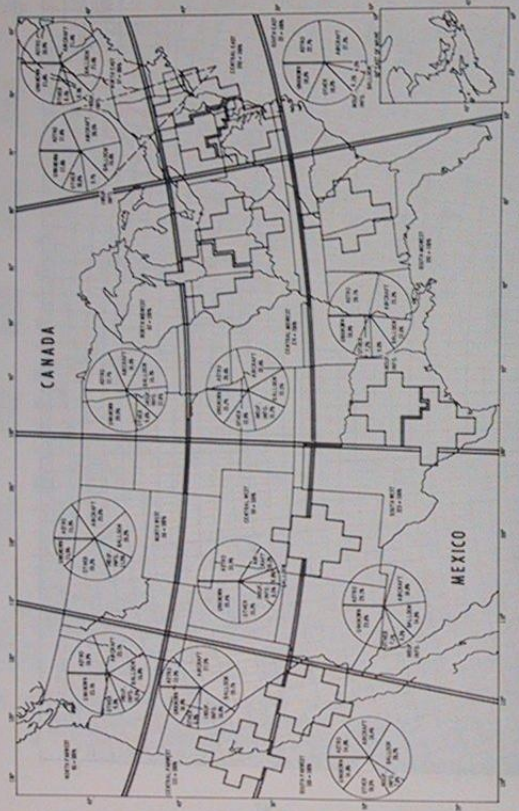

FIGURE 32 DISTRIBUTION OF OBJECT SIGHTINGS BY EVALUATION FOR THE TWELVE REGIONAL AREAS OF THE UNITED STATES, WITH THE STRATEGIC AREAS LOCATED (STRATEGIC AREAS WERE DETERMINED ON THE BASIS OF CONCENTRATION OF OBJECT SIGHTINGS)

This information consisted of:

(1) Time and date of observation in Greenwich Civil Time

(2) Latitude and longitude of the observer at the time of observation.

Figure 39 shows a celestial sphere on which Z represents the observer's zenith, s represents the sun, and N represents the north celestial pole.

Using the date and time of the observation, the longitude and declination (S) of the sun were obtained from an ephemeris of the sun and corrected for the equation of time. The difference between the longitudes of the sun and the observer was taken, and called the hour angle (HA on Figure 39).

Then, using the declination of the sun (S), the latitude of the observer (lat), and the hour angle (HA), the angle (ZS) between the observer's zenith and the sun can be calculated from the law of cosines of spherical trigonometry. Thus, $\cos \overline{ZS} = \cos (90 - \text{lat}) \cos (90 - S) + \sin (90 - \text{lat}) \sin (90 - S) \cos (HA)$.

Since the angle ZS is measured from the observer's zenith, the angle of elevation of the sun above the horizon for daytime sightings was found by taking $90 - \overline{ZS}$. When the sun was below the horizon, the angle of depression of the sun below the horizon was found by taking $\overline{ZS} - 90$.

Having found the angle ZS, the bearing of the sun (angle B) was obtained from the formula:

$$\frac{\sin (B)}{\sin (90 - S)} = \frac{\sin (HA)}{\sin (ZS)}$$

All of the above calculations were made with IBM equipment. Sines, cosines, and their inverses were obtained from a deck of 9,000 IBM cards on which seven-place Peter's tables of the sines, cosines, and tangents of angles had been punched for each 0.01 of a degree from 0 to 90 degrees.

Upon completion of these calculations, the cards representing OBJECT SIGHTINGS were sorted on the sign of the sine of the bearing angle. This separated the cards into two groups: (1) sightings which occurred between noon and midnight, for which the sine of the bearing angle was positive; and (2) sightings between midnight and noon, for which the sine of the bearing angle was negative. Then each of these groups was sorted into groups for intervals of 10° in angle of elevation of the sun from -90° to +90°. A count was made of the number of cards in each group and from this a histogram was constructed (Figure 40). The UNKNOWN OBJECT SIGHTINGS were then sorted out, counted in the same manner, and a histogram was made (again see Figure 40).