

TABLE 15
Distance by Vertical Angle
Measured Between Sea Horizon and Top of Object Beyond Sea Horizon

| Angle | Difference in feet between height of object and height of eye of observer | | | | | | | | | | Angle |
|-------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | |
| ° ' / | Miles | Miles | Miles | Miles | Miles | Miles | Miles | Miles | Miles | Miles | ° ' / |
| -0 04 | 12.4 | 12.8 | 13.2 | 13.6 | 14.0 | 14.4 | 15.0 | 15.7 | 16.3 | 16.9 | -0 04 |
| -0 03 | 10.5 | 10.9 | 11.4 | 11.8 | 12.2 | 12.6 | 13.3 | 14.0 | 14.6 | 15.2 | -0 03 |
| -0 02 | 8.7 | 9.2 | 9.7 | 10.2 | 10.6 | 11.0 | 11.8 | 12.5 | 13.1 | 13.7 | -0 02 |
| -0 01 | 7.2 | 7.7 | 8.2 | 8.7 | 9.1 | 9.5 | 10.3 | 11.0 | 11.7 | 12.3 | -0 01 |
| 0 00 | 5.8 | 6.4 | 6.9 | 7.4 | 7.8 | 8.2 | 9.0 | 9.7 | 10.4 | 11.1 | 0 00 |
| 0 01 | 4.8 | 5.3 | 5.8 | 6.3 | 6.7 | 7.1 | 7.9 | 8.6 | 9.3 | 9.9 | 0 01 |
| 0 02 | 3.9 | 4.4 | 4.9 | 5.4 | 5.8 | 6.2 | 6.9 | 7.6 | 8.3 | 8.9 | 0 02 |
| 0 03 | 3.3 | 3.7 | 4.2 | 4.6 | 5.0 | 5.4 | 6.1 | 6.8 | 7.4 | 8.0 | 0 03 |
| 0 04 | 2.8 | 3.2 | 3.6 | 4.0 | 4.4 | 4.7 | 5.4 | 6.1 | 6.7 | 7.3 | 0 04 |
| 0 05 | 2.4 | 2.8 | 3.1 | 3.5 | 3.9 | 4.2 | 4.8 | 5.5 | 6.0 | 6.6 | 0 05 |
| 0 06 | 2.1 | 2.4 | 2.8 | 3.1 | 3.4 | 3.7 | 4.3 | 4.9 | 5.5 | 6.0 | 0 06 |
| 0 07 | 1.8 | 2.2 | 2.5 | 2.8 | 3.1 | 3.4 | 3.9 | 4.5 | 5.0 | 5.5 | 0 07 |
| 0 08 | 1.6 | 1.9 | 2.2 | 2.5 | 2.8 | 3.1 | 3.6 | 4.1 | 4.6 | 5.0 | 0 08 |
| 0 09 | 1.5 | 1.7 | 2.0 | 2.3 | 2.5 | 2.8 | 3.3 | 3.8 | 4.2 | 4.7 | 0 09 |
| 0 10 | 1.3 | 1.6 | 1.8 | 2.1 | 2.3 | 2.6 | 3.0 | 3.5 | 3.9 | 4.3 | 0 10 |
| 0 15 | 0.9 | 1.1 | 1.3 | 1.5 | 1.6 | 1.8 | 2.1 | 2.5 | 2.8 | 3.1 | 0 15 |
| 0 20 | 0.7 | 0.8 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.4 | 0 20 |
| 0 25 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.3 | 1.5 | 1.8 | 2.0 | 0 25 |
| 0 30 | 0.5 | 0.6 | 0.7 | 0.7 | 0.8 | 0.9 | 1.1 | 1.3 | 1.5 | 1.7 | 0 30 |
| 0 35 | | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 | 1.0 | 1.1 | 1.3 | 1.4 | 0 35 |
| 0 40 | | | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 | 1.0 | 1.1 | 1.3 | 0 40 |
| 0 45 | | | | 0.5 | 0.6 | 0.6 | 0.7 | 0.9 | 1.0 | 1.1 | 0 45 |
| 0 50 | | | | 0.5 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 0 50 |
| 0 55 | | | | 0.5 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 0.9 | 0 55 |
| 1 00 | | | | | | 0.5 | 0.6 | 0.7 | 0.8 | 0.8 | 1 00 |
| 1 10 | | | | | | | 0.5 | 0.6 | 0.6 | 0.7 | 1 10 |
| 1 20 | | | | | | | | 0.5 | 0.6 | 0.6 | 1 20 |
| 1 30 | | | | | | | | | 0.5 | 0.6 | 1 30 |
| 1 40 | | | | | | | | | 0.5 | 0.5 | 1 40 |
| 1 50 | | | | | | | | | | 0.5 | 1 50 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

TABLE 15
Distance by Vertical Angle
Measured Between Sea Horizon and Top of Object Beyond Sea Horizon

| Angle | Difference in feet between height of object and height of eye of observer | | | | | | | | | | | Angle |
|-------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 100 | 120 | 140 | 160 | 180 | 200 | 250 | 300 | 350 | 400 | 450 | |
| ° ' / | Miles | Miles | Miles | Miles | Miles | Miles | Miles | Miles | Miles | Miles | Miles | ° ' / |
| 0 00 | 11.7 | 12.8 | 13.8 | 14.8 | 15.7 | 16.5 | 18.4 | 20.2 | 21.8 | 23.3 | 24.7 | 0 00 |
| 0 01 | 10.5 | 11.6 | 12.7 | 13.6 | 14.5 | 15.3 | 17.3 | 19.0 | 20.7 | 22.2 | 23.6 | 0 01 |
| 0 02 | 9.5 | 10.6 | 11.6 | 12.5 | 13.4 | 14.3 | 16.2 | 17.9 | 19.6 | 21.0 | 22.5 | 0 02 |
| 0 03 | 8.6 | 9.7 | 10.7 | 11.6 | 12.5 | 13.3 | 15.2 | 16.9 | 18.5 | 20.0 | 21.4 | 0 03 |
| 0 04 | 7.8 | 8.8 | 9.8 | 10.7 | 11.6 | 12.4 | 14.3 | 16.0 | 17.5 | 19.0 | 20.4 | 0 04 |
| 0 05 | 7.1 | 8.1 | 9.0 | 9.9 | 10.8 | 11.5 | 13.4 | 15.1 | 16.6 | 18.1 | 19.5 | 0 05 |
| 0 06 | 6.5 | 7.5 | 8.4 | 9.2 | 10.0 | 10.8 | 12.6 | 14.2 | 15.8 | 17.2 | 18.6 | 0 06 |
| 0 07 | 6.0 | 6.9 | 7.7 | 8.6 | 9.4 | 10.1 | 11.9 | 13.5 | 15.0 | 16.4 | 17.7 | 0 07 |
| 0 08 | 5.5 | 6.4 | 7.2 | 8.0 | 8.8 | 9.5 | 11.2 | 12.8 | 14.2 | 15.6 | 16.9 | 0 08 |
| 0 09 | 5.1 | 5.9 | 6.7 | 7.5 | 8.2 | 8.9 | 10.6 | 12.1 | 13.5 | 14.9 | 16.2 | 0 09 |
| 0 10 | 4.7 | 5.5 | 6.3 | 7.0 | 7.7 | 8.4 | 10.0 | 11.5 | 12.9 | 14.2 | 15.5 | 0 10 |
| 0 11 | 4.4 | 5.2 | 5.9 | 6.6 | 7.3 | 7.9 | 9.5 | 10.9 | 12.3 | 13.6 | 14.8 | 0 11 |
| 0 12 | 4.1 | 4.8 | 5.5 | 6.2 | 6.9 | 7.5 | 9.0 | 10.4 | 11.7 | 13.0 | 14.2 | 0 12 |
| 0 13 | 3.9 | 4.6 | 5.2 | 5.9 | 6.5 | 7.1 | 8.5 | 9.9 | 11.2 | 12.5 | 13.6 | 0 13 |
| 0 14 | 3.6 | 4.3 | 4.9 | 5.6 | 6.2 | 6.7 | 8.1 | 9.5 | 10.7 | 11.9 | 13.1 | 0 14 |
| 0 15 | 3.4 | 4.1 | 4.7 | 5.3 | 5.8 | 6.4 | 7.8 | 9.0 | 10.3 | 11.5 | 12.6 | 0 15 |
| 0 20 | 2.7 | 3.2 | 3.7 | 4.2 | 4.6 | 5.1 | 6.3 | 7.4 | 8.4 | 9.5 | 10.5 | 0 20 |
| 0 25 | 2.2 | 2.6 | 3.0 | 3.4 | 3.8 | 4.2 | 5.2 | 6.2 | 7.1 | 8.0 | 8.9 | 0 25 |
| 0 30 | 1.8 | 2.2 | 2.6 | 2.9 | 3.2 | 3.6 | 4.4 | 5.3 | 6.1 | 6.9 | 7.7 | 0 30 |
| 0 35 | 1.6 | 1.9 | 2.2 | 2.5 | 2.8 | 3.1 | 3.9 | 4.6 | 5.3 | 6.0 | 6.7 | 0 35 |
| 0 40 | 1.4 | 1.7 | 1.9 | 2.2 | 2.5 | 2.8 | 3.4 | 4.1 | 4.7 | 5.4 | 6.0 | 0 40 |
| 0 45 | 1.2 | 1.5 | 1.7 | 2.0 | 2.2 | 2.5 | 3.1 | 3.6 | 4.2 | 4.8 | 5.4 | 0 45 |
| 0 50 | 1.1 | 1.3 | 1.6 | 1.8 | 2.0 | 2.2 | 2.8 | 3.3 | 3.8 | 4.4 | 4.9 | 0 50 |
| 0 55 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 0 55 |
| 1 00 | 0.9 | 1.1 | 1.3 | 1.5 | 1.7 | 1.9 | 2.3 | 2.8 | 3.2 | 3.7 | 4.1 | 1 00 |
| 1 10 | 0.8 | 1.0 | 1.1 | 1.3 | 1.4 | 1.6 | 2.0 | 2.4 | 2.8 | 3.2 | 3.6 | 1 10 |
| 1 20 | 0.7 | 0.8 | 1.0 | 1.1 | 1.3 | 1.4 | 1.8 | 2.1 | 2.4 | 2.8 | 3.1 | 1 20 |
| 1 30 | 0.6 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.6 | 1.9 | 2.2 | 2.5 | 2.8 | 1 30 |
| 1 40 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.4 | 1.7 | 2.0 | 2.2 | 2.5 | 1 40 |
| 1 50 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.3 | 1.5 | 1.8 | 2.0 | 2.3 | 1 50 |
| 2 00 | 0.5 | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 | 1.2 | 1.4 | 1.6 | 1.9 | 2.1 | 2 00 |
| 2 30 | | 0.5 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.1 | 1.3 | 1.5 | 1.7 | 2 30 |
| 3 00 | | | | 0.5 | 0.6 | 0.6 | 0.8 | 0.9 | 1.1 | 1.3 | 1.4 | 3 00 |
| 3 30 | | | | | 0.5 | 0.5 | 0.7 | 0.8 | 0.9 | 1.1 | 1.2 | 3 30 |
| 4 00 | | | | | | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.1 | 4 00 |
| 4 30 | | | | | | | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 4 30 |
| 5 00 | | | | | | | | 0.5 | 0.6 | 0.7 | 0.8 | 5 00 |
| 6 00 | | | | | | | | | 0.5 | 0.5 | 0.6 | 6 00 |
| 7 00 | | | | | | | | | | 0.5 | 0.5 | 7 00 |
| 8 00 | | | | | | | | | | | 0.5 | 8 00 |
| 10 00 | | | | | | | | | | | | 10 00 |

TABLE 15
 Distance by Vertical Angle
 Measured Between Sea Horizon and Top of Object Beyond Sea Horizon

| Angle ° ′ | Difference in feet between height of object and height of eye of observer | | | | | | | | | | Angle ° ′ | |
|--------------|---|---------------------|---------------------|---------------------|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|--------------|----------------------|
| | 500 <i>Miles</i> | 600 <i>Miles</i> | 700 <i>Miles</i> | 800 <i>Miles</i> | 900 <i>Miles</i> | 1000 <i>Miles</i> | 1200 <i>Miles</i> | 1400 <i>Miles</i> | 1600 <i>Miles</i> | 1800 <i>Miles</i> | | 2000 <i>Miles</i> |
| 0 05 | 20.8 | 23.2 | 25.4 | 27.5 | 29.5 | 31.4 | 34.8 | 38.0 | 41.0 | 43.8 | 46.5 | 0 05 |
| 0 06 | 19.8 | 22.3 | 24.5 | 26.6 | 28.5 | 30.4 | 33.8 | 37.0 | 40.0 | 42.8 | 45.4 | 0 06 |
| 0 07 | 19.0 | 21.4 | 23.6 | 25.6 | 27.6 | 29.4 | 32.9 | 36.0 | 39.0 | 41.8 | 44.4 | 0 07 |
| 0 08 | 18.2 | 20.5 | 22.7 | 24.7 | 26.7 | 28.5 | 31.9 | 35.1 | 38.0 | 40.8 | 43.4 | 0 08 |
| 0 09 | 17.4 | 19.7 | 21.9 | 23.9 | 25.8 | 27.6 | 31.0 | 34.1 | 37.0 | 39.8 | 42.5 | 0 09 |
| 0 10 | 16.7 | 19.0 | 21.1 | 23.1 | 25.0 | 26.8 | 30.1 | 33.2 | 36.2 | 38.9 | 41.5 | 0 10 |
| 0 11 | 16.0 | 18.3 | 20.4 | 22.3 | 24.2 | 26.0 | 29.3 | 32.4 | 35.3 | 38.0 | 40.6 | 0 11 |
| 0 12 | 15.4 | 17.6 | 19.6 | 21.6 | 23.4 | 25.2 | 28.5 | 31.5 | 34.4 | 37.1 | 39.7 | 0 12 |
| 0 13 | 14.8 | 16.9 | 19.0 | 20.9 | 22.7 | 24.4 | 27.7 | 30.7 | 33.6 | 36.3 | 38.8 | 0 13 |
| 0 14 | 14.2 | 16.3 | 18.3 | 20.2 | 22.0 | 23.7 | 26.9 | 30.0 | 32.8 | 35.4 | 38.0 | 0 14 |
| 0 15 | 13.7 | 15.8 | 17.7 | 19.6 | 21.3 | 23.0 | 26.2 | 29.2 | 32.0 | 34.6 | 37.2 | 0 15 |
| 0 17 | 12.7 | 14.7 | 16.6 | 18.4 | 20.1 | 21.7 | 24.8 | 27.8 | 30.5 | 33.1 | 35.6 | 0 17 |
| 0 20 | 11.4 | 13.3 | 15.1 | 16.8 | 18.4 | 20.0 | 23.0 | 25.8 | 28.4 | 31.0 | 33.4 | 0 20 |
| 0 25 | 9.7 | 11.4 | 13.0 | 14.6 | 16.1 | 17.5 | 20.3 | 22.9 | 25.4 | 27.8 | 30.1 | 0 25 |
| 0 30 | 8.4 | 9.9 | 11.4 | 12.8 | 14.2 | 15.5 | 18.1 | 20.5 | 22.9 | 25.2 | 27.4 | 0 30 |
| 0 35 | 7.4 | 8.8 | 10.1 | 11.4 | 12.6 | 13.9 | 16.3 | 18.5 | 20.7 | 22.9 | 24.9 | 0 35 |
| 0 40 | 6.6 | 7.8 | 9.0 | 10.2 | 11.4 | 12.5 | 14.7 | 16.9 | 18.9 | 20.9 | 22.9 | 0 40 |
| 0 45 | 6.0 | 7.1 | 8.2 | 9.3 | 10.3 | 11.4 | 13.4 | 15.4 | 17.3 | 19.2 | 21.1 | 0 45 |
| 0 50 | 5.4 | 6.4 | 7.5 | 8.5 | 9.4 | 10.4 | 12.3 | 14.2 | 16.0 | 17.7 | 19.5 | 0 50 |
| 0 55 | 5.0 | 5.9 | 6.8 | 7.8 | 8.7 | 9.6 | 11.4 | 13.1 | 14.8 | 16.5 | 18.1 | 0 55 |
| 1 00 | 4.6 | 5.5 | 6.3 | 7.2 | 8.0 | 8.9 | 10.5 | 12.2 | 13.8 | 15.3 | 16.9 | 1 00 |
| 1 10 | 3.9 | 4.7 | 5.5 | 6.2 | 7.0 | 7.7 | 9.2 | 10.6 | 12.1 | 13.5 | 14.9 | 1 10 |
| 1 20 | 3.5 | 4.2 | 4.8 | 5.5 | 6.2 | 6.8 | 8.1 | 9.4 | 10.7 | 12.0 | 13.2 | 1 20 |
| 1 30 | 3.1 | 3.7 | 4.3 | 4.9 | 5.5 | 6.1 | 7.3 | 8.5 | 9.6 | 10.8 | 11.9 | 1 30 |
| 1 40 | 2.8 | 3.3 | 3.9 | 4.4 | 5.0 | 5.5 | 6.6 | 7.7 | 8.7 | 9.8 | 10.8 | 1 40 |
| 1 50 | 2.5 | 3.0 | 3.6 | 4.1 | 4.5 | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 9.9 | 1 50 |
| 2 00 | 2.3 | 2.8 | 3.3 | 3.7 | 4.2 | 4.6 | 5.5 | 6.5 | 7.4 | 8.2 | 9.1 | 2 00 |
| 2 30 | 1.9 | 2.2 | 2.6 | 3.0 | 3.4 | 3.7 | 4.5 | 5.2 | 5.9 | 6.7 | 7.4 | 2 30 |
| 3 00 | 1.6 | 1.9 | 2.2 | 2.5 | 2.8 | 3.1 | 3.7 | 4.4 | 5.0 | 5.6 | 6.2 | 3 00 |
| 3 30 | 1.3 | 1.6 | 1.9 | 2.1 | 2.4 | 2.7 | 3.2 | 3.7 | 4.3 | 4.8 | 5.3 | 3 30 |
| 4 00 | 1.2 | 1.4 | 1.6 | 1.9 | 2.1 | 2.3 | 2.8 | 3.3 | 3.7 | 4.2 | 4.7 | 4 00 |
| 5 00 | 0.9 | 1.1 | 1.3 | 1.5 | 1.7 | 1.9 | 2.3 | 2.6 | 3.0 | 3.4 | 3.7 | 5 00 |
| 6 00 | 0.8 | 0.9 | 1.1 | 1.3 | 1.4 | 1.6 | 1.9 | 2.2 | 2.5 | 2.8 | 3.1 | 6 00 |
| 7 00 | 0.7 | 0.8 | 0.9 | 1.1 | 1.2 | 1.3 | 1.6 | 1.9 | 2.1 | 2.4 | 2.7 | 7 00 |
| 8 00 | 0.6 | 0.7 | 0.8 | 0.9 | 1.1 | 1.2 | 1.4 | 1.6 | 1.9 | 2.1 | 2.3 | 8 00 |
| 10 00 | 0.5 | 0.6 | 0.7 | 0.7 | 0.8 | 0.9 | 1.1 | 1.3 | 1.5 | 1.7 | 1.9 | 10 00 |
| 12 00 | | 0.5 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.1 | 1.2 | 1.4 | 1.5 | 12 00 |
| 15 00 | | | | 0.5 | 0.6 | 0.6 | 0.7 | 0.9 | 1.0 | 1.1 | 1.2 | 15 00 |
| 20 00 | | | | | | 0.5 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 20 00 |
| 25 00 | | | | | | | | 0.5 | 0.6 | 0.6 | 0.7 | 25 00 |
| 30 00 | | | | | | | | | 0.5 | 0.5 | 0.6 | 30 00 |