44	10.30	11.16	12.02	12.88
90	5.45	6.36	7.27	8.18	9.09	10.00	10.91	11.82	12.73	13.64
95	5.76	6.72	7.68	8.64	9.60	10.56	11.52	12.47	13.43	14.39
100	6.06	7.07	8.08	9.09	10.10	11.11	12.12	13.13	14.14	15.15
105	6.36	7.42	8.48	9.55	10.61	11.67	12.73	13.79	14.85	15.91
110	6.67	7.78	8.89	10.00	11.11	12.22	13.33	14.44	15.56	16.67
115	6.97	8.13	9.29	10.45	11.62	12.78	13.94	15.10	16.26	17.42
120	7.27	8.48	9.70	10.91	12.12	13.33	14.55	15.76	16.97	18.18
125	7.58	8.84	10.10	11.36	12.63	13.89	15.15	16.41	17.68	18.94
130	7.88	9.19	10.51	11.82	13.13	14.44	15.76	17.07	18.38	19.70
135	8.18	9.55	10.91	12.27	13.64	15.00	16.36	17.73	19.09	20.50
140	8.48	9.90	11.31	12.73	14.14	15.56	16.97	18.38	19.80	21.20
145	8.79	10.25	11.72	13.18	14.65	16.11	17.58	19.04	20.50	22.00
150	9.09	10.61	12.12	13.64	15.15	16.67	18.18	19.70	21.20	22.70
160	9.70	11.31	12.93	14.55	16.16	17.78	19.39	21.00	22.60	24.20
170	10.30	12.02	13.74	15.45	17.17	18.89	20.60	22.30	24.00	25.80

AIR SPEED (MPH)	SWATH WIDTH (FEET)									
	80	85	90	100	110	120	130	140	150	
85	13.74	14.60	15.45	17.17	18.89	20.06	22.30	24.00	25.80	
90	14.55	15.45	16.36	18.18	20.00	21.80	23.60	25.50	27.30	
95	15.35	16.31	17.27	19.19	21.10	23.00	24.90	26.90	28.80	
100	16.16	17.17	18.18	20.20	22.20	24.20	26.30	28.30	30.30	
105	16.97	18.03	19.09	21.20	23.30	25.50	27.60	29.70	31.80	
110	17.78	18.89	20.00	22.20	24.40	26.70	28.90	31.10	33.30	
115	18.59	19.75	20.90	23.20	25.60	27.90	30.20	32.50	34.80	
120	19.39	20.60	21.80	24.20	26.70	29.10	31.50	33.90	36.40	
125	20.20	21.50	22.70	25.30	27.80	30.30	32.80	35.40	37.90	
130	21.00	22.30	23.60	26.30	28.90	31.50	34.10	36.80	39.40	
135	21.80	23.20	24.50	27.30	30.00	32.70	35.50	38.20	41.00	
140	22.60	24.00	25.50	28.30	31.10	33.90	36.80	39.60	42.40	
145	23.40	24.90	26.40	29.30	32.20	35.20	38.10	41.00	44.00	
150	24.20	25.80	27.30	30.30	33.30	36.40	39.40	42.40	45.40	
160	25.90	27.50	29.10	32.30	35.60	38.80	42.00	45.20	48.4	
170	27.50	29.20	30.90	34.30	37.80	41.20	44.60	48.00	51.60	

TABLE II

ONE QUART OR .25 GALLONS PER ACRE
 AIRCRAFT FLOW RATE IN GALLONS PER MINUTE (GPM)
 FOR SPECIFIED AIR SPEEDS AND SWATH WIDTHS

USEFUL FORMULA:

$$\text{FLOW RATE (GPM)} = \frac{(\text{AIR SPEED-MPH}) \times (\text{SWATH WIDTH-FEET}) \times (\text{SPRAY RATE-GAL/AC})}{495}$$

495

AIR SPEED (MPH)	SWATH WIDTH										
	40	45	50	55	60	65	70	75	80	85	90
30	.606	.682	.758	.833	.909	.985	1.060	1.140	1.210	1.290	1.360
35	.707	.795	.884	.972	1.060	1.150	1.240	1.330	1.410	1.500	1.590
40	.808	.909	1.010	1.110	1.210	1.310	1.410	1.520	1.620	1.720	1.820
45	.909	1.020	1.140	1.250	1.360	1.480	1.590	1.700	1.820	1.930	2.050
50	1.010	1.140	1.260	1.390	1.520	1.640	1.770	1.890	2.020	2.140	2.270
55	1.110	1.250	1.390	1.530	1.670	1.810	1.940	2.080	2.220	2.360	2.500
60	1.210	1.360	1.520	1.670	1.820	1.970	2.120	2.270	2.420	2.580	2.730
65	1.310	1.480	1.640	1.810	1.970	2.130	2.300	2.460	2.630	2.790	2.950
70	1.410	1.590	1.770	1.940	2.120	2.300	2.470	2.650	2.830	3.010	3.180
75	1.520	1.700	1.890	2.080	2.270	2.460	2.650	2.840	3.030	3.220	3.410
80	1.620	1.820	2.020	2.220	2.420	2.630	2.830	3.030	3.230	3.430	3.640
85	1.720	1.930	2.150	2.360	2.580	2.790	3.010	3.220	3.430	3.650	3.860
90	1.820	2.050	2.270	2.500	2.730	2.950	3.180	3.410	3.640	3.860	4.090
95	1.920	2.160	2.400	2.640	2.880	3.120	3.360	3.600	3.840	4.080	4.320
100	2.020	2.270	2.530	2.780	3.030	3.280	3.540	3.790	4.040	4.290	4.550
105	2.120	2.390	2.650	2.920	3.180	3.450	3.710	3.980	4.240	4.510	4.770
110	2.220	2.500	2.780	3.060	3.330	3.610	3.890	4.170	4.440	4.720	5.000
115	2.320	2.610	2.900	3.190	3.480	3.780	4.070	4.360	4.650	4.940	5.230
120	2.420	2.730	3.030	3.330	3.640	3.940	4.240	4.550	4.850	5.150	5.450
125	2.530	2.840	3.160	3.470	3.790	4.100	4.420	4.730	5.050	5.370	5.680
130	2.630	2.950	3.280	3.610	3.940	4.270	4.600	4.920	5.250	5.580	5.910
135	2.730	3.070	3.410	3.750	4.090	4.430	4.770	5.110	5.660	5.800	6.140
140	2.830	3.180	3.540	3.890	4.240	4.600	4.950	5.300	5.660	6.010	6.370
145	2.930	3.300	3.660	4.030	4.390	4.760	5.130	5.490	5.860	6.220	6.590
150	3.030	3.410	3.790	4.170	4.550	4.920	5.300	5.680	6.060	6.440	6.820
160	3.230	3.640	4.040	4.440	4.850	5.250	5.660	6.060	6.460	6.870	7.270
170	3.430	3.860	4.290	4.720	5.150	5.580	6.010	6.440	6.870	7.300	7.730

TABLE III

ONE GALLON PER ACRE

AIRCRAFT FLOW RATE IN GALLONS PER MUNITE (GPM)
FOR SPECIFIED AIR SPEEDS AND SWATH WIDTHS

USEFUL FORMULA:

$$\text{FLOW RATE (GPM)} = \frac{(\text{AIR SPEED-MPH}) \times (\text{SWATH WIDTH-FEET}) \times (\text{SPRAY RATE-GAL/AC})}{495}$$

AIR SPEED (MPH)	SWATH WIDTH (FEET)									
	30	35	40	45	50	55	60	65	70	75
30	1.82	2.12	2.42	2.73	3.03	3.33	3.64	3.94	4.24	4.55
35	2.12	2.47	2.83	3.18	3.54	3.89	4.24	4.60	4.95	5.30
40	2.42	2.83	3.23	3.64	4.04	4.44	4.85	5.25	5.66	6.06
45	2.73	3.18	3.64	4.09	4.55	5.00	5.45	5.91	6.36	6.82
50	3.03	3.54	4.04	4.55	5.05	5.56	6.06	6.57	7.07	7.58
55	3.33	3.89	4.44	5.00	5.55	6.11	6.67	7.22	7.78	8.33
60	3.64	4.24	4.85	5.45	6.06	6.67	7.27	7.88	8.48	9.09
65	3.94	4.60	5.25	5.91	6.57	7.22	7.88	8.54	9.19	9.85
70	4.24	4.95	5.66	6.36	7.07	7.78	8.48	9.19	9.90	10.61
75	4.55	5.30	6.06	6.82	7.58	8.33	9.09	9.85	10.61	11.36
80	4.85	5.66	6.46	7.27	8.08	8.89	9.70	10.51	11.31	12.12
85	5.15	6.01	6.87	7.73	8.59	9.44	10.30	11.16	12.02	12.88
90	5.45	6.36	7.27	8.18	9.09	10.00	10.91	11.82	12.73	13.64
95	5.76	6.72	7.68	8.64	9.60	10.56	11.52	12.47	13.43	14.39
100	6.06	7.07	8.08	9.09	10.10	11.11	12.12	13.13	14.14	15.15
105	6.36	7.42	8.48	9.55	10.61	11.67	12.73	13.79	14.85	15.91
110	6.67	7.78	8.89	10.00	11.11	12.22	13.33	14.44	15.56	16.67
115	6.97	8.13	9.29	10.45	11.62	12.78	13.94	15.10	16.26	17.42
120	7.27	8.48	9.70	10.91	12.12	13.33	14.55	15.76	16.97	18.18
125	7.58	8.84	10.10	11.36	12.63	13.89	15.15	16.41	17.68	18.94
130	7.88	9.19	10.51	11.82	13.13	14.44	15.76	17.07	18.38	19.70
135	8.18	9.55	10.91	12.27	13.64	15.00	16.36	17.73	19.09	20.50
140	8.48	9.90	11.31	12.73	14.14	15.56	16.97	18.38	19.80	21.20
145	8.79	10.25	11.72	13.18	14.65	16.11	17.58	19.04	20.50	22.00
150	9.09	10.61	12.12	13.64	15.15	16.67	18.18	19.70	21.20	22.70
160	9.70	11.31	12.93	14.55	16.016	17.78	19.39	21.00	22.60	24.20
170	10.30	12.02	13.74	15.45	17.17	18.89	20.60	22.30	24.00	25.80

TABLE IV
TWO GALLONS PER ACRE

AIRCRAFT FLOW RATE IN GALLONS PER MUNITE (GPM)
FOR SPECIFIED AIR SPEEDS AND SWATH WIDTHS

USEFUL FORMULA:

$$\text{FLOW RATE (GPM)} = \frac{(\text{AIR SPEED-MPH}) \times (\text{SWATH WIDTH-FEET}) \times (\text{SPRAY RATE-GAL/AC})}{495}$$

AIR SPEED (MPH)	SWATH WIDTH (FEET)									
	30	35	40	45	50	55	60	65	70	75
30	3.64	4.24	4.85	5.45	6.06	6.67	7.27	7.88	8.48	9.09
35	4.24	4.95	5.66	6.36	7.07	7.78	8.48	9.19	9.90	10.61
40	4.85	5.66	6.46	7.27	8.08	8.89	9.70	10.51	11.31	12.12
45	5.45	6.36	7.27	8.18	9.09	10.00	10.91	11.82	12.73	13.64
50	6.06	7.07	8.08	9.09	10.10	11.11	12.12	13.13	14.14	15.15
55	6.67	7.78	8.89	10.00	11.11	12.22	13.33	14.44	15.56	16.67
60	7.27	8.48	9.70	10.91	12.12	13.33	14.55	15.75	16.97	18.20
65	7.88	9.19	10.51	11.82	13.33	14.44	15.76	17.07	18.38	19.70
70	8.48	9.90	11.31	12.73	14.14	15.56	16.97	18.38	19.80	21.20
75	9.09	10.61	12.12	13.64	15.15	16.67	18.18	19.70	21.20	22.70
80	9.70	11.31	12.93	14.09	16.16	17.78	19.39	21.00	22.60	24.20
85	10.30	12.02	13.74	14.55	17.17	18.89	20.60	22.30	24.00	25.80
90	10.91	12.73	14.55	16.36	18.18	20.00	21.80	23.64	25.50	27.30
95	11.52	13.43	15.35	17.27	19.19	21.10	23.00	24.90	26.90	28.80
100	12.12	14.14	16.16	18.18	20.20	22.20	24.20	26.30	28.30	30.30
105	12.73	14.85	16.97	19.09	21.20	23.30	25.50	27.60	29.70	31.80
110	13.33	15.56	17.78	20.00	22.20	24.40	26.70	28.90	31.80	33.30
115	13.94	16.26	18.59	20.90	23.20	25.60	27.90	30.20	32.50	34.80
120	14.55	16.97	19.39	21.80	24.20	26.70	29.10	31.50	33.90	36.40
125	15.15	17.68	20.20	22.70	25.30	27.80	30.30	32.80	35.40	37.90
130	15.76	18.38	21.00	23.60	26.30	28.90	31.50	34.10	36.80	39.40
135	16.36	19.09	21.80	24.50	27.30	30.00	32.70	35.50	38.20	41.00
140	16.97	19.80	22.60	25.50	28.30	31.10	33.90	36.80	39.60	42.40
145	17.58	20.50	23.40	26.40	29.30	32.20	35.20	38.10	41.00	44.00
150	18.18	21.20	24.20	27.30	30.30	33.30	36.40	39.40	42.40	45.40
160	19.39	22.60	25.90	29.10	32.30	35.60	38.80	42.00	45.20	48.40
170	20.60	24.00	27.5	30.90	34.30	37.80	41.20	44.60	48.00	51.60

TABLE V
THREE GALLONS PER ACRE

AIRCRAFT FLOW RATE IN GALLONS PER MUNITE (GPM)
FOR SPECIFIED AIR SPEEDS AND SWATH WIDTHS

USEFUL FORMULA:

$$\text{FLOW RATE (GPM)} = \frac{(\text{AIR SPEED-MPH}) \times (\text{SWATH WIDTH-FEET}) \times (\text{SPRAY RATE-GAL/AC})}{495}$$

AIR SPEED (MPH)	SWATH WIDTH (FEET)									
	30	35	40	45	50	55	60	65	70	75
30	5.45	6.36	7.27	8.18	9.09	10.00	10.91	11.82	12.73	13.64
35	6.36	7.42	8.48	9.55	10.61	11.67	12.73	13.97	14.85	15.91
40	7.27	8.48	9.70	10.91	12.12	13.33	14.55	15.76	16.97	18.18
45	8.18	9.55	10.91	12.27	13.64	15.00	16.36	17.73	19.09	20.50
50	9.09	10.61	12.12	13.64	15.15	16.67	18.18	19.70	21.20	22.70
55	10.00	11.67	13.30	15.00	16.70	18.33	20.00	21.70	23.30	25.00
60	10.91	12.73	14.55	16.36	18.18	20.00	21.80	23.60	25.50	27.30
65	11.82	13.79	15.76	17.73	19.70	21.70	23.60	25.60	27.60	29.50
70	12.73	14.85	16.97	19.09	21.20	23.30	25.50	27.60	29.70	31.80
75	13.64	15.91	18.18	20.50	22.70	25.00	27.30	29.50	31.80	34.10
80	14.55	16.97	19.39	21.80	24.20	26.70	29.10	31.50	33.90	36.40
85	15.45	18.03	20.60	23.20	25.80	28.30	30.90	33.50	36.10	38.60
90	16.36	19.09	21.80	24.50	27.30	30.00	32.70	35.50	38.20	40.90
95	17.27	20.20	23.00	25.90	28.80	31.70	34.50	37.40	40.30	43.20
100	18.18	21.20	24.20	27.30	30.30	33.30	36.40	39.40	42.40	45.50
105	19.09	22.30	25.50	28.60	31.80	35.50	38.20	41.40	44.50	47.70
110	20.00	23.30	26.70	30.00	33.30	36.70	40.00	43.30	46.70	50.00
115	20.90	24.40	27.90	31.40	34.80	38.30	41.80	45.30	48.80	52.30
120	21.80	25.50	29.10	32.70	36.40	40.00	43.60	47.30	50.90	54.50
125	22.70	26.50	30.30	34.10	37.90	41.70	45.50	49.20	53.00	56.80
130	23.60	27.60	31.50	35.50	39.40	43.30	47.30	51.20	55.20	59.10
135	24.50	28.60	32.70	36.80	40.90	45.00	49.10	53.20	57.30	61.40
140	25.50	29.70	33.90	38.20	42.40	46.70	50.90	55.20	59.40	63.60
145	26.40	30.80	35.20	39.50	43.90	48.30	52.70	57.10	61.50	65.90
150	27.30	31.80	36.40	40.90	45.50	50.00	54.50	59.10	63.60	68.20
160	29.10	33.90	38.80	43.60	48.50	53.30	58.20	63.00	67.90	72.70
170	30.90	36.10	41.20	46.40	51.50	56.70	61.80	67.00	72.10	77.30

TABLE VI
FIVE GALLONS PER ACRE

AIRCRAFT FLOW RATE IN GALLONS PER MUNITE (GPM)
FOR SPECIFIED AIR SPEEDS AND SWATH WIDTHS

USEFUL FORMULA:

$$\text{FLOW RATE (GPM)} = \frac{(\text{AIR SPEED-MPH}) \times (\text{SWATH WIDTH-FEET}) \times (\text{SPRAY RATE-GAL/AC})}{495}$$

AIR SPEED (MPH)	SWATH WIDTH (FEET)									
	30	35	40	45	50	55	60	65	70	75
30	9.09	10.61	12.12	13.64	15.15	16.67	18.18	19.70	21.20	22.70
35	10.61	12.37	14.14	15.91	17.68	19.44	21.20	23.00	24.70	26.50
40	12.12	14.14	16.16	18.18	20.20	22.20	24.20	26.30	28.30	30.30
45	13.64	15.91	18.18	20.50	22.70	25.00	27.30	29.50	31.80	34.10
50	15.15	17.68	20.20	22.70	25.30	27.80	30.30	32.80	35.40	37.90
55	16.67	19.44	22.20	25.00	27.80	30.60	33.30	36.10	38.90	41.70
60	18.18	21.20	24.20	27.30	30.30	33.30	36.40	39.40	42.40	45.50
65	19.70	23.00	26.30	29.50	32.80	36.10	39.40	42.70	46.00	49.20
70	21.20	24.70	28.30	31.80	35.40	38.90	42.40	46.00	49.50	53.00
75	22.70	26.50	30.30	34.10	37.90	41.70	45.50	49.20	53.00	56.80
80	24.20	28.30	32.30	36.40	40.40	44.40	48.50	52.50	56.60	60.60
85	25.80	30.10	34.30	38.60	42.90	47.20	51.50	55.80	60.10	64.40
90	27.30	31.80	36.40	40.90	45.50	50.00	54.50	59.10	63.60	68.20
95	28.80	33.60	38.40	43.20	48.00	52.80	57.60	62.40	67.20	72.00
100	30.30	35.40	40.40	45.50	50.50	55.60	60.60	65.70	70.70	75.80
105	31.30	37.10	42.40	47.70	53.00	58.30	63.60	68.90	74.20	79.50
110	33.30	38.90	44.40	50.00	55.60	61.10	66.70	72.20	77.80	83.30
115	34.80	40.70	46.50	52.30	58.10	63.90	69.70	75.50	81.30	87.10
120	36.40	42.40	48.50	54.50	60.60	66.70	72.70	78.80	84.80	90.90
125	37.90	44.20	50.50	56.80	63.10	69.40	75.80	82.10	88.40	94.70
130	39.40	46.00	52.50	59.10	65.70	72.20	78.80	85.40	91.90	98.50
135	41.00	47.70	54.50	61.40	68.20	75.00	81.80	88.60	95.50	102.00
140	42.40	49.50	56.60	63.60	70.70	77.80	84.80	91.90	99.00	106.00
145	44.00	51.30	58.60	65.90	73.20	80.60	87.90	95.20	103.00	110.00
150	45.50	53.00	60.60	68.20	75.80	83.30	90.90	98.50	106.00	114.00
160	48.40	56.60	64.60	72.70	80.80	88.90	97.00	105.00	113.00	121.00
170	51.50	60.10	68.70	77.30	85.90	94.40	103.00	112.00	120.00	129.00

TABLE VII
TEN GALLONS PER ACRE

AIRCRAFT FLOW RATE IN GALLONS PER MUNITE (GPM)
FOR SPECIFIED AIR SPEEDS AND SWATH WIDTHS

USEFUL FORMULA:

$$\text{FLOW RATE (GPM)} = \frac{(\text{AIR SPEED-MPH}) \times (\text{SWATH WIDTH-FEET}) \times (\text{SPRAY RATE-GAL/AC})}{495}$$

AIR SPEED (MPH)	SWATH WIDTH (FEET)									
	30	35	40	45	50	55	60	65	70	75
30	18.20	21.20	24.20	27.30	30.30	33.30	36.40	39.40	42.40	45.50
35	21.20	24.70	28.30	31.80	35.40	38.90	42.40	46.00	49.50	53.00
40	24.20	28.30	32.30	36.40	40.40	44.40	48.50	52.50	56.60	60.60
45	27.30	31.80	36.40	40.90	45.50	50.00	54.50	59.10	63.60	68.20
50	30.30	35.40	40.40	45.50	50.50	55.60	60.60	65.70	70.70	75.80
55	33.30	38.90	44.40	50.00	55.50	61.10	66.70	72.20	77.80	83.30
60	36.40	42.40	48.50	54.50	60.60	66.70	72.70	78.80	84.80	90.90
65	39.40	46.00	52.50	59.10	65.70	72.20	78.80	85.40	91.90	98.50
70	42.40	49.50	56.60	63.60	70.70	77.80	84.80	91.90	99.00	106.10
75	45.50	53.00	60.60	68.20	75.80	83.30	90.90	98.50	106.10	113.60
80	48.50	56.60	64.60	72.70	80.80	88.90	97.00	105.10	113.10	121.20
85	51.50	60.10	68.70	77.30	85.90	94.40	103.00	111.60	120.20	128.80
90	54.50	63.60	72.70	81.80	90.90	100.00	109.10	118.20	127.30	136.40
95	57.60	67.20	76.80	86.40	96.00	105.60	115.20	124.70	134.30	143.90
100	60.60	70.70	80.80	90.90	101.00	111.10	121.20	131.30	141.40	151.50
105	63.60	74.20	84.80	95.50	106.10	116.70	127.30	137.90	148.50	159.10
110	66.70	77.80	88.90	100.00	111.10	122.20	133.30	144.40	155.60	166.70
115	69.70	81.30	92.90	104.50	116.20	127.80	139.40	151.00	162.60	174.20
120	72.70	84.80	97.00	109.10	121.20	133.30	145.50	157.60	169.70	181.80
125	75.80	88.40	101.00	113.60	126.30	138.90	151.50	164.10	176.80	189.40
130	78.80	91.90	105.10	118.20	131.30	144.40	157.60	170.70	183.80	197.00
135	81.80	95.50	109.10	122.70	136.40	150.00	163.60	177.30	190.90	205.00
140	84.80	99.00	113.10	127.30	141.40	155.60	169.70	183.80	198.00	212.00
145	87.90	102.50	117.20	131.80	146.50	161.10	175.80	190.40	205.00	220.00
150	90.90	106.10	121.20	136.40	151.50	166.70	181.80	197.00	212.00	227.00
160	97.00	113.10	129.30	145.50	161.60	177.80	193.90	210.00	226.00	242.00
170	103.00	120.20	137.40	154.50	171.70	188.90	206.00	223.00	240.00	258.00

TABLE VIII

NOZZLE FLOW RATES IN GALLONS PER MINUTE
 SPRAYING SYSTEMS COMPANY #4664, #6135 AND #8355
 DIAPHRAGM TEE JET NOZZLES WITH #13, #23 AND #25 CORES

ORIFICE NUMBER	ORIFICE DIAMETER (inches)	PRESSURE PSI										
		15	20	25	30	35	40	45	50	60	70	80
D2-13	.031	.050	.058	.065	.071	.077	.082	.087	.091	.100	.108	.116
D3-13	.047	.056	.064	.072	.079	.085	.091	.096	.102	.111	.120	.129
D4-13	.063	.072	.084	.093	.102	.111	.118	.125	.13	.14	.16	.17
D2-23	.031	.060	.069	.077	.085	.091	.098	.103	.109	.120	.129	.14
D3-23	.047	.072	.083	.093	.102	.110	.118	.125	.13	.14	.16	.17
D4-23	.063	.092	.106	.119	.13	.14	.15	.16	.17	.18	.20	.21
D5-23	.075	.111	.129	.14	.16	.17	.18	.19	.20	.22	.24	.26
D6-23	.094	.128	.15	.17	.18	.20	.21	.22	.23	.26	.28	.30
D2-25	.031	.097	.112	.126	.14	.15	.16	.17	.18	.19	.21	.22
D3-25	.047	.117	.13	.15	.17	.18	.19	.20	.21	.23	.25	.27
D4-25	.063	.18	.21	.23	.25	.27	.29	.31	.33	.36	.38	.41
D5-25	.075	.21	.25	.28	.30	.33	.35	.37	.39	.43	.46	.49
D6-25	.094	.27	.31	.35	.38	.41	.44	.47	.49	.54	.58	.62
D7-25	.109	.32	.37	.41	.45	.48	.52	.55	.58	.63	.69	.73
D8-25	.125	.37	.43	.48	.53	.57	.61	.65	.68	.75	.81	.86

NOZZLE FLOW RATES ARE FROM SPRAYING SYSTEMS COMPANY DATE. FLOW RATES BASED ON SPRAYING WATER AT 70°F.

TABLE IX

NOZZLE FLOW RATES IN GALLONS PER MINUTE
 SPRAYING SYSTEMS COMPANY #4664, #6135 AND #8355
 DIAPHRAGM TEE JET NOZZLES WITH #45 CORE

ORIFICE NUMBER	ORIFICE DIAMETER (inches)	PRESSURE PSI										
		15	20	25	30	35	40	45	50	60	70	80
D2-45	.031	.13	.14	.16	.18	.19	.20	.22	.23	.25	.27	.28
D3-45	.047	.14	.17	.18	.20	.22	.23	.24	.26	.28	.31	.33
D4-45*	.063	.22	.25	.28	.31	.33	.36	.38	.40	.43	.47	.50
D5-45	.078	.28	.32	.36	.39	.42	.45	.48	.50	.55	.60	.64
D6-45*	.094	.35	.41	.45	.50	.54	.58	.61	.65	.72	.76	.83
D7-45	.109	.41	.48	.54	.59	.64	.68	.72	.76	.84	.90	.97
D8-45*	.125	.51	.59	.66	.72	.78	.84	.88	.93	1.04	1.10	1.21
D10-45*	.156	.66	.77	.86	.94	1.02	1.10	1.15	1.21	1.35	1.44	1.57
D12-45*	.188	.82	.95	1.07	1.17	1.27	1.36	1.44	1.52	1.68	1.80	1.95

NOZZLE FLOW RATES ARE FROM SPRAYING SYSTEMS COMPANY DATE. FLOW RATES BASED ON SPRAYING WATER AT 70°F.

*MORE POPULAR ORIFICE AND CORE COMBINATIONS

TABLE X

NOZZLE FLOW RATES IN GALLONS PER MINUTE
 SPRAYING SYSTEMS COMPANY #4664, #6135 AND #8355
 DIAPHRAGM TEE JET NOZZLES WITH #45 CORE AND #56 CORES

ORIFICE NUMBER	ORIFICE DIAMETER (inches)	PRESSURE PSI										
		15	20	25	30	35	40	45	50	60	70	80
D2-46	.031	.17	.19	.22	.24	.25	.27	.29	.30	.33	.35	.37
D3-46	.047	.20	.23	.25	.28	.30	.32	.34	.36	.39	.43	.45
D4-46*	.063	.34	.39	.44	.48	.52	.56	.59	.62	.68	.73	.78
D5-46	.031	.47	.54	.60	.66	.71	.77	.81	.85	.94	1.01	1.10
D6-46*	.047	.67	.78	.87	.95	1.04	1.10	1.17	1.23	1.35	1.48	1.58
D7-46	.063	.86	.98	1.10	1.22	1.32	1.39	1.50	1.55	1.72	1.86	1.97
D8-46*	.075	1.13	1.30	1.45	1.59	1.72	1.84	1.95	2.06	2.25	2.43	2.62
D10-46*	.094	1.52	1.76	1.96	2.15	2.32	2.48	2.63	2.75	3.05	3.28	3.53
D12-46*	.031	1.92	2.25	2.47	2.71	2.93	3.13	3.32	3.50	3.83	4.14	4.42
D2-56	.047	.15	.17	.19	.21	.23	.25	.26	.27	.30	.32	.34
D4-56	.063	.34	.39	.44	.48	.52	.55	.59	.62	.68	.73	.78
D6-56*	.075	.68	.78	.88	.96	1.04	1.11	1.18	1.24	1.36	1.47	1.57
D8-56*	.094	1.18	1.36	1.52	1.67	1.80	1.93	2.05	2.16	2.36	2.55	2.73
D10-56*	.109	1.64	1.91	2.13	2.33	2.52	2.71	2.85	3.02	3.31	3.56	3.80
D12-56*	.125	1.91	2.25	2.47	2.71	2.93	3.13	3.32	3.50	3.79	4.14	4.43

NOZZLE FLOW RATES ARE FROM SPRAYING SYSTEMS COMPANY DATE. FLOW RATES BASED ON
 SPRAYING WATER AT 70°F.

*MORE POPULAR ORIFICE AND CORE COMBINATIONS

TABLE XI

NOZZLE FLOW RATES IN GALLONS PER MINUTE
 SPRAYING SYSTEMS COMPANY #4664, #6135 AND #8355
 DIAPHRAGM TEE JET NOZZLES WITHOUT CORE

ORIFICE NUMBER	ORIFICE DIAMETER (inches)	PRESSURE PSI										
		15	20	25	30	35	40	45	50	60	70	80
D2	.031	.17	.20	.22	.24	.26	.28	.30	.31	.34	.37	.40
D3	.047	.22	.25	.28	.31	.33	.35	.37	.39	.43	.47	.50
D4	.063	.35	.40	.45	.49	.53	.56	.60	.63	.69	.75	.80
D5	.078	.50	.58	.65	.71	.77	.82	.87	.92	1.01	1.09	1.16
D6	.094	.71	.82	.92	1.00	1.08	1.16	1.23	1.30	1.42	1.53	1.64
D7	.109	.89	1.03	1.15	1.26	1.36	1.46	1.54	1.63	1.78	1.93	2.06
D8	.125	1.21	1.39	1.56	1.71	1.85	1.97	2.09	2.21	2.42	2.61	2.79
D10	.156	1.89	2.18	2.43	2.67	2.88	3.08	3.27	3.44	3.77	4.07	4.35
D12	.188	2.71	3.13	3.50	3.83	4.14	4.43	4.69	4.95	5.42	5.86	6.23

NOZZLE FLOW RATES ARE FROM SPRAYING SYSTEMS COMPAN

TABLE XII

NOZZLE FLOW RATES IN GALLONS PER MINUTE
 SPRAYING SYSTEMS COMPANY #4666
 DIAPHRAGM CHECK VALVE AND # 1/8 B WHIRLJET NOZZLE

WHIRLJET NOZZLE NO.	BODY NO.	CAP NO.	ORIFICE DIAMETER	PRESSURE PSI									
				15	20	25	30	35	40	45	50	60	
1/8 B1-1	1	1	1/16 (.063)	.123	.142	.159	.175	.188	.20	.21	.22	.25	
1/8 B1-2	1	2	5/64 (.078)	.147	.171	.190	.21	.23	.24	.26	.27	.29	
1/8 B1-3	1	3	3/32 (.094)	.192	.22	.25	.27	.29	.31	.33	.35	.38	
1/8 B2-2	2	2	5/64 (.078)	.24	.28	.32	.35	.37	.40	.42	.45	.49	
1/8 B2-3	2	3	3/32 (.094)	.29	.34	.38	.42	.45	.48	.51	.54	.59	
1/8 B2-5	2	5	1/8 (.125)	.43	.50	.56	.61	.66	.71	.75	.79	.87	
1/8 B3-2	3	2	5/64 (.078)	.28	.32	.36	.39	.43	.46	.49	.51	.56	
1/8 B3-3	3	3	3/32 (.094)	.36	.41	.46	.51	.55	.58	.62	.65	.71	
1/8 B3-8	3	8	5/32 (.156)	.51	.59	.66	.72	.78	.83	.88	.93	1.02	
1/8 B5-3	5	3	3/32 (.094)	.46	.53	.59	.65	.70	.75	.80	.84	.92	
1/8 B5-5	5	5	1/8 (.125)	.61	.71	.79	.87	.94	1.00	1.06	1.12	1.22	
1/8 B5-8	5	8	5/32 (.156)	.66	.77	.86	.94	1.01	1.08	1.15	1.21	1.33	
1/8 B5-10	5	10	11/64 (.172)	.79	.91	1.02	1.12	1.21	1.29	1.37	1.44	1.58	
1/8 B8-3	8	3	3/32 (.094)	.48	.56	.63	.69	.74	.79	.84	.89	.97	
1/8 B8-5	8	5	1/8 (.125)	.74	.85	.96	1.05	1.13	1.21	1.28	1.35	1.48	
1/8 B8-8	8	8	5/32 (.156)	.97	1.12	1.25	1.37	1.48	1.58	1.68	1.77	1.94	
1/8 B8-10	8	10	11/64 (.172)	1.10	1.27	1.42	1.55	1.68	1.79	1.90	2.00	2.19	
1/8 B10-1	10	1	1/16 (.063)	.26	.30	.34	.37	.40	.43	.45	.48	.52	
1/8 B10-2	10	2	5/64 (.078)	.42	.49	.55	.60	.65	.69	.73	.77	.85	
1/8 B10-3	10	3	3/32 (.094)	.59	.68	.76	.83	.89	.96	1.01	1.07	1.17	
1/8 B10-5	10	5	1/8 (.125)	.85	.99	1.10	1.21	1.31	1.40	1.48	1.56	1.71	
1/8 B10-8	10	8	5/32 (.156)	1.05	1.21	1.35	1.48	1.60	1.71	1.81	1.91	2.09	
1/8 B10-10	10	10	11/64 (.172)	1.22	1.41	1.58	1.73	1.87	2.00	2.12	2.24	2.45	

FIELD CALIBRATION CHECK

This method involves loading the aircraft with a known volume of material, flying a known area, measuring the amount of material discharged and computing the application rate.

1. AIRCRAFT SPEED IS KNOWN

Load a known volume of material into aircraft spray tank. Fly aircraft at known speed and pressure for 60 seconds. Check volume in spray tank at the end of 60-second calibration run.

$$\text{FINISHED SPRAY RATE (GPA)} = \frac{\text{VOLUME DISCHARGED}}{\text{ACRES COVERED}}$$

$$\text{VOLUME DISCHARGED} = (\text{INITIAL VOLUME}) - (\text{FINAL VOLUME})$$

$$\text{ACRES COVERED} = \frac{(\text{SPEED-MPH}) \times (\text{SWATH-FEET})}{495}$$

EXAMPLE: Aircraft speed is 110 mph, swath width is 65'. You wish to apply 2 gpa; spray pressure is 30 psi, initial volume in spray tank was 100 gallons, final volume was 71 gallons.

$$\text{VOLUME DISCHARGED (GAL)} = 100 \text{ GAL} - 71 \text{ GAL}$$

$$\text{VOLUME DISCHARGED} = 29 \text{ GAL}$$

$$\text{ACRES COVERED} = \frac{110 \text{ MPH} \times 65'}{495}$$

$$\text{ACRES COVERED} = 14.44 \text{ ACRES}$$

$$\text{GPA} = \frac{29 \text{ GAL}}{14.44 \text{ ACRES}} = 2.0 \text{ GAL/ACRE}$$

2. FLYING A KNOWN AREA:

Load aircraft with a known volume of material. Fly upwind and downwind over a known area at a desired speed and spray, pressure. Determine final volume in spray tank and compute application rate.

$$\text{FINISHED SPRAY RATE (GPA)} = \frac{\text{VOLUME DISCHARGED}}{\text{ACRES COVERED}}$$

$$\text{VOLUME DISCHARGED} = (\text{INITIAL VOLUME}) - (\text{FINAL VOLUME})$$

$$\text{ACRES COVERED} = \frac{(\text{RUN LENGTH-FEET}) \times (\text{SWATH WIDTH-FEET}) \times (\text{NO. OF RUNS})}{43,560 \text{ FT}^2/\text{ACRE}}$$

EXAMPLE: Calibration run is 2,000', swath width is 65'. The area is flown 3 times in each direction for a total of 6 times. Initial volume in spray tank was 100 gallons. Final volume in spray tank was 64 gallons. Spray pressure was 30 psi.

$$\text{VOLUME DISCHARGED} = (100 \text{ GAL}) - (64 \text{ GAL}) = 36 \text{ GAL}$$

$$\text{ACRES COVERED} = \frac{(2,000') \times (65') \times (6)}{43,560 \text{ FT}^2/\text{AC}} = 17.91 \text{ ACRES}$$

$$\text{GPA} = \frac{36 \text{ GAL}}{17.91 \text{ ACRES}} = 2.0 \text{ GPA}$$

3. COMPUTING PRESSURE CHANGES TO VARY FINISHES SPRAY RATE:

HYDRAULIC FLOW FORMULA:

$$P_2 = P_1 \left(\frac{VOLUME_2}{VOLUME_1} \right)^2$$

P_2 = FINAL PRESSURE (PSI)
 P_1 = INITIAL PRESSURE (PSI)
 $VOLUME_2$ = FINAL VOLUME
 $VOLUME_1$ = INITIAL VOLUME

EXAMPLE: A spray nozzle has a flow rate of .48 gpm at 30 psi. Compute flow rate for this nozzle at 40 psi.

P_2 = FINAL PRESSURE (PSI)
 P_1 = INITIAL PRESSURE = 30 PSI
 $VOLUME_2$ = FINAL VOLUME = 1.75 GPA
 $VOLUME_1$ = INITIAL VOLUME = 2.0 GPA
 $P_2 = 30 \text{ PSI} \left(\frac{1.75 \text{ GPA}}{2.0 \text{ GPA}} \right)^2$
 $P_2 = (30 \text{ PSI}) \times (.766)$
 $P_2 = 23 \text{ PSI}$

4. COMPUTING NOZZLE FLOW RATES AT VARIOUS PRESSURES

The hydraulic flow formula can be used to compute nozzle flow rates at various pressures if the flow rate for a given pressure is known

HYDRAULIC FLOW FORMULA:

$$P_2 = P_1 \left(\frac{VOLUME_2}{VOLUME_1} \right)^2$$

$$\frac{VOLUME_2}{VOLUME_1} = \sqrt{\frac{P_2}{P_1}}$$

$$VOLUME_2 = VOLUME_1 \sqrt{\frac{P_2}{P_1}}$$

EXAMPLE: = A spray nozzle has a flow rate of .48 gpm at 30 psi. Compute flow rate for this nozzle at 40 psi.?

$$VOLUME_2 = .48 \text{ GPM} \sqrt{\frac{40 \text{ PSI}}{30 \text{ PSI}}}$$

$VOLUME_2 = .55 \text{ GPM AT 40 PSI}$

5. ULV (ULTRA LOW VOLUME) CALIBRATION:

When applying sprays at very low finished spray rates it will be difficult to fly a known area and accurately measure the volume discharged with the calibration marks on the spray tank. The volume discharged should be computed with the following procedure:

- A. Add actual material to be applied to the spray tank. Use 20 to 30 gallons of material to allow discharge of 5 to 10 gallons without cavitating the spray pump. Operate spray system to fill pump, spray lines and spray boom with material.
- B. Measure distance from a known reference point such as a tank baffle to surface of liquid in spray tank.
- C. Mark location of aircraft tires on loading area.
- D. Fly a known area and discharge at least five and preferably 10 gallons of material.
- E. Return aircraft to exact spot marked on loading area.
- F. Determine volume of spray discharged by adding enough material to fill tank to initial point. Measure material added to nearest quart.
- G.

$$\text{GALLONS PER ACRE (GPA)} = \frac{\text{VOLUME DISCHARGED}}{\text{ACRES COVERED}}$$

$$\text{ACRES COVERED} = \frac{(\text{RUN LENGTH- FEET}) \times (\text{SWATH WIDTH}) \times (\text{NO. OF RUNS})}{43,560 \text{ FT}^2/\text{ACRE}}$$

EXAMPLE: Six gallons of material was discharged while flying a 2,000' calibration run 4 times in each direction on a 70' swath with 30-psi spray pressure.

$$\text{ACRES COVERED} = \frac{(2,000') \times (70' \text{ SWATH}) \times (8 \text{ RUNS})}{43,560 \text{ FT}^2/\text{ACRE}}$$

$$\text{ACRES COVERED} = 25.7 \text{ ACRES}$$

$$\text{GPA} = \frac{6 \text{ GAL}}{25.7 \text{ ACRES}} = .23 \text{ GAL/ACRE}$$

NOTE: Spray pressure required to apply another finished spray rate can be calculated with the previously explained hydraulic flow formula.

EXAMPLE: CALCULATE PRESSURE REQUIRED TO APPLY .25 GPA

$$P_2 = P_1 \left(\frac{\text{VOLUME}_2}{\text{VOLUME}_1} \right)^2$$

$$P_1 = 30 \text{ PSI}$$

$$\text{VOLUME}_2 = .25 \text{ GPA}$$

$$\text{VOLUME}_1 = .23 \text{ GPA}$$

$$P_2 = 30 \text{ PSI} \left(\frac{.25 \text{ GPA}}{.23 \text{ GPA}} \right)^2$$

$$P_2 = 30 \text{ PSI (1.18)}$$

$$P_2 = 35 \text{ PSI}$$

TABLE XIII

ACRES FOR VARIOUS SWATH WIDTHS AND CALIBRATION RUN LENGTHS

RUNLENGTH (MILES)	SWATH WIDTH (FEET)															
	30	35	40	45	50	55	60	65	70	80	90	100	110	120	130	150
.05	.182	.212	.242	.273	.303	.333	.364	.394	.424	.485	.545	.606	.667	.727	.788	.90
.10	.364	.424	.485	.545	.606	.667	.727	.788	.848	.970	1.09	1.21	1.33	1.45	1.58	1.82
.20	.727	.848	.970	1.09	1.21	1.33	1.45	1.58	1.70	1.94	2.18	2.42	2.67	2.91	3.15	3.64
.25	.909	1.06	1.21	1.36	1.52	1.67	1.82	1.97	2.12	2.42	2.73	3.03	3.33	3.64	3.94	4.55
.30	1.09	1.27	1.45	1.64	1.82	2.00	2.18	2.36	2.55	2.91	3.27	3.64	4.00	4.36	4.72	5.45
.40	1.45	1.70	1.94	2.18	2.42	2.67	2.91	3.15	3.39	3.88	4.36	4.85	5.33	5.82	6.30	7.27
.50	1.82	2.12	2.42	2.73	3.03	3.33	3.64	3.94	4.24	4.85	5.45	6.06	6.67	7.27	7.88	9.09
.60	2.18	2.55	2.91	3.27	3.64	4.00	4.36	4.72	5.09	5.82	6.55	7.27	8.00	8.73	9.45	10.9
.70	2.55	2.97	3.39	3.82	4.24	4.67	5.09	5.52	5.94	6.79	7.64	8.48	9.33	10.2	11.0	12.7
.80	2.91	3.39	3.88	4.36	4.85	5.33	5.82	6.30	6.79	7.76	8.73	9.70	10.7	11.6	12.6	14.5
.90	3.27	3.82	4.36	4.91	5.45	6.00	6.55	7.09	7.64	8.73	9.82	10.9	12.0	13.1	14.2	16.4
1.00	3.64	4.24	4.85	5.45	6.06	6.67	7.27	7.88	8.48	9.70	10.9	12.1	13.3	14.5	15.8	18.2
1.10	4.00	4.67	5.33	6.00	6.67	7.33	8.00	8.67	9.33	10.67	12.0	13.3	14.7	16.0	17.3	20.0
1.20	4.36	5.09	5.82	6.55	7.27	8.00	8.73	9.45	10.1	11.6	13.1	14.5	16.0	17.5	18.9	21.8
1.30	4.73	5.52	6.30	7.09	7.88	8.67	9.45	10.20	11.0	12.6	14.2	15.8	17.3	18.9	20.5	23.6
1.40	5.09	5.94	6.79	7.64	8.48	9.33	10.20	11.00	11.9	13.6	15.3	17.0	18.7	20.4	22.1	25.5
1.50	5.45	6.36	7.27	8.18	9.09	10.00	10.90	11.80	12.7	14.5	16.4	18.2	20.0	21.8	23.6	27.3

TABLE XIV

ACRES FOR VARIOUS SWATH WIDTHS AND CALIBRATION RUN LENGTHS

RUNLENGTH (FEET)	SWATH WIDTH (FEET)															
	30	35	40	45	50	55	60	65	70	80	90	100	110	120	130	150
600	.413	.482	.551	.620	.689	.758	.826	.895	.964	1.10	1.24	1.38	1.52	1.65	1.79	2.07
700	.482	.562	.643	.723	.803	.884	.964	1.04	1.12	1.29	1.45	1.61	1.77	1.93	2.09	2.41
800	.551	.643	.735	.826	.918	1.01	1.10	1.19	1.29	1.47	1.65	1.84	2.02	2.20	2.39	2.75
900	.620	.723	.826	.930	1.03	1.14	1.24	1.34	1.45	1.65	1.86	2.07	2.27	2.48	2.69	3.10
1,000	.689	.803	.918	1.03	1.15	1.26	1.38	1.49	1.61	1.84	2.07	2.30	2.53	2.75	2.98	3.44
1,100	.758	.884	1.01	1.14	1.26	1.39	1.52	1.64	1.77	2.02	2.27	2.53	2.78	3.03	3.28	3.79
1,200	.826	.964	1.10	1.24	1.38	1.52	1.65	1.79	1.93	2.20	2.48	2.75	3.03	3.31	3.58	4.13
1,300	.895	1.04	1.19	1.34	1.49	1.64	1.79	1.94	2.09	2.39	2.69	2.98	3.28	3.58	3.88	4.48
1,400	.964	1.12	1.29	1.45	1.61	1.77	1.93	2.09	2.25	2.57	2.89	3.21	3.53	3.86	4.18	4.82
1,500	1.03	1.21	1.38	1.55	1.72	1.89	2.07	2.24	2.41	2.75	3.10	3.44	3.79	4.13	4.48	5.17
1,600	1.10	1.29	1.47	1.65	1.84	2.02	2.20	2.39	2.57	2.94	3.31	3.67	4.04	4.41	4.78	5.51
1,800	1.24	1.45	1.65	1.86	2.07	2.27	2.48	2.69	2.89	3.31	3.72	4.13	4.55	4.96	5.37	6.20
2,000	1.38	1.61	1.84	2.07	2.30	2.53	2.75	2.98	3.21	3.67	4.13	4.59	5.05	5.50	5.97	6.89
2,200	1.52	1.77	2.02	2.27	2.53	2.78	3.03	3.28	3.54	4.04	4.55	5.05	5.56	6.06	6.57	7.58
2,400	1.65	1.93	2.20	2.48	2.75	3.03	3.31	3.58	3.86	4.41	4.96	5.51	6.06	6.61	7.16	8.26
2,600	1.79	2.09	2.39	2.69	2.98	3.28	3.58	3.88	4.18	4.78	5.37	5.97	6.56	7.16	7.76	8.95
2,800	1.93	2.25	2.57	2.89	3.21	3.53	3.86	4.18	4.50	5.14	5.79	6.43	7.07	7.71	8.36	9.64
3,000	2.07	2.41	2.75	3.10	3.44	3.79	4.13	4.48	4.82	5.51	6.20	6.89	7.58	8.26	8.95	10.3
3,200	2.20	2.57	2.94	3.31	3.67	4.04	4.41	4.78	5.14	5.88	6.61	7.35	8.08	8.82	9.55	11.0
3,400	2.34	2.73	3.12	3.51	3.90	4.29	4.68	5.07	5.46	6.24	7.02	7.81	8.59	9.37	10.1	11.7
3,600	2.48	2.89	3.31	3.72	4.13	4.55	4.96	5.37	5.79	6.61	7.43	8.26	9.09	9.92	10.7	12.4
3,800	.62	3.05	3.49	3.93	4.36	4.80	5.23	5.67	3.11	6.98	7.85	8.72	9.60	10.5	11.3	13.1
4,000	2.75	3.21	3.67	4.13	4.59	5.05	5.50	5.97	6.43	7.35	8.26	9.18	10.1	11.0	11.9	13.8