APPENDIX

Jamming Calculations

The three methods used in jamming calculations involve jamming formulas, the GTA 30-6-5, and the JAMPOT fan. The jamming formulas are used to determine the jamming power output and jammer distance to target. Calculations are made manually. The GTA 30-6-5 results require the aid of the electronic warfare jamming calculator. Likewise, the results achieved with the JAMPOT fan require the aid of a JAMPOT fan template.

ABBREVIATIONS AND FORMUL4S

Understanding the abbreviations and jamming formulas presented makes jamming mission computation easier. When planning a jamming mission, it is necessary to make a thorough and reasonable appraisal of the significant technical factors that impact on effective jamming missions. Once these factors are determined, they are used to select the proper jamming equipment to conduct the jamming mission.

Abbreviations

Study the following abbreviations before reading further. They will be used often, and a little time spent on them now may preclude the necessity of constantly turning the pages to understand what they mean. Additionally, as you use these formulas, ensure you are using the numbers in the proper units (for example, power in watts, distance in kilometers, and elevation in feet).

P_j = Minimum amount of jammer power output required in watts (read on power output meter of the jammer).

P_t = Power output of the enemy transmitter in watts.

H_j = Elevation of the jammer location above the sea level.

NOTE: *The elevation of the jammer location and the enemy transmitter location does not include the height of the antenna above the ground or the length of the antenna.* ***It is the location elevation above the sea level.***

H_t = Elevation of the enemy transmitter location above the sea level.

D_j = Jammer location-to-target receiver location distance in kilometers.

D_t = Enemy transmitter location-to-target receiver location distance in kilometers.

K = Number 2 for jamming frequency modulated receivers (jammer tuning accuracy).

n = Terrain and ground conductivity factor.

- **5 =** Very rough terrain (rocky mountains or desert) with poor ground conductivity.
- **4 =** Moderately rough terrain (rolling to high hills, forested farmland) with fair to good ground conductivity.
- **3 =** Rolling hills (farmland type terrain) with good ground conductivity.
- **2 =** Level terrain (over water, sea, lakes, and ponds) with good ground conductivity.

Jamming Formulas

Jamming formulas provide the tools needed to compute the jamming power output and jammer distances. The formulas presented here are based on a tactical situation where the enemy transmitter-receiver link and jammer-enemy receiver link are operating over moderately rough terrain with no high hills between the two locations. The enemy transmitter and friendly jammer locations are at approximately the same elevation above the sea level (difference is less than 10 meters). When the terrain features differ by more than 10 meters between the enemy transmitter and friendly jammer locations, the mission planner must factor this difference into his calculations.

FORMULA 1

Formula 1 (Figure A-1) is used to compute the minimum jammer power output that is required (the least amount) to effectively jam the target receiver.

Formula 1 is written as–

$$P_j = P_t \times K \times \left(\frac{H_t}{H_j}\right)^2 \times \left(\frac{D_j}{D_t}\right)^n$$

Figure A-1. Formula 1.

EQUIPMENT PARAMETERS

The equipment parameters of friendly and enemy equipment are needed to solve this formula. The parameters of friendly equipment can be obtained from the technical manuals written for the equipment. Technical intelligence publications on enemy communications systems provide similar data and can be obtained from the G2. When information is not available on enemy communications systems, it may become necessary to estimate the parameters to reach a solution. In the following tactical situation, the essential parameters needed to compute formula 1 are given as:

f = Frequency (37.5 megahertz).

D_t = Enemy transmitter location-to-target receiver location distance in km (9 km).

D_j = Jammer location-to-target receiver location distance in km (17 km).

P_t = Power output of the enemy transmitter in watts (5 watts).

P_j = Minimum amount of jammer power output required in watts (solve).

H_t = Elevation of the enemy transmitter location above the sea level in meters (385 meters).

H_j = Elevation of the jammer location above the sea level in meters (388 meters).

K = FM jammer tuning accuracy (2).

n = Terrain and ground conductivity factor (4).

Substitute the parameters in formula 1 using the steps shown in Table A-1 on page A-4 to solve for P_j.

Table A-1. Formula 1 calculations.

STEP 1

Replace P_t with 5.

$$P_j = 5 \times K \times \left(\frac{H_t}{H_i}\right)^2 \times \left(\frac{D_j}{D_t}\right)^n$$

STEP 2

Replace K with 2.

$$P_j = 5 \times 2 \times \left(\frac{H_t}{H_j}\right)^2 \times \left(\frac{D_j}{D_t}\right)^n$$

STEP 3

Replace H_t with 385.

$$P_j = 5 \times 2 \times \left(\frac{385}{H_j}\right)^2 \times \left(\frac{D_j}{D_t}\right)^n$$

STEP 4

Replace H_j with 386.

$$P_j = 5 \times 2 \times \left(\frac{385}{386}\right)^2 \times \left(\frac{D_j}{D_t}\right)^n$$

STEP 5

Replace D_j with 17.

$$P_j = 5 \times 2 \times \left(\frac{385}{386}\right)^2 \times \left(\frac{17}{D_t}\right)^n$$

STEP 6

Replace D_t with 9.

$$P_j = 5 \times 2 \times \left(\frac{385}{386}\right)^2 \times \left(\frac{17}{9}\right)^n$$

STEP 7

Replace n with 4.

$$P_j = 5 \times 2 \times \left(\frac{385}{386}\right)^2 \times \left(\frac{17}{9}\right)^4$$

At this point, you have replaced the formula 1 parameters with the given numerical values to solve for P_j. The following steps involve completing the mathematical computations.

(Steps 8 through 13 are continued on the next page.)

Table A-1. Formula 1 calculations (continued).

STEP 8

Multiply 5 by 2; divide 385 by 386; divide 17 by 9.

$$P_j = 10\ x\ (1)^2\ x\ (1.88)^4$$

If the difference between H_t (385) and H_j (386) is less than 10 meters, the elevation factor is 1. When dividing D_j (17) by D_t (9), use the second decimal place and do not round off.

STEP 9

Reduce $(1)^2$ to 1. $P_j = 10\ x\ 1\ x\ (1.88)^4$

STEP 10

Multiply 1.88 by 1.88. $P_j = 10\ x\ (3.53)^2$

STEP 11

Multiply 3.53 by 3.53. $P_j = 10\ x\ 12.46$

STEP 12

Multiply 12.46 by 10. $P_j = 124.60$ or 125 *watts*

STEP 13

If the jammer's LPA antenna is used, divide the power output from step 12 by 2. $P_j = \frac{125}{2} = 62.5$ *watts*

The selected jammer must be able to produce and use 125 watts of power output to overcome the enemy's transmitter signal at the target receiver location. Less than 124.6 watts of power will not be effective. If more than 125 watts are used, jamming will still be effective. The 125 watts represents the minimum power output reading for effective jamming using a whip antenna in this tactical situation. The 62.5 watts is the minimum power for the same problem when using the jammer's log periodic array (LPA) antenna.

FORMULA 2

Formula 2 (Figure A-2) is used to compute the maximum distance that a jammer's location can be from the target receiver location and still be effective. Use 1,500 watts as the maximum jammer power output in this tactical situation. Substitute the rest of the numerical values from formula 1 for the parameters in formula 2. Use the steps in Table A-2 to find the solution for the maximum jammer location-to-target receiver location distance.

Formula 2 is written as–

$$D_j = D_t \sqrt[n]{\frac{P_j}{P_t \times K \times \left(\frac{H_t}{H_j}\right)^2}}$$

Figure A-2. Formula 2.

Table A-2. Formula 2 calculations.

STEP 1 Replace D_t with 9.	$D_j = 9 \sqrt[n]{\frac{P_j}{P_t \times K \times \left(\frac{H_t}{H_j}\right)^2}}$
STEP 2 Replace n with 4.	$D_j = 9 \sqrt[4]{\frac{P_j}{P_t \times K \times \left(\frac{H_t}{H_j}\right)^2}}$

(Steps 3 through 8 are continued on the next page.)

Table A-2. Formula 2 calculations (continued).

STEP 3

Replace P_t with 5.

$$D_j = 9\sqrt[4]{\frac{P_j}{5 \times K \times \left(\frac{H_t}{H_j}\right)^2}}$$

STEP 4

Replace K with 2.

$$D_j = 9\sqrt[4]{\frac{P_j}{5 \times 2 \times \left(\frac{H_t}{H_j}\right)^2}}$$

STEP 5

Replace H_t with 385.

$$D_j = 9\sqrt[4]{\frac{P_j}{5 \times 2 \times \left(\frac{385}{H_j}\right)^2}}$$

STEP 6

Replace H_j with 386.

$$D_j = 9\sqrt[4]{\frac{P_j}{5 \times 2 \times \left(\frac{385}{386}\right)^2}}$$

STEP 7

Replace P_j with 1,500.

$$D_j = 9\sqrt[4]{\frac{1500}{5 \times 2 \times \left(\frac{385}{386}\right)^2}}$$

At this point, you have replaced the formula 2 parameters with the numerical values given to solve for D_j. Perform the mathematical calculations in the following steps (8 through 13), to find the solution for the maximum distance between the jammer and target receiver when using the **jammer's whip antenna**. If the jammer's LPA antenna is used, go directly to step 14. Do not perform steps 8 through 13.

STEP 8

Multiplying 2 by 5 equals 10. Dividing 385 by 386 equals .99; however, when the difference between elevation levels is less than 10 meters, use the multiplication factor of 1. Therefore, 1^2 is reduced to 1.

$$D_j = 9\sqrt[4]{\frac{1500}{10 \times 1}}$$

(Steps 9 through 13 are continued on the next page.)

Table A-2. Formula 2 calculations (continued).

STEP 9

Multiplying 10 times 1 equals 10.

$$D_j = 9 \sqrt[4]{\frac{1500}{10}}$$

STEP 10

Dividing 1,500 by 10 equals 150.

$$D_j = 9 \sqrt[4]{150}$$

Steps 11 and 12 perform the same function as the fourth root (step 10). Taking the square root twice is the same as taking the fourth root of a number.

STEP 11

The square root of 150 is 12.247 or 12.25.

$$D_j = 9 \sqrt[2]{150} = 12.25$$

STEP 12

The square root of 12.25 is 3.5.

$$D_j = 9 \sqrt[2]{12.25} = 3.5$$

STEP 13

Multiply 9 times 3.5.

$$D_j = 9 \times 3.5 = 31.5$$

The distance is 31.5 kilometers when using the jammer's **whip antenna**. Steps 1 through 13 of formula 2 illustrate the maximum distance a jammer can be operated and still be effective against a target receiver in this tactical situation.

(Steps 14 through 17 are continued on the next page.)

Table A-2. Formula 2 calculations (continued).

NOTE: Steps 1 through 13 are calculated based on the power output using a whip antenna. The LPA antenna increases the potential of the maximum power output and requires different calculations. Continue with steps 14 through 20 when the LPA antenna is used instead of the whip antenna.

STEP 14

Double the selected jammer's maximum power output when using the LPA antenna. If the maximum power output is 1,500 watts, then P_j times 2 equals 3,000 watts. Replace P_j with 3,000.

$$D_j = 9\sqrt[4]{\frac{3000}{5 \times 2 \times \left(\frac{385}{386}\right)^2}}$$

STEP 15

Multiplying 2 by 5 equals 10. Dividing 385 by 386 equals .99; however, when the difference between elevation levels is less than 10 meters, use the multiplication factor of 1. Therefore, 1^2 is reduced to 1.

$$D_j = 9\sqrt[4]{\frac{3000}{10 \times 1}}$$

STEP 16

Multiplying 10 times 1 equals 10.

$$D_j = 9\sqrt[4]{\frac{3000}{10}}$$

STEP 17

Dividing 3,000 by 10 equals 300.

$$D_j = 9\sqrt[4]{300}$$

Steps 18 and 19 perform the same function as finding the fourth root (step 17). Taking the square root twice provides the same result as taking the fourth root of a number.

(Steps 18 through 20 are continued on the next page.)

Table A-2. Formula 2 calculations (continued).

STEP 18

The square root of 300 = 17.32

$$D_j = 9 \sqrt[2]{300} = 17.32$$

STEP 19

The square root of 17.32 is 4.16.

$$D_j = 9 \sqrt[2]{17.32} = 4.16$$

STEP 20

Multiply 9 by 4.16.

$$D_j = 9 \times 4.16 = 37.44 \ km$$

The formula 2 computation illustrates the maximum distance that the jammer can be located from the target receiver's location and still be effective. In this tactical situation, that distance is 37.44 kilometers when using the jammer's LPA antenna.

TERRAIN AND GROUND CONDUCTIVITY FACTORS

As previously mentioned, the attenuation of radio waves is subject to terrain and ground conductivity factors (n). Table A-3 on page A-11 is used to compute the minimum jammer power output and maximum jammer location-to-target receiver location distance. Multiply the watts from Table A-3 by the power output of the enemy's transmitter to obtain the minimum power output. The factor of n equals 5 is used for very rough terrain (deserts or mountains) with poor ground conductivity. The table is a matrix. The left column (reading down from 0.5 to 10.0) is the jammer location-to-target receiver location distance in kilometers. The top line of numbers (0.5 to 5.0) is the enemy transmitter-to-target receiver location distance in kilometers. The internal numbers (1 through 26.4K) are expressed in watts or kilowatts (K equals multiplication by 1,000).

To use the table, take the kilometers reading from the left column and the kilometers reading from the top line and find where they intersect. For example, if the jammer is 1.5 kilometers from the target and the enemy transmitter is 0.5 from the target, the factor is 486 watts. This means if the enemy transmitter uses only 1 watt, the jammer must use at least 486 watts to be successful under these conditions.

The factor of 486 is achieved by dividing the jammer location-to-target receiver distance (1.5) by the enemy transmitter location-to-target receiver distance (0.5). The result (3) is first raised to the fifth power (243) and then doubled *(486)*. When fractions are encountered as result of division (for example 8.5 km divided by 4.5 kilometers equals 1.8888), only the first two digits to the right of the decimal are used, and the fraction is not rounded off. Therefore, for the purpose of finding then factor, 1.8888 is viewed as 1.88.

Table A-3. Desert or mountain terrain (n = 5) in kilometers.

D_j	D_t 0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
0.5	2	1	1	1	1	1	1	1	1	1
1.0	64	2	1	1	1	1	1	1	1	1
1.5	486	15	2	1	1	1	1	1	1	1
2.0	2048	64	9	2	1	1	1	1	1	1
2.5	6250	196	26	6	2	1	1	1	1	1
3.0	15.6K	486	64	15	5	2	1	1	1	1
3.5	33.6K	1051	139	33	11	5	2	1	1	1
4.0	65.5K	2048	270	64	21	9	4	2	1	1
4.5	118K	3691	486	116	38	15	7	4	2	1
5.0	200K	6250	823	196	64	26	12	6	4	2
5.5		10K	1326	315	103	42	20	10	6	4
6.0		15.6K	2048	486	160	64	30	15	9	5
6.5		23.2K	3056	726	238	96	45	23	13	8
7.0		33.6K	4427	1051	345	139	64	33	19	11
7.5		47.5K	6250	1483	486	196	91	47	26	15
8.0		65.6K	8630	2048	671	270	125	64	36	21
8.5		88.8K	11.7K	2774	909	366	169	87	48	29
9.0		118K	15.6K	3691	1210	486	225	116	64	38
9.5			20.4K	4836	1585	637	295	152	84	50
10.0			26.4K	6250	2048	823	381	196	108	64

Table A-4 is similar to Table A-3, but the internal numbers are changed. They are based a factor of n = 4. After dividing the jammer-t.o-target receiver distance by the enemy transmitter location-to-target receiver distance, the result is raised to the fourth power and then doubled.

Table A-4. Rolling hills terrain (n = 4) (moderately rough, with good ground conductivity) in kilometers.

D_J	D_T 0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
0.5	2	1	1	1	1	1	1	1	1	1
1.0	32	2	1	1	1	1	1	1	1	1
1.5	162	10	2	1	1	1	1	1	1	1
2.0	512	32	6	2	1	1	1	1	1	1
2.5	1250	78	15	5	2	1	1	1	1	1
3.0	2592	162	32	10	4	2	1	1	1	1
3.5	4802	300	59	19	8	4	2	1	1	1
4.0	8192	512	101	32	13	6	3	2	1	1
4.5	13.1K	820	162	51	21	10	6	3	2	1
5.0	20K	1250	247	78	32	15	8	5	3	2
5.5	29.3K	1830	362	114	47	23	12	7	5	3
6.0	41.5K	2592	512	162	66	32	17	10	6	4
6.5	57.1K	3570	705	223	91	44	23	14	9	6
7.0	76.8K	4802	949	300	123	59	32	19	12	8
7.5	101K	6328	1250	396	162	78	42	25	15	10
8.0	131K	8192	1618	512	210	101	55	32	20	13
8.5	167K	10.4K	2062	653	267	129	70	41	26	17
9.0	210K	13.1K	2592	820	336	162	87	51	32	21
9.5	261K	16.3K	3218	1018	417	201	109	64	40	26
10.0	320K	20K	3951	1250	512	247	132	78	49	32

Table A-5 is based on a factor of n = 3. After dividing the jammer-to-target receiver distance by the enemy transmitter location-to-target receiver distance, the result is raised to the third power and doubled.

Table A-5. Moderately level terrain (n = 3) (rolling hills or farmland, with good ground conductivity) in kilometers.

D_j	D_t 0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
0.5	2	1	1	1	1	1	1	1	1	1
1.0	16	2	1	1	1	1	1	1	1	1
1.5	54	7	2	1	1	1	1	1	1	1
2.0	128	16	5	2	1	1	1	1	1	1
2.5	250	31	9	4	2	1	1	1	1	1
3.0	432	54	16	7	4	2	1	1	1	1
3.5	686	86	25	11	6	3	2	1	1	1
4.0	1024	128	38	16	8	5	3	2	1	1
4.5	1458	182	54	23	12	7	4	3	2	1
5.0	2000	250	74	31	16	9	6	4	3	2
5.5	2662	333	99	42	21	12	8	5	4	3
6.0	3456	432	128	54	28	16	10	7	5	4
6.5	4394	549	163	69	35	20	13	9	6	4
7.0	5488	686	203	86	44	25	16	11	8	6
7.5	6750	844	250	106	54	31	20	13	9	7
8.0	8192	1024	303	128	66	38	24	16	11	8
8.5	9826	1228	364	154	79	46	29	19	14	10
9.0	11.7K	1458	432	182	93	54	34	23	16	12
9.5	13.7K	1715	508	214	110	64	40	27	19	14
10.0	16K	2000	593	250	128	74	47	31	22	16

Table A-6 is based on a factor of n = 2. After dividing the jammer-to-target receiver distance by the enemy transmitter location-to-target receiver distance, the result is raised to the second power and doubled.

Table A-6. Level terrain (n = 2) (over sea water, with good ground conductivity) in kilometers.

D_j	D_t 0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
0.5	2	1	1	1	1	1	1	1	1	1
1.0	8	2	1	1	1	1	1	1	1	1
1.5	18	5	2	1	1	1	1	1	1	1
2.0	32	8	4	2	1	1	1	1	1	1
2.5	50	13	6	4	2	1	1	1	1	1
3.0	72	18	8	5	3	2	1	1	1	1
3.5	98	25	11	6	4	3	2	1	1	1
4.0	128	32	14	8	5	4	3	2	1	1
4.5	162	41	18	10	7	5	3	3	2	1
5.0	200	50	22	13	8	6	4	3	3	2
5.5	242	61	27	15	10	7	5	4	3	2
6.0	288	72	32	18	12	8	6	5	4	3
6.5	338	85	38	21	14	9	7	5	4	3
7.0	392	98	44	25	16	11	8	6	5	4
7.5	450	113	50	28	18	13	9	7	6	5
8.0	512	128	57	32	21	14	10	8	6	5
8.5	578	145	64	36	23	16	12	9	7	6
9.0	648	162	72	41	26	18	13	10	8	7
9.5	722	181	80	45	29	20	15	11	9	7
10.0	800	200	89	50	32	22	16	13	10	8

Tables A-3 through A-6 are reliable under the following conditions:

- Elevation of the jammer location above the sea level is approximately the same as the elevation of the enemy transmitter location (less than 10 meters difference).
- Power values obtained from the tables match the reading on the jammer's power output meter. (Antenna loss and voltage standing wave ratio have been taken into account.)
- Power values are used with the jammer's whip antenna.
- Jammer location must have a reasonable LOS propagation path to the target receiver location with no high hills between the two locations.
- Jammer is used against frequency modulated voice communications in the VHF range.

The exceptions to the above conditions are—

- If the elevation of the jammer location and the enemy transmitter location difference is 10 meters or more.
- If the LPA antenna is used instead of a whip antenna, the power indicated must be divided by 2.

ELEVATION RATIO AND MULTIPLICATION FACTORS

Table A-7, page A-16, is used to convert the minimum jammer power output value obtained from Table A-3. It is used when the elevation difference of the jammer location and the enemy transmitter location is 10 or more meters.

Determine the Elevation Ratio

To convert the minimum jammer power output from Table A-3, the elevation ratio must be determined. To do this, divide the jammer location elevation by the enemy transmitter location elevation. The jammer location-to-enemy transmitter location elevation ratios are listed in the left column in Table A-7. Rounding down, find the next lower elevation ratio number which is closest to your computed ratio. Always round the ratio down to the next lower ratio number in the table to ensure that there will be sufficient power output for effective jamming. The figure to the right of the numbers is the elevation multiplication factor. Multiply the minimum jammer power output value from Table A-3 by the elevation multiplication factor from Table A-7. The result is the final minimum jammer power output necessary for effective jamming, in this location elevation ratio situation.

Determine the Multiplication Factor

As an example, we will use the minimum jammer power output from Table A-3 of 64 watts. The elevation of the jammer location is 435 meters and the elevation of the enemy transmitter location is 557 meters. Determine the location elevation ratio by dividing the jammer location elevation (435 meters) by the enemy transmitter location elevation (557 meters). The result is the fraction .78. Round the fraction **down** to the nearest number on Table A-7 (.75). Read to the right of .75 and the multiplication factor is 1.8. Next, multiply the jammer power output selected from Table A-3 (64 watts) by the multiplication factor of (1.8). The answer is 115.2 or 116. The 116 watts is adjusted into a power output figure used in computing the final jammer power output which can be used for effective jamming.

Table A-7. Elevation ratio and multiplication factor.

RATIO	MULTIPLIER	RATIO	MULTIPLIER	RATIO	MULTIPLIER
0.05	400.0	1.05	.91	2.05	.24
0.10	44.5	1.10	.83	2.10	.23
0.15	25.0	1.15	.76	2.15	.22
0.20	16.0	1.20	.70	2.20	.21
0.25	11.2	1.25	.64	2.25	.20
0.30	8.2	1.30	.60	2.30	.19
0.35	6.3	1.35	.55	2.35	.18
0.40	5.0	1.40	.52	2.40	.17
0.45	4.0	1.45	.48	2.45	.17
0.50	3.4	1.50	.45	2.50	.16
0.55	2.8	1.55	.42	2.55	.15
0.60	2.4	1.60	.40	2.60	.15
0.65	2.3	1.65	.37	2.65	.14
0.70	2.1	1.70	.35	2.70	.14
0.75	1.8	1.75	.33	2.75	.13
0.80	1.6	1.80	.31	2.80	.13
0.85	1.4	1.85	.30	2.85	.12
0.90	1.3	1.90	.28	2.90	.12
0.95	1.2	1.95	.27	2.95	.11
1.00	1.0	2.00	.25	3.00	.11

NOTE: For all elevation ratios above 3.00, use an elevation multiplier of .11.

MINIMUM JAMMER POWER OUTPUT REQUIREMENT

Table A-8 is a step-by-step exercise to determine the minimum jammer power output for effective jamming using Table A-3 (desert terrain) with the following parameters:

- Enemy transmitter-to-target receiver distance
- Jammer-to-target receiver distance (18 km).
- Enemy transmitter power output (1.5 watts).
- Jammer location elevation above the sea level (85 meters).
- Enemy transmitter location elevation above the sea level (68 meters).

Table A-8. Finding the minimum jammer power output.

STEP 1

When the parameters for D_j or D_t are too large for the table being used, divide both distances by the lowest common denominator to bring the numbers into the range of the table. In this case, D_j equals 18 km and D_t equals 8 km. Divide both by 2 to bring the numbers into the desired range. Dividing 18 by 2 equals 9 for the D_j. Dividing 8 by 2 equals a D_t of 4. A D_j of 9 and D_t of 4 are within the range of Table 3-3.

STEP 2

Read Table 3-3 from left to right along the 9.0 D_j line to the 4.0 D_t column. The reading is 116 watts of power output where they intersect.

D_j \ D_t	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
8.5	88.8K	11.7K	2774	909	366	169	87	48	29	
9.0	118K	15.6K	3691	1210	486	225	**116**	64	38	
9.5		20.4K	4836	1585	637	295	152	84	50	

STEP 3

Multiply 116 watts (from Table 3-3) times 1.5 (enemy transmitter power output). *Your answer should be* **174** *watts.*

STEP 4

Divide the jammer location elevation (85) by the enemy transmitter location elevation (68). *The answer is* **1.25**.

(Steps 5 through 7are continued on the next page).

Table A-8. Finding the minimum jammer power output (continued).

STEP 5

Use Table 3-7 to determine the multiplication factor. Find 1.25 in the ratio column. The fraction to right of 1.25 is the elevation multiplier (.64).

RATIO	MULTIPLIER	RATIO	MULTIPLIER	RATIO	MULTIPLIER
0.25	11.2	**1.25**	**.64**	2.25	.20
0.30	8.2	1.30	.60	2.30	.19
0.35	6.3	1.35	.55	2.35	.18

STEP 6

Multiply 174 watts by .64 to find the minimum jammer power output required for effective jamming. *The minimum jammer power for this situation is* **111.36**.

Select a jammer which meets or exceeds this minimum of 111 watts. Table A-9 contains a list of current jammers to aid in the selection process.

STEP 7

If the jammer's LPA antenna is used, divide the power output from step 6 by 2. Dividing 111 by 2 equals 55.5 or 56 watts.

Table A-9. Jamming equipment list.

NAME	FREQUENCY RANGE	MAXIMUM POWER OUTPUT	MODULATION
AN/TLQ-15	1.5-20 MHz	2,000 watts	CW, AM, FM, DSSB
AN/TLQ-17A(V)3	1.5-80 MHz	550 watts	CW, AM, FM, SSB
AN/ULQ-19	20-80 MHz	100 watts	FM

MAXIMUM JAMMER DISTANCE

The following parameters are provided to compute the maximum distance a jammer location can be from the target receiver location (Table A-10):

- Enemy transmitter-to-target receiver distance (3 km).
- Enemy transmitter power output (2 watts).
- Jammer power output (550 watts).
- Jammer location elevation above the sea level (385 meters).
- Enemy transmitter location elevation above the sea level (386 meters).

Table A-10. Finding the maximum effective distance between a jammer and its target.

STEP 1

Determine the difference between the jammer location elevation (385) and the enemy transmitter location elevation (386). Since the elevation difference is less than 10 meters the elevation multiplication factor is 1.

STEP 2

Divide the power output of the selected jammer in watts by the multiplication factor.

$$\frac{550}{1} = 550 \ \textit{watts}$$

STEP 3

Divide the power output (550) by the enemy transmitter power output (2).

$$\frac{550}{2} = 275 \ \textit{watts}$$

(Steps 4 through 6 are continued on the next page.)

Table A-10. Finding the maximum effective distance between a jammer and its target (continued).

STEP 4

From Table 3-3, determine the power output in watts. Read down the D_t=3.0 column to the next lower power output value under 275 watts (270 watts).

D_j	D_t 0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
7.5		47.5K	6250	1483	486	196	91	47	26	15
8.0		65.6K	8630	2048	671	**270**	125	64	36	21
8.5		88.8K	11.7K	2774	909	366	169	87	48	29

NOTE: If the D_t value is not on the table, divide this distance by a number that would bring it into the range of the table. For example, if the enemy transmitter-to-target receiver distance were 6 km, it would have to be divided by 2 to use the table. In this case, the D_j must also be multiplied by 2 to maintain the proper ratio.

STEP 5

Read left to the jammer to target receiver distance column. *The maximum effective distance is* **8.0** *km.*

STEP 6

If the jammer's LPA antenna is used, multiply the distance shown in step 5 by 2. In this case, the maximum distance that the jammer can be located from the target receiver and remain effective would be 16 km.

2 x 8.0 = 16 km

THE GTA 30-6-5 CALCULATOR

The **Electronic Warfare (EW) Jamming Calculator** (Figure A-3), provides a quick and easy method to calculate the minimum jammer power output required for effective jamming. This calculator can be used with any size map.

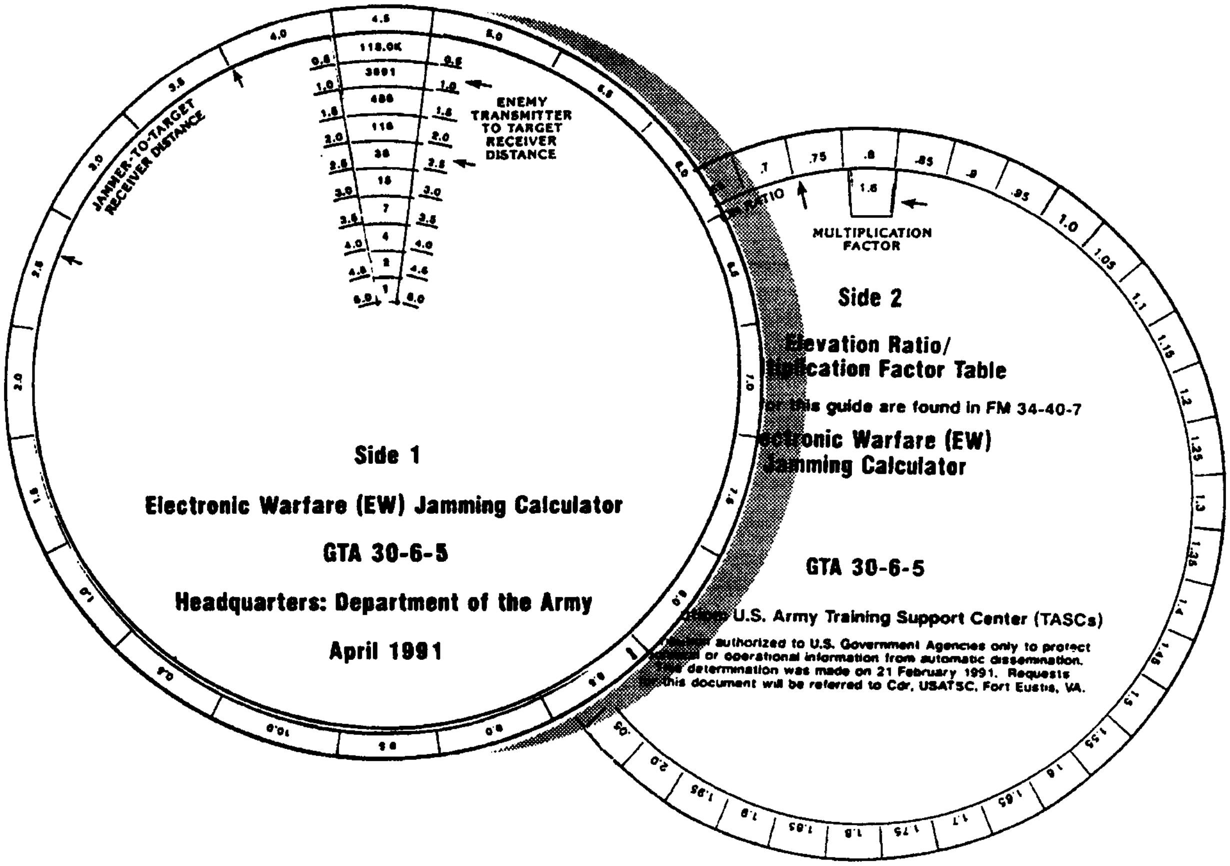


Figure A-3. Both sides of the GTA 30-6-5 calculator.

GTA 30-6-5 Calculator Effectiveness

The GTA 30-6-5 calculator is effective under the following conditions and parameters when—

- Frequency modulated voice communications in the VHF range are used.
- The enemy communication transmitter power output is known.
- The enemy communication transmitter-to-target receiver distance in kilometers is known.
- The jammer location-to-target receiver location distance in kilometers is known.
- The jammer location, enemy transmitter location, and target receiver location are known.
- All location elevations are measured from the sea level.
- Power output values calculated using the GTA 30-6-5 calculations are for the jammer's whip antenna. (If the LPA antenna is used, divide the final calculated power output by 2.)
- The minimum jammer power output calculated (in watts) must be read on the jammer's power output meter.
- Jammer location must have a reasonable LOS propagation path to the target receiver's location with no high hills between the two locations.

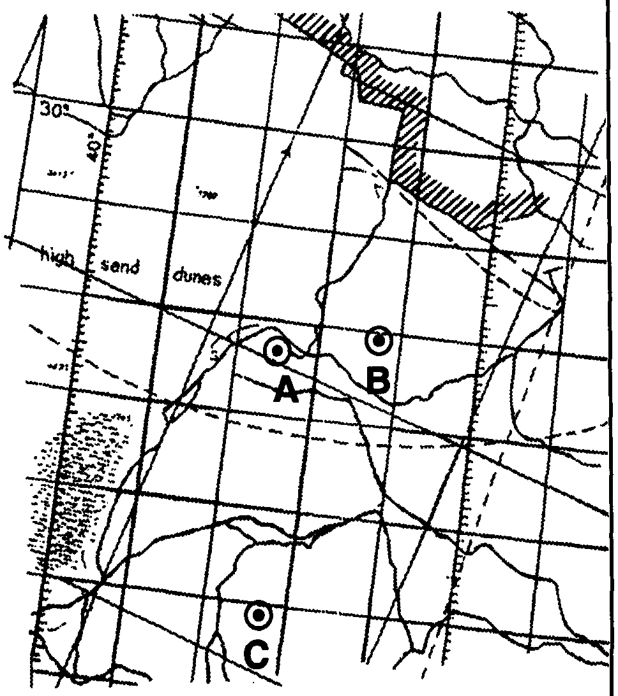
Minimum Jammer Power Output Required for Effective Jamming

Use the GTA 30-6-5 calculator shown in Figure A-3 to determine the minimum jammer power output required for effective jamming. Calculations include the minimum power for the whip antenna and the LPA antenna (Table A-11).

Table A-11. Minimum jamming power calculations.

STEP 1

Plot the locations of the enemy transmitter (A), the target receiver (B), and the selected jammer (C) on a map. The jammer selected is the AN/TLQ-17A(V)3 with maximum power output of 550 watts. The enemy transmitter power output is 3 watts.



(Steps 2 through 3B are continued on the next page.)

Table A-11. Minimum jamming power calculations (continued).

STEP 2

Determine the jammer location-to-target receiver location distance (D_j). Always **round up** the D_j number to the next higher .5 km. Determine the enemy transmitter location-to-target receiver distance (D_t).

D_j = 8.6 *km* = 9.0 *km*

D_t = 5.3 *km* = 5.0 *km*

Always **round down** the D_t number to the next lower .5 km. Determine the jammer location elevation (H_j) in meters. Determine the enemy transmitter location elevation (H_t) in meters.

H_j = 390 *meters*

H_t = 392 *meters*

STEP 3

When the H_j and H_t difference, above the sea level, is **less** than 10 meters, use the elevation multiplication factor of 1.

NOTE: Steps 3A through 3C would be used when the difference between the H_j and H_t is greater than 10 meters. These computations will compensate for the location elevation difference.

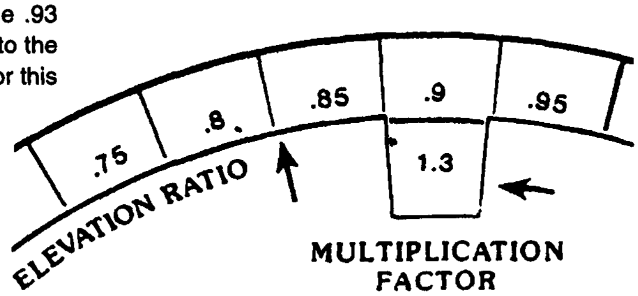
STEP 3A

If the H_t elevation were 420 instead of 392, divide the jammer's elevation (H_j of 390) by the enemy transmitter's elevation (H_t of 420). This fraction **(.93)** is the elevation ratio number.

$$\frac{H_j = 390}{H_t = 420} = .93$$

STEP 3B

Go to Side 2 on the GTA 30-6-5 calculator. Using the .93 elevation ratio number for this example, round it down to the next lower number found in the outer ring of Side 2. For this example it is **.9**.

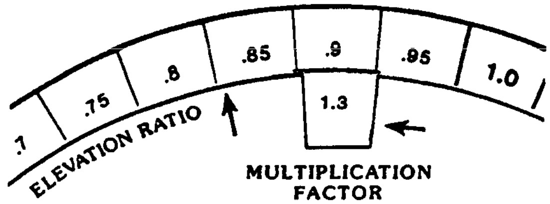


(Steps 3C through 4C are continued on the next page.)

Table A-11. Minimum jamming power calculations (continued).

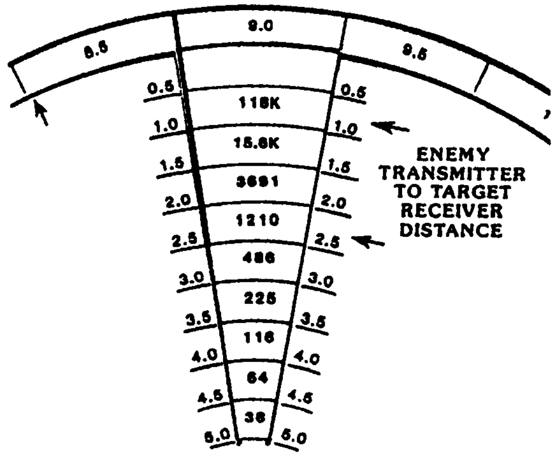
STEP 3C

Align the opening or slot of the smaller disk under the ELEVATION RATIO .9 on the outer ring. The MULTIPLICATION FACTOR of 1.3 will appear in the slot of the smaller disk.



STEP 4

Go to Side 1 of the GTA 30-6-5 calculator. Using the distances from step 2--where D_j is 9.0 km and D_t is 5.0 km, locate the JAMMER-TO-TARGET RECEIVER DISTANCE (D_j) of 9.0 km on the outer ring. Align the slot of the smaller disk with the 9.0 on the outer ring. Go down the edge of the slot on the smaller disk and find the ENEMY TRANSMITTER TO TARGET RECEIVER DISTANCE (D_t) 5.0 km.

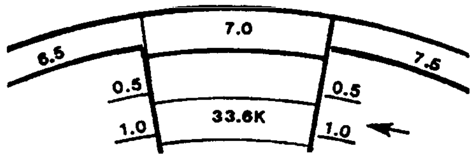


STEP 4A

When either the D_j or D_t is **greater** than the numbers listed on Side 1, divide both distances by the lowest possible denominator (2, 3, or 4 as required) to bring them within the range of the calculator. For example, if the D_j is 14 km and the D_t is 5.0 km, the lowest common denominator would be 2. Dividing the D_j and D_t by 2 equals 7.0 and 2.5.

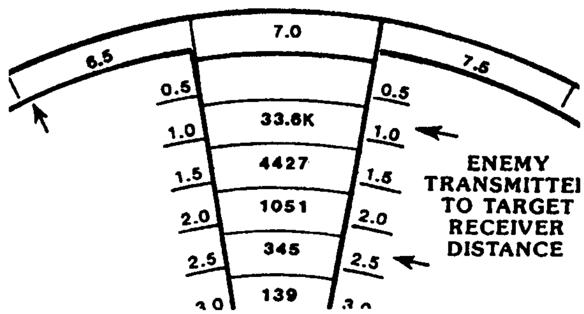
STEP 4B

Use Side 1 of the GTA 30-6-5 calculator. Locate the JAMMER-TO-TARGET RECEIVER DISTANCE (D_j) of 7.0 km on the outer ring. Align the slot of the smaller disk with the 7.0 on the outer ring.



STEP 4C

Go down the edge of the slot on the smaller disk and find the ENEMY TRANSMITTER TO TARGET RECEIVER DISTANCE (D_t) of **2.5 km.** The number **345** appears in the opening, next to the 2.5 km. The 345 is simply a power output number in watts. It is not the minimum jamming power output required value. It must be multiplied by the enemy power output.



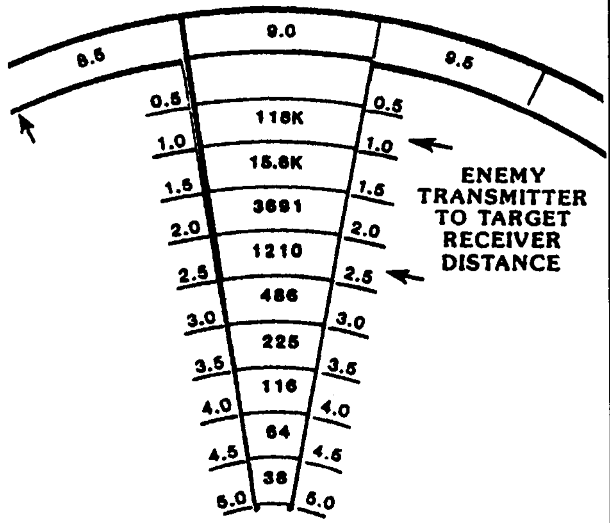
(Steps 5 and 6 are continued on the next page.)

Table A-11. Minimum jamming power calculations (continued).

NOTE: Step 4C is repeated in step 5 using the D_j (9.0) and the D_t (5.0) from step 4.

STEP 5

After finding 9.0 on the outer ring, go down the edge of the slot on the smaller disk and find the ENEMY TRANSMITTER TO TARGET RECEIVER DISTANCE (D_t) of 5.0 km. The number 38 appears in the opening, next to the 5.0 ENEMY TRANSMITTER TO TARGET RECEIVER DISTANCE (D_t). Remember, 38 is simply a power output number in watts. It is not the minimum jamming power output required value.



STEP 6

Multiply the calculated power of 38 watts by the enemy transmitter power output of 3 watts (from step 1). (If the result produces a fraction, always round the number up.) The minimum jammer power output required for effective jamming, for this example, is 114 watts using the jammer's **whip** antenna.

38 x 3 = 114 watts

NOTE: Steps 3, 4, 5, and 6 were calculated using the multiplication factor of 1. Multiply the elevation multiplication factor of 1.3 (from step 3C) by the computed minimum jammer power output of 114 watts (step 6). When using the jammer's LPA antenna instead of the whip antenna, perform step 7.

114 x 1.3 = 148.2

(Step 7 is continued on the next page.)

Table A-11. Minimum jamming power calculations (continued).

STEP 7 When using the jammer's LPA, take the computed minimum jammer power output required of 114 watts from step 6 and divide it by 2. This 57 watts is the minimum jammer power output required for effective jamming for this example. Remember, this is the value that is read on the jammer's power output meter.	$\frac{114}{2} = 57$ *watts*

The jammer must be capable of producing at least 114 watts with the whip antenna or 57 watts for the LPA antenna for jamming to be effective. If a higher power value is used, the jammer will still be effective. Using any power output less than these values will not effectively jam the target receiver for this example.

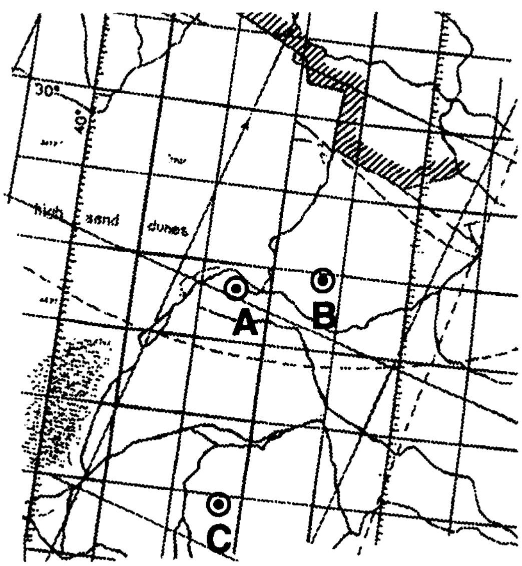
Compute the Maximum Distance the Jammer Can Be From the Target Receiver

Perform the following steps in Table A-12 to calculate the maximum distance the selected jammer site can be from the target receiver and still jam effectively. Use the GTA 30-6-5 calculator to find the maximum power output of the jammer.

Table A-12. Maximum distance from jammer to target.

STEP 1

Plot the locations of the enemy transmitter (A), the target receiver (B), and the selected jammer (C) on a map. The selected jammer is the AN/TLQ-17A(V)3 with a maximum output of 550 watts. The enemy transmitter power output is 2 watts.



(Steps 2 through 4A are continued on the next page.)

Table A-12. Maximum distance from jammer to target (continued).

STEP 2

Measure the distance between the A and B. The measurement for this example is 3.1 km. (Always round down this distance to the next lower .5 km.) For this example, the distance for calculating purposes is 3.0 km.

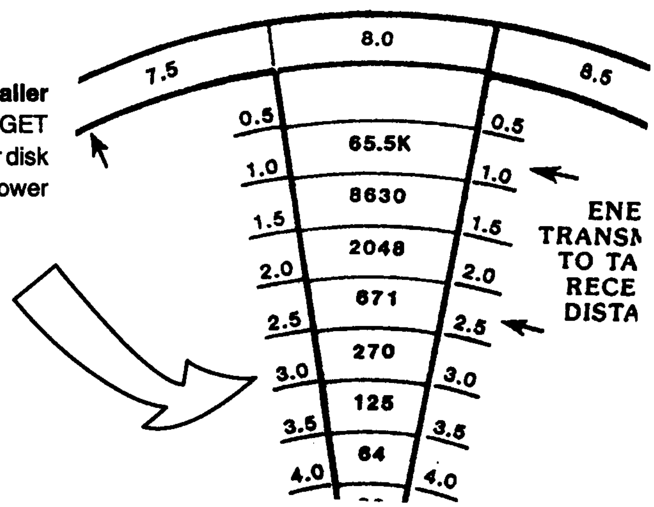
STEP 3

Divide the jammer's maximum power output (P_j) 550 by the enemy transmitter power output (P_t) 2.

$$\frac{P_j\ 550}{P_t\ 2} = 275$$

STEP 4

Go to Side 1 of the GTA 30-6-5. Along the slot of the **smaller** disk, find the ENEMY TRANSMITTER TO TARGET RECEIVER DISTANCE (D_t) of 3.0 km. Rotate this smaller disk until the calculated power of 275 watts or the next lower power number (270) appears in the opening next to the 3.0 km.



Side 1

NOTE: If the enemy transmitter distance were 6 km instead of 3.1, we would have to divide the 6 km by 2 to bring it into the range of Side 1. Steps 4A through 4D are computed using the enemy transmitter distance of 6 km.

STEP 4A

When the enemy transmitter distance exceeds those shown on Side 1, divide the distance by the lowest number that would bring it into the range of the calculator.

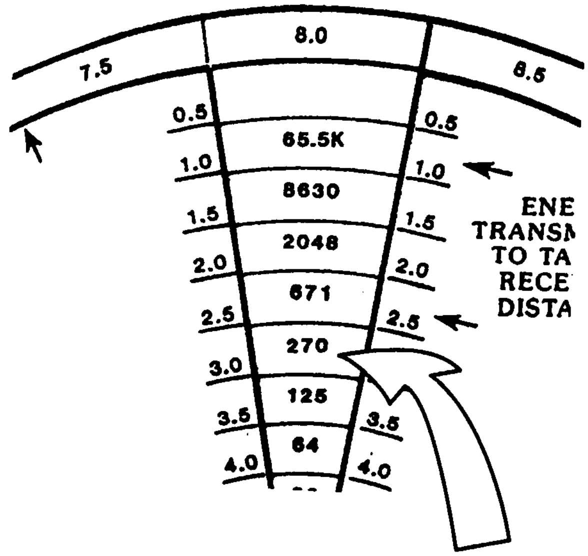
$$\frac{6}{2} = 3$$

(Steps 4B through 5 are continued on the next page.)

Table A-12. Maximum distance from jammer to target (continued).

STEP 4B

Go to the 3 km number along the ENEMY TRANSMITTER TO TARGET RECEIVER DISTANCE slot and rotate the smaller disk until the 275 watts or the next lower power number (270) is found.



STEP 4C

Read the JAMMER-TO-TARGET RECEIVER DISTANCE on the outer ring of Side 1. The jammer distance for the 270 watts is 8.0 km.

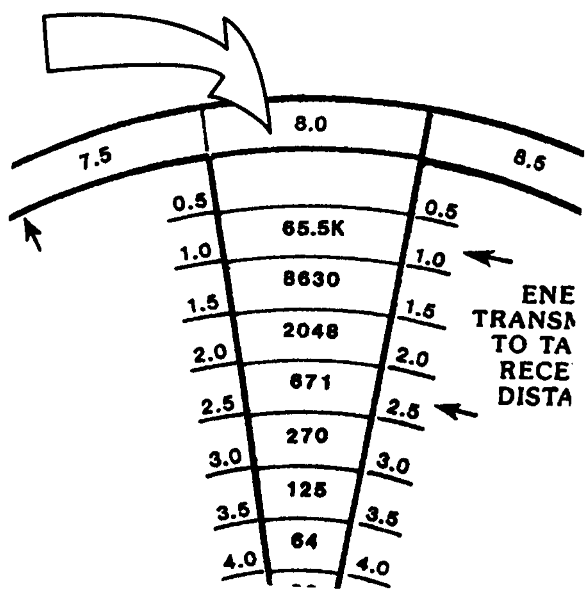
STEP 4D

The jammer distance must be multiplied by the same factor used to bring it into the range of the calculator. In this case, it must be multiplied by 2 to maintain the correct distance ratio.

$8 \times 2 = 16\ km$

STEP 5

Read the JAMMER-TO-TARGET RECEIVER DISTANCE on the outer ring of Side 1. The jammer distance for the 270 watts is 8.0 km.



(Steps 6 through 6C are continued in the next page.)

Table A-12. Maximum distance from jammer to target (continued).

STEP 6

Determine the elevation of several preselected jammer location sites. If the selected jammer location elevation and the enemy transmitter location elevation difference is **less** than 10 meters, use the elevation multiplication factor of 1. This means the maximum distance the jammer can be from the target receiver, using a whip antenna, is 8 km. If the selected jammer location elevation and the enemy transmitter location elevation difference is **greater** than 10 meters, use steps 6A through 6D to determine the elevation multiplication factor.

$$\frac{8}{1} = 8$$

NOTE: If more than one site is selected, use the lowest elevation of those selected.

STEP 6A

To determine the elevation MULTIPLICATION FACTOR using Side 2, the elevation ratio must be computed. In this example, the selected jammer site elevation is 390 meters and the enemy transmitter site elevation is 500 meters. (All elevations are measured from the sea level.)

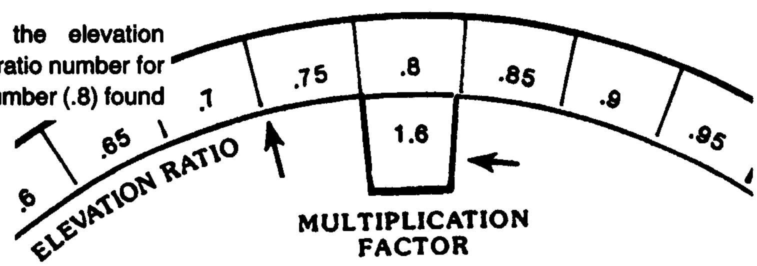
STEP 6B

Divide the jammer location elevation of 390 meters by the enemy transmitter elevation of 500 meters. The elevation ratio fraction is .78.

$$\frac{390}{500} = .78$$

STEP 6C

Convert the elevation ratio fraction to the elevation multiplication factor. Using the .78 elevation ratio number for this example, round it up to the next higher number (.8) found on the outer ring of Side 2.



Side 2

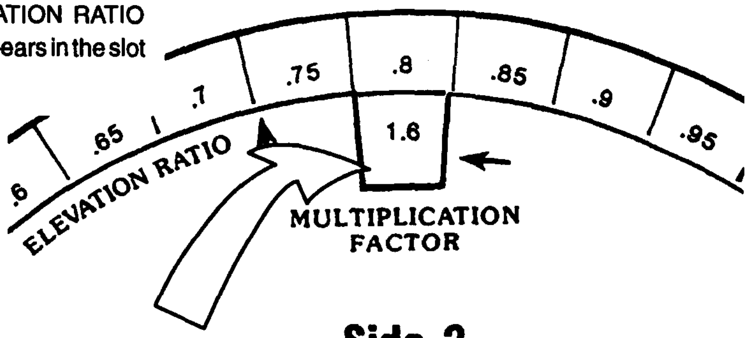
Elevation Ratio/ Multiplication Factor Table

(Steps 6D through 7 are continued on the next page.)

Table A-12. Maximum distance from jammer to target (continued).

STEP 6D

Align the slot of the smaller disk on the ELEVATION RATIO of .8. The MULTIPLICATION FACTOR of 1.6 appears in the slot of the smaller disk.



Side 2

Elevation Ratio/ Multiplication Factor Table

STEP 6E

Divide the MULTIPLICATION FACTOR (1.6) into the D_j (8 km from step 5). The maximum distance for using a whip antenna would be 5 km.

$$\frac{8}{1.6} = 5$$

NOTE: The calculations in steps 6A through 6E are based on an enemy transmitter power output of 2 watts, a preselected jammer site elevation of 390 meters, an enemy transmitter elevation of 500 meters, and the maximum power output of 550 watts of the AN/TLQ-17A(V)3 jammer using a whip antenna. If the LPA antenna is used instead of a whip antenna, perform step 7.

STEP 7

When the jammer's LPA antenna is used for the jamming mission, multiply the calculated jammer distance by 2. If necessary round down to the next lower .5 km. The maximum distance the AN/TLQ-17A(V)3 location can be from the target receiver location is 10 km. This is a radius of 10 km from the target receiver's location.

$$5 \times 2 = 10$$

GTA 30-6-5 Calculator Work Sheet

The GTA 30-6-5 calculator work sheet (Figure A-4) is to be used with the GTA 30-6-5 calculator when computing the minimum jammer power output required for a given jamming situation. Table A-13, page 32, explains how to fill in the work sheet.

	J-TO-RX DISTANCE	ET-TO-RX DISTANCE	JAMMER LOCATION ELEVATION	ET LOCATION ELEVATION	ELEVATION				JAMMING POWER				ET POWER		MINIMUM JAMMER POWER OUTPUT REQUIRED
					RATIO		FACTOR		GTA 30–6–5		JAMMER OUTPUT				
1.						=		X		=		X		=	watts
2.						=		X		=		X		=	watts
3.						=		X		=		X		=	watts
4.						=		X		=		X		=	watts
5.						=		X		=		X		=	watts
6.						=		X		=		X		=	watts
7.						=		X		=		X		=	watts
8.						=		X		=		X		=	watts
9.						=		X		=		X		=	watts
10.						=		X		=		X		=	watts
11.						=		X		=		X		=	watts
12.						=		X		=		X		=	watts
13.						=		X		=		X		=	watts
14.						=		X		=		X		=	watts
15.						=		X		=		X		=	watts
16.						=		X		=		X		=	watts
17.						=		X		=		X		=	watts
18.						=		X		=		X		=	watts
19.						=		X		=		X		=	watts
20.						=		X		=		X		=	watts

Figure A-4. GTA 30-6-5 calculator work sheet.

Table A-13. GTA 30-6-5 calculator work sheet computations.

STEP 1

From step 2 of Table A-11, list the measured distances in the appropriate distance columns.

J-TO-RX DISTANCE	ET-TO-RX DISTANCE
9.0 km	5.0 km

STEP 2

From step 3A of Table A-11, list the elevations in the appropriate elevation columns.

JAMMER LOCATION ELEVATION	ET LOCATION ELEVATION
390 m	420 m

STEP 2A

If elevation difference is less than 10 meters, enter 1 in the elevation RATIO and FACTOR columns.

ELEVATION

RATIO		FACTOR
1	=	1

STEP 2B

If the elevation difference is 10 meters or more, divide the jammer's elevation by the ET elevation. For example, in steps 3A and 3B of Table A-11, the ratio is .93 and the factor is 1.3.

ELEVATION

RATIO		FACTOR
.93	=	1.3

STEP 3

From step 5 of Table A-11, list the GTA 30-6-5 calculator jammer power in the GTA 30-6-5 column.

JAMMING POWER

GTA 30–6–5		JAMMER OUTPUT
38	=	

STEP 4

Multiply the elevation factor of 1.3 times the GTA 30-6-5 calculator value of 38.

ELEVATION RATIO		ELEVATION FACTOR		JAMMING POWER GTA 30–6–5		JAMMING POWER JAMMER OUTPUT
	=	1.3	x	38	=	49.4

(Steps 5 and 6 are continued on the next page.)

Table A-13. GTA 30-6-5 calculator work sheet computations (continued).

STEP 5

Multiply the 49.4 jammer output times the enemy transmitter power output (3 watts from step 1 of Table A-11). This is the minimum jammer power output required for effective jamming using the jammer's whip antenna.

JAMMING POWER: GTA 30-6-5		JAMMING POWER: JAMMER OUTPUT		ET POWER		MINIMUM JAMMER POWER OUTPUT REQUIRED	
38	=	49.4	X	3	=	148.2	watts

NOTE: If the jammer's LPA antenna is to be used, continue with step 6 after completing this step.

STEP 6

Perform this step whenever using the jammer's LPA antenna. Divide the whip antenna power output by 2. In this case, the minimum jammer power output required for effective jamming is 74.1 watts.

$$\frac{148.2}{2} = 74.1 \text{ watts}$$

Figure A-5 shows a completed GTA 30-6-5 calculator work sheet. The elevation difference reflects data from step 2B.

	J-TO-RX DISTANCE	ET-TO-RX DISTANCE	JAMMER LOCATION ELEVATION	ET LOCATION ELEVATION	ELEVATION RATIO		ELEVATION FACTOR		JAMMING POWER GTA 30-6-5		JAMMING POWER JAMMER OUTPUT		ET POWER		MINIMUM JAMMER POWER OUTPUT REQUIRED	
1.	9.0 km	5.0 km	390 m	420 m	.93	=	1.3	X	38	=	49.4	X	3	=	148.2	watts
2.						=		X		=		X		=		watts
3.						=		X		=		X		=		watts
4.						=		X		=		X		=		watts

Figure A-5. An example of a completed GTA 30-6-5 calculator work sheet.

THE JAMPOT FAN

The JAMPOT fan (Figure A-6) provides another method for measuring distances needed to calculate the required jamming power output. It is designed to be used with Table A-14, page A-35. The JAMPOT fan is an overlay template developed for a map scale of 1:50,000. It can also be used for a map scale of 1:100,000 by multiplying the jammer-to-target receiver distance by two.

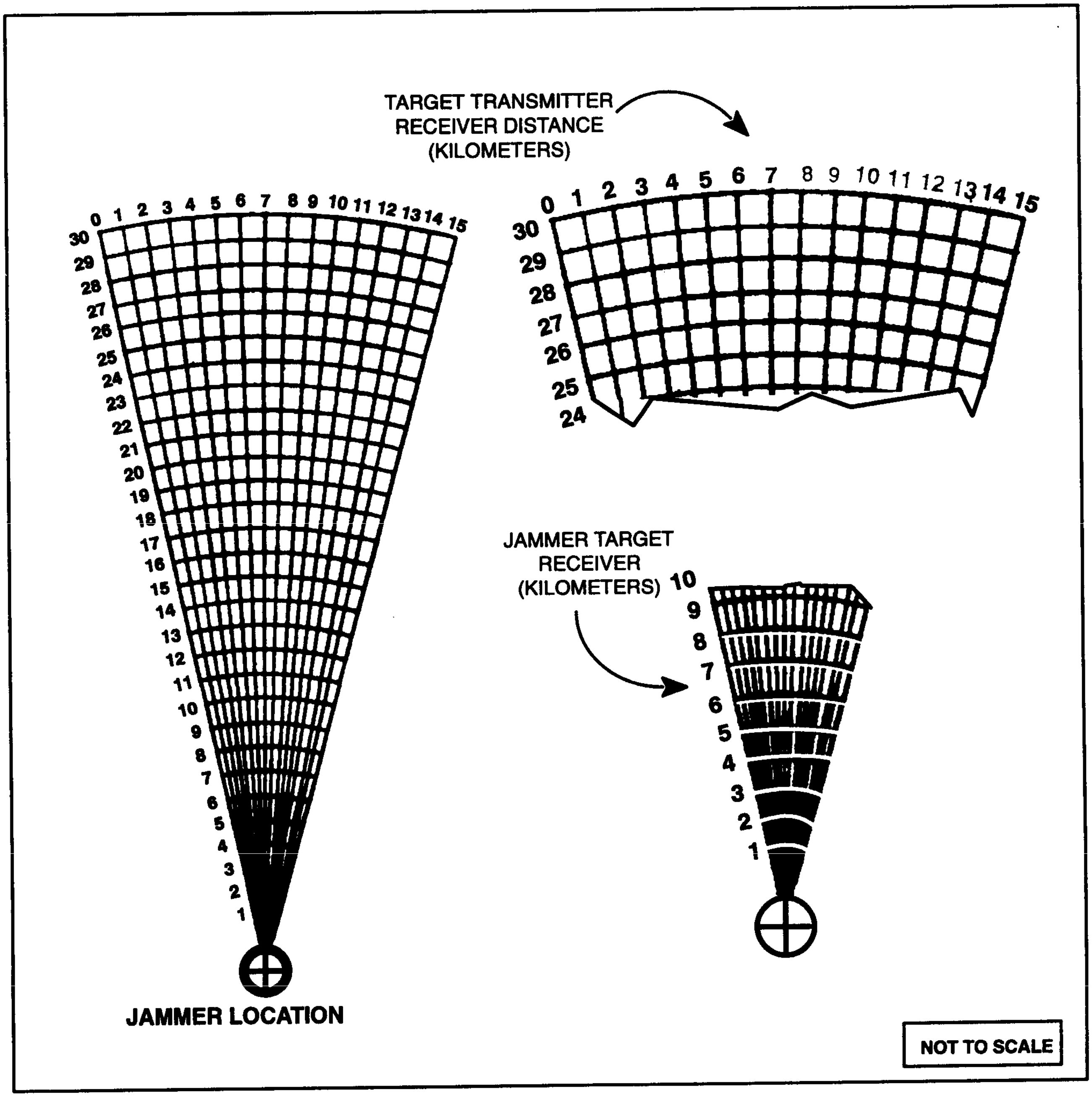


Figure A-6. The JAMPOT fan.

Table A-14. Jammer power output values.

D_J	D_t 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	3	1													
2	32	3	1												
3	163	10	3	1											
4	515	32	7	3	1										
5	1.3K	79	16	5	3	1									
6	2.6K	163	32	10	4	3	1								
7	4.9K	302	60	19	8	4	3	2	1						
8	8.3K	515	120	32	13	7	4	3	2	1					
9	13.2K	825	163	52	21	10	6	4	3	2	1				
10	20.1K	1.3K	248	79	32	16	9	5	3	3	2	1			
11	29.5K	1.9K	364	115	47	23	13	7	5	3	3	2	1		
12	41,7K	2.6K	515	163	67	32	18	10	7	4	3	3	2	1	
13	57.5K	3.6K	709	225	92	45	24	14	9	6	4	3	3	2	1
14	77.2K	4.9K	954	302	124	60	32	19	12	8	6	4	3	3	2
15	103K	6.4K	1.3K	398	163	79	43	25	16	10	7	5	4	3	3
16		8.3K	1.7K	515	211	102	55	32	20	13	9	7	5	4	3
17		10.5K	2.1K	656	269	130	70	41	26	17	12	8	6	5	4
18		13.2K	2.6K	825	338	163	88	52	32	21	15	10	8	6	5
19		16.4K	3.3K	1.1K	419	202	109	64	40	26	18	13	9	7	5
20		20.1K	4.0K	1.3K	515	248	134	79	49	32	22	16	12	9	7
21		24.5K	4.9K	1.5K	626	302	163	96	60	39	27	19	14	10	8
22		29.5K	5.8K	1.8K	754	364	196	115	72	47	32	23	17	13	10
23		35.2K	7.0K	2.2K	900	434	235	138	86	57	39	27	20	15	11
24		41.7K	8.2K	2.6K	1.1K	515	288	163	102	67	46	32	24	18	13
25		49.1K	9.7K	3.1K	1.3K	606	327	192	120	79	54	38	28	21	16
26		57.5K	11.4K	3.6K	1.5K	709	383	225	140	92	63	45	32	24	18
27		66.8K	13.2K	4.2K	1.7K	825	445	261	163	107	73	52	38	28	21
28		77.3K	15.3K	4.9K	2.0K	954	515	302	189	124	85	60	44	32	25
29		88.9K	17.6K	5.5K	2.3K	1.1K	592	347	217	142	97	69	50	37	28
30		103.8K	20.1K	6.4K	2.6K	1.3K	678	398	248	163	111	79	57	43	32

NOTE: Table A-14 is a matrix. The left column (from 1 through 30) represents the jammer-to-target receiver in kilometers. The top row is the target transmitter-to-receiver distance. The values are given in watts and kilowatts (K means multiplication by 1,000).

JAMPOT Fan Effectiveness

The JAMPOT fan is effective only under the following conditions and parameters:

- It must be used for frequency modulated voice, amplitude modulated voice, or continuous wave communications in the VHF range.
- The enemy target transmitter power output must be known.
- The enemy transmitter-to-target receiver distance in kilometers must be known.
- The jammer location must be known.
- The jammer must be located at the same elevation above the sea level or higher than the enemy target transmitter.
- A whip antenna must be used with the power output values in Table A-14. (If the LPA antenna is used, divide the values by two.)
- The jammer power output values obtained from Table A-14 must be read on the jammer's power output meter.
- The jammer location must have a reasonable LOS propagation path to the target receiver location with no high hills between the two locations.

Using the JAMPOT Fan

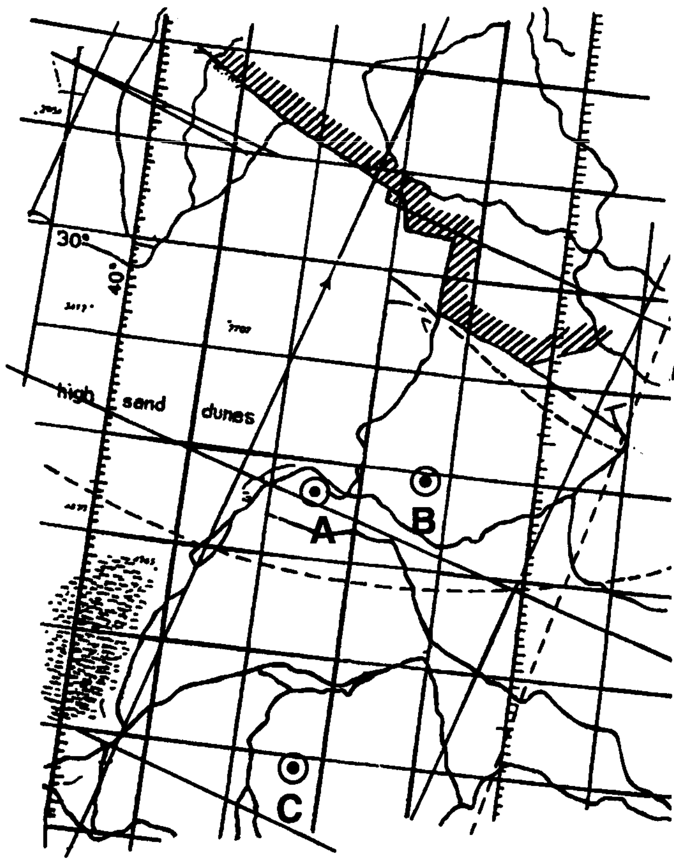
Table A-15 is a step-by-step explanation of how to use the JAMPOT fan.

Table A-15. How to use the JAMPOT fan.

STEP 1

Plot the locations of the target receiver (A), the enemy target transmitter (B), and the jammer (C) locations on a 1:50,000 scale map.

NOTE: Enemy transmitter power output is 3 watts.

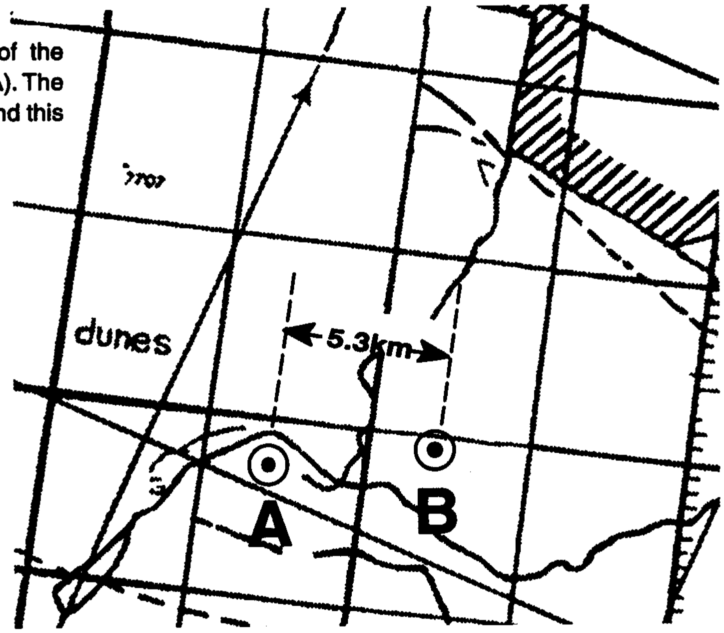


(Steps 2 and 3 are continued on the next page.)

Table A-15. How to use the JAMPOT fan (continued).

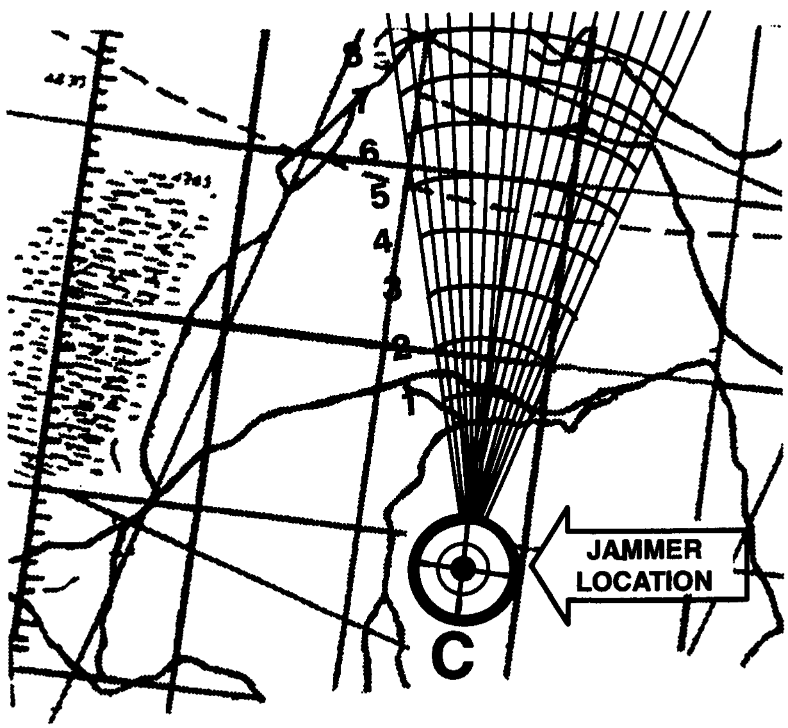
STEP 2

Measure the distance between the location of the enemy's transmitter (B) and the target receiver (A). The measurement for this example is 5.3 km. (Round this number down to the next lower km--5.)



STEP 3

Place the jammer location point of the JAMPOT fan on the jammer location (C) on the map.

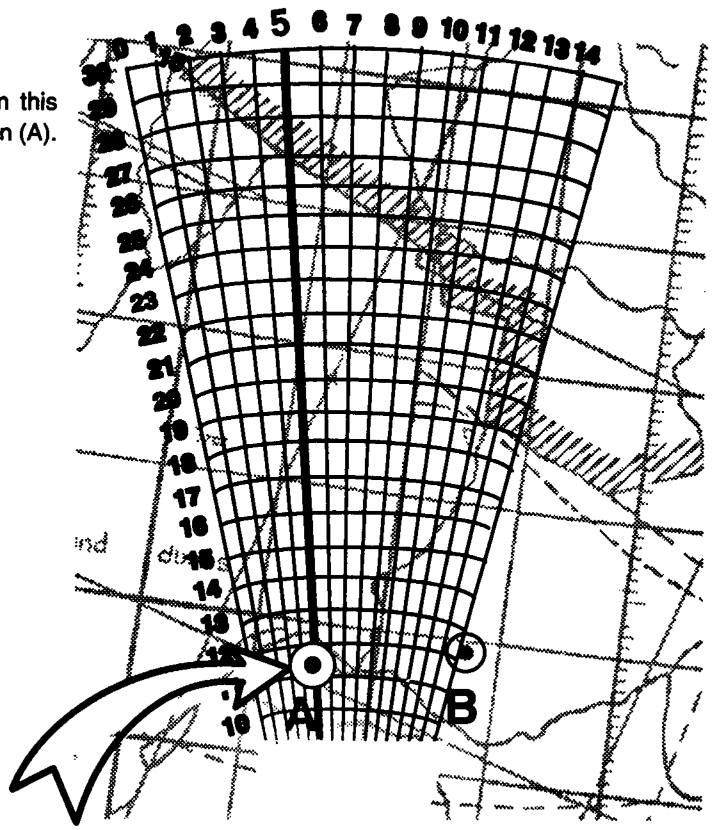


(Steps 4 and 5 are continued on the next page.)

Table A-15. How to use the JAMPOT fan (continued).

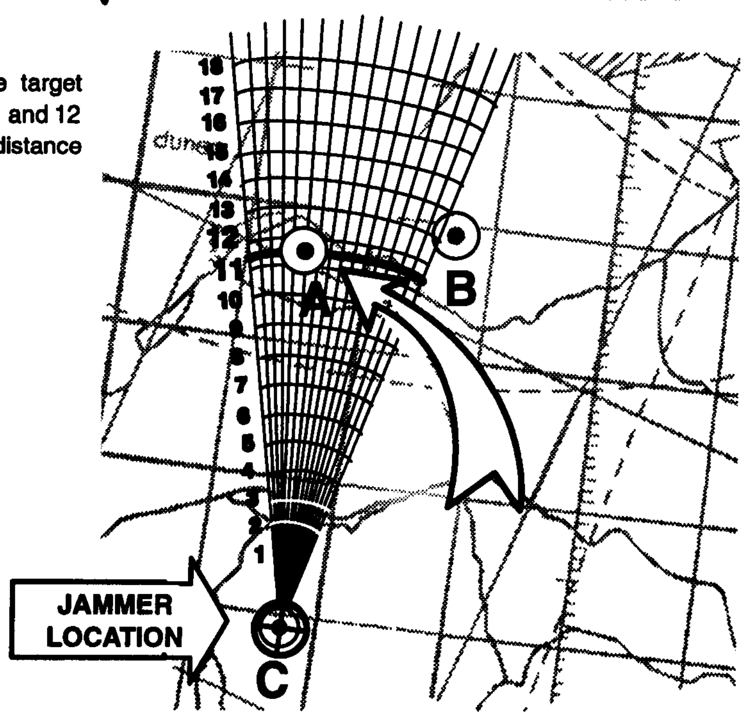
STEP 4

Place the JAMPOT target link distance line, in this case the 5 km line, on the target receiver location (A).



STEP 5

Read to the left on the JAMPOT fan. The target receiver's location (A) appears between the 11 and 12 km lines on the jammer-to-target receiver distance scale. (Round this number up to 12 km.)



(Steps 6 and 7 are continued on the next page.)

Table A-15. How to use the JAMPOT fan (continued).

STEP 6

Use Table A-14. Find the 12 kilometer jammer-to-target receiver distance by reading down the left column.

10	20.1K	1.3K	248	79	32
11	29.5K	1.9K	364	115	47
12	41.7K	2.6K	515	163	67
13	57.5K	3.6K	709	225	92
14	77.2K	4.9K	954	302	124
15	103K	6.4K	1.3K	398	163
16		8.3K	1.7K	515	211
17		10.5K	2.1K	656	269

STEP 7

Read across the top of Table A-14 to find the 5 km target link distance line.

D_j	1	2	3	4	5
1	3	1			
2	32	3	1		
3	163	10	3	1	
4	515	32	7	3	1
5	1.3K	79	16	5	3
6	2.6K	163	32	10	4
7	4.9K	302	60	19	8

(Steps 8 and 9 are continued on the next page.)

Table A-15. How to use the JAMPOT fan (continued).

STEP 8

Read down the 5 km target link distance column to the intersection of the 12 km row. The reading is 67 watts.

D_j	1	2	3	4	5
1	3	1			
2	32	3	1		
3	163	10	3	1	
4	515	32	7	3	1
5	1.3K	79	16	5	3
6	2.6K	163	32	10	4
7	4.9K	302	60	19	8
8	8.3K	515	120	32	13
9	13.2K	825	163	52	21
10	20.1K	1.3K	248	79	32
11	29.5K	1.9K	364	115	47
12	41.7K	2.6K	515	163	**67**
13	57.5K	3.6K	709	225	92
14	77.2K	4.9K	954	302	124

STEP 9

Multiply the 67 watts by the enemy transmitter's power output of 3 watts (given in step 1). The minimum required output for this example is 201 watts.

67 x 3 = 201 watts