## APPENDIX D

# VISIBILITY PROFILES

*To effectively accomplish the mission of locating targets and reporting battlefield information, moving-target-locating radars must have electronic line of sight within the area of responsibility. A visibility profile pinpoints those areas that cannot be seen by the radar. This appendix will show how to construct visibility profiles and to develop an onionskin radar visibility diagram to be used as an overlay. It should be noted that the construction of a complete visibility profile is a time-consuming process. Therefore, visibility profiles should be constructed only as time and mission requirements permit.*

## CONSTRUCTING A VISIBILITY PROFILE

The study of landforms by a visual examination of the contour lines is adequate for many purposes. When the situation demands precision, it requires a profile. A profile is an exaggerated side view of a portion of the earth's surface along a line between two points. To plot the masked or hidden areas requires a series of profiles through the area of interest. The terrain and the assigned area of interest will determine the number of profiles required.

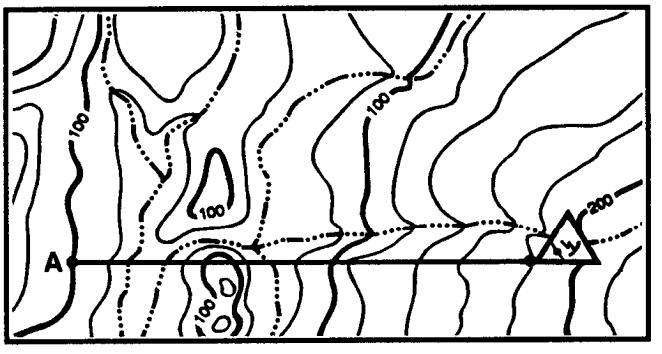
The general procedure is to construct profiles in series by starting at one (generally the left) edge of the assigned sector and placing one profile next to the other in a clockwise manner at least every 100 mils. Determine the forward and rear limits of the masked areas by drawing straight lines from the radar position to and past the highest points on the profile. Determine the masked areas by projecting or extending the visible points on the profiles to an overlay as shown in the figures on the following pages.

The specific procedural steps are described below.

Draw an azimuth line (to the nearest 100 mils on the map between the MTLR position and its range limit at the left edge of its assigned sector. (See the figure below.) This is the profile line.

Determine, by examination, the values of the highest and lowest contour lines that cross or touch the profile line. Add one contour interval value above the highest contour line and below the lowest contour line to account for hills and valleys.

**PROFILE LINE CONSTRUCTED ON A CONTOUR MAP**

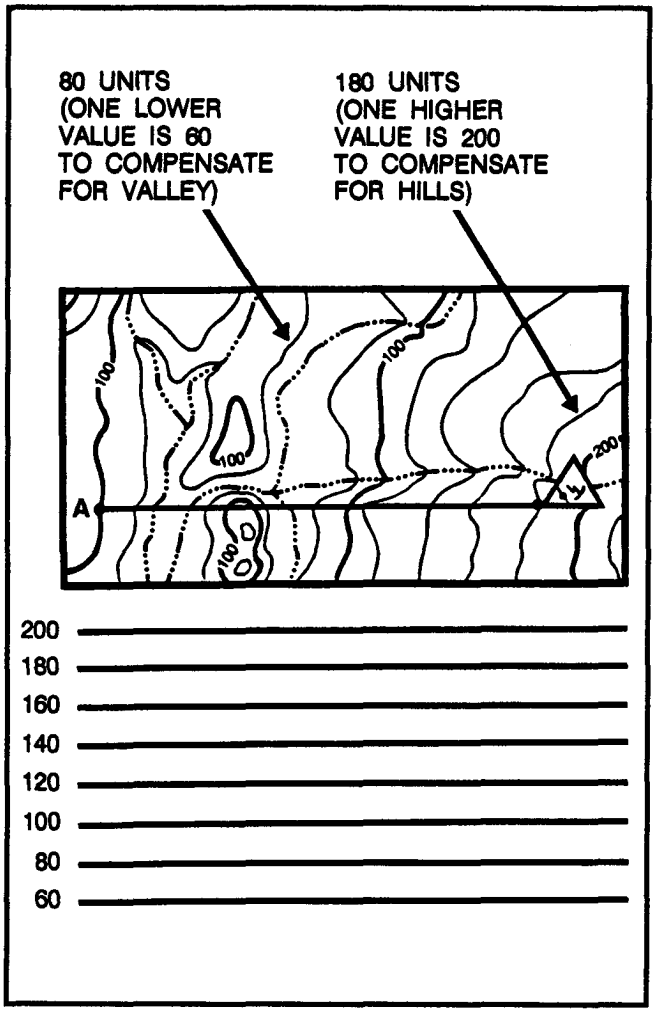


On a blank sheet of paper, draw equally spaced horizontal lines. Draw enough lines so there will be one line for each contour value determined in the preceding step.

Place the lined paper on the map with the top line adjacent and parallel to the profile line. On the lined paper, number the line closest to the profile line with the highest value determined above.

Number the rest of the lines in sequence down to the lowest value on the line farthest from the profile line.

**CONTOUR INTERVAL VALUES**

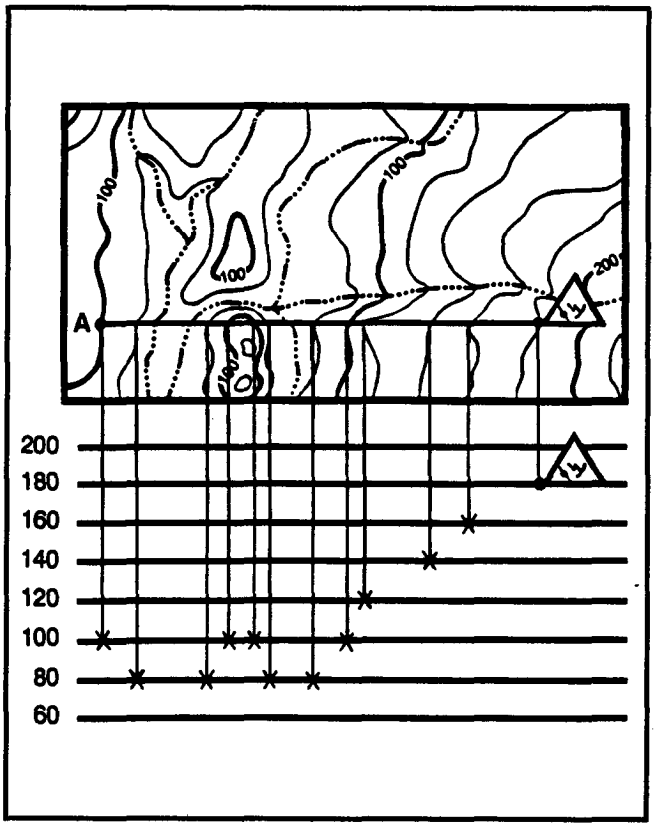



From each point crossed or touched by the profile line, draw a line perpendicular to the line with the same value. Place a tick mark where the perpendicular line crosses the line as shown below.

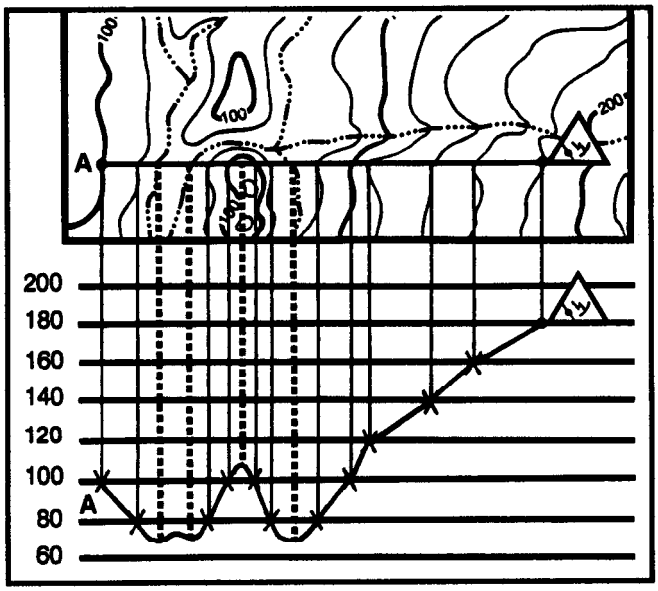
Determine the highest point of a hill and the lowest point of a valley by interpolation. Draw a perpendicular line to each interpolated value. This is shown in the figure on the next page.

After drawing all perpendicular lines, connect the tick marks with a smooth natural curve. This curve should follow the contour of the terrain as shown in the figure on the next page. Usually, hills and valleys are rounded and streams form a sharp V-shape.

**PERPENDICULAR LINES DROPPED FROM CONTOUR LINES**



**INTERPOLATION AND CONNECTING ENDPOINTS**



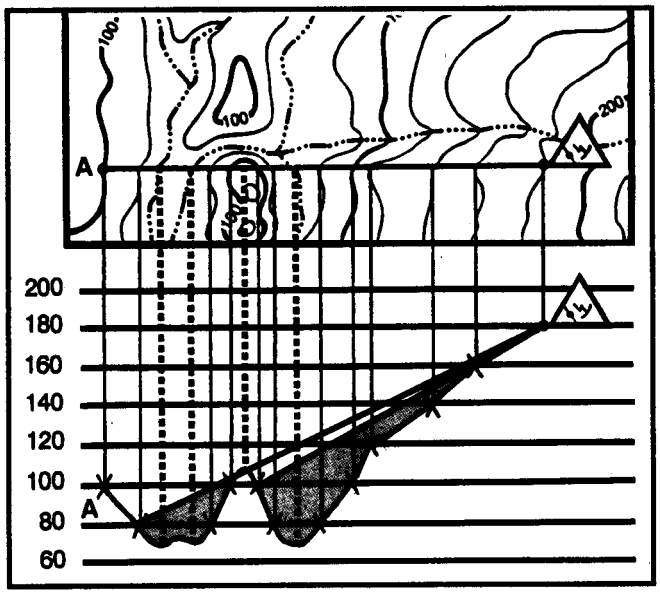

Next, draw straight lines from the radar to the lowest points-of visibility along the entire length of the terrain profile. Those areas not visible to the radar are below the lines and may be shaded as shown in the figure below.

Finally, transfer the shaded nonvisible area to the profile line. Do this by extending perpendicular lines from the left and right limits of the defilade areas as shown below. The defilade is shown as a heavy-lined portion of the profile line.

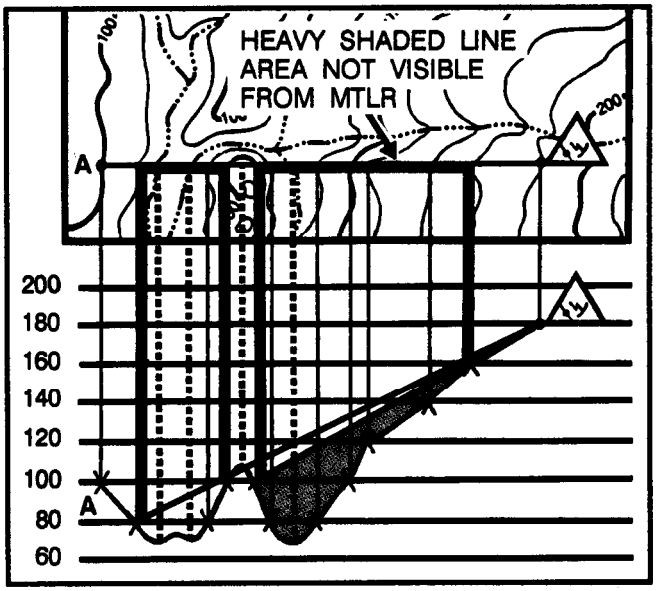
Construct the second profile in the same manner as the first. Move the straightedge clockwise from the first profile line and watch for major contour changes in the terrain. When a contour change that might block the visibility occurs or 100 mils from the first profile line, hold the straightedge in position and plot the points as previously explained. Continue the procedure, inspecting the complete area of interest. The number of profiles drawn to any one area will vary, depending on the terrain and the width of the area. As a minimum, however, profile lines will be drawn every 100 mils.

**NOTE:** An observed fire (OF) fan may provide a suitable 100-mil-graded template for constructing subsequent profile lines.

**NONVISIBLE AREAS (DEFILADE)**



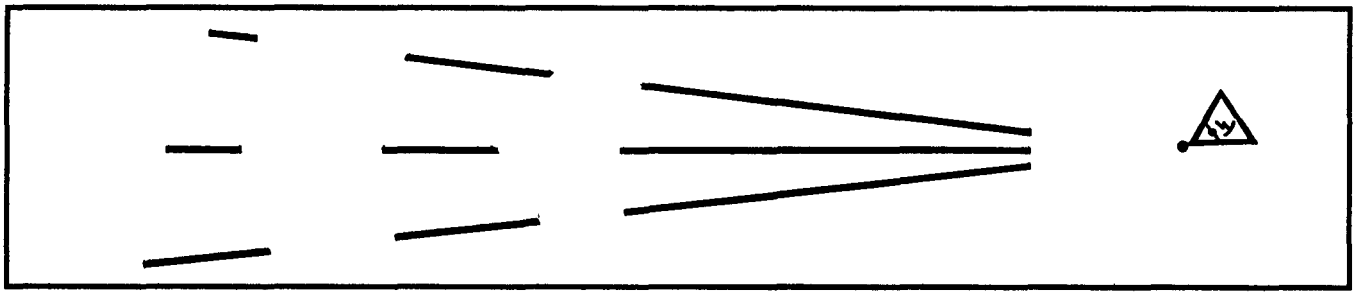

**POINTS TRANSFERRED FROM PROFILE TO PROFILE LINE**



## CONSTRUCTING THE RADAR VISIBILITY DIAGRAM (OVERLAY)

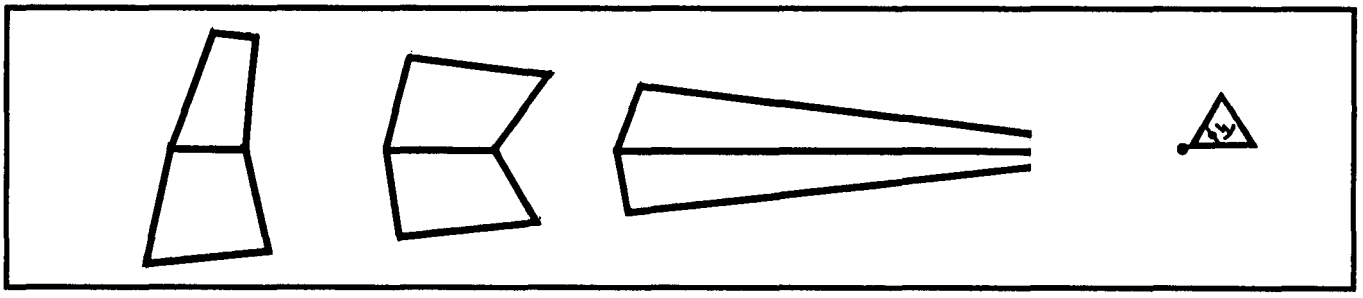
Transfer each visibility profile line in the zone of observation to the onionskin overlay as shown in the figure below.

**PROFILE LINES IN THE ZONE OF OBSERVATION**



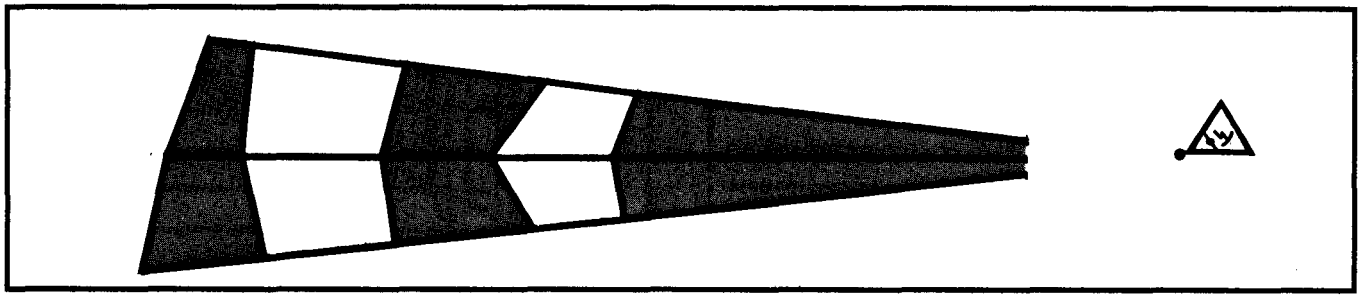
Connect all the nonvisible portions along each line of vision after they are identified and shaded.

**POINTS TRANSFERRED FROM PROFILES TO STRAIGHT LINES**



The finished product is as shown below. The plotter highlights nonvisible areas by shading or crosshatching the defilade areas.

**AREAS OF VISIBILITY AND NONVISIBILITY**



Label the 100-mil azimuth lines on the appropriate profiles, and determine marginal information from the OPORD and map sheet that will identify the radar visibility diagram. This overlay then becomes the radar visibility diagram. When the marginal information has been entered, the diagram will look like the example shown below. Since the radar visibility diagram is an operations document, it should be classified and / or safeguarded to prevent disclosure to the enemy. It is then ready to be submitted to division artillery.

## CONSTRUCTING A HASTY VISIBILITY PROFILE

A hasty profile is constructed when speed is an important element or when a complete profile is unnecessary. The hasty profile shows only the hilltops, the ridgetops, and, if desired, the valleys. Construction is the same as for a detailed visibility profile.

**SAMPLE RADAR VISIBILITY DIAGRAM**

**SAMPLE MARGINAL DATA**

| DATA | EXAMPLE MARGINAL ENTRY |
|---|---|
| (1) Radar coordinates | 561480-3830375 |
| (2) Map sheet/ scale | Lawton, 1:50,000 |
| (3) Map series/ data | V783, sheet 6353 III |
| (4) Weather | Clear |
| (5) Unit | C/25 FA |
| (6) Date-time group | 230730 May 90 |
| (7) Left and right limits | 4,700 mils 5,500 mils |