Kotlarić's Star Finder and Identifier, designed and patented by Dr. Stjepo M. Kotlarić, Assistant Director of the Hydrographic Institute of the Yugoslav Navy, is actually a booklet of 18 pairs of star charts with a plastic template enclosed. It depicts the 57 selected stars plus 125 other stars, for a total or 182 stars. All of the 173 stars listed in the *Nautical Almanac* are depicted. This star finder provides greater reliability in identification than No. 2102–D.

Each pair of star charts shows the Western and Eastern Hemispheres separately. The Western Hemisphere is shown using the stereographic projection (art. 318) on a plane tangent to the celestial equator at the west point; the Eastern Hemisphere is shown using the same projection on a plane tangent to the celestial equator at the east point.

The stars are plotted with different symbols, according to their magnitude. Selected stars are in black, and other stars in green. The stars in constellations are connected by a broken yellow line, while the "star-chasing" alignments are plotted with solid yellow lines. The names of the selected stars are shown in black capital letters, while all other stars are shown in green, using capital letters for popular names.

Since the list of stars near the back of the *Nautical Almanac* is not compiled in alphabetical order, an alphabetical index of stars with their rounded values of SHA and declination is included with the star finder to facilitate location of a star in the list.

Two 20° intervals of LHA ♈, differing by 180°, are used for constructing each pair of star charts. The circle bordering the star chart (fig. 2210d) represents the observer's celestial meridian. The circle is graduated to permit orientation of the plastic template to the star chart, according to the observer's latitude, in order to portray the visible hemisphere in the horizon system of coordinates.

The latitude scale on the right-hand half is black, and that on the left half is red. By selecting the appropriate pair of star charts according to the values of LHA ♈ and the azimuth, printed on the star charts, and by placing the template over the selected star chart in such a way that their centers coincide and the zenith of the template is placed on the proper latitude value on the black border scale when the azimuth figures are in black type (or on the red border scale when the azimuth figures are in red type), the altitude and azimuth of a star can be determined. Also, with the observed altitude and azimuth the coordinates of the star in the celestial equator system can be determined.

Star symbols on all the star charts are plotted for odd tens of degrees of LHA ♈. A part of the star's path is plotted to a distance of 10° to the left and to the right of the star symbol's position. A 10° increase of LHA ♈ from the star symbol's position is plotted as a solid line path, and a 10° decrease of LHA ♈ is plotted as a dotted line path. These portions of the star paths facilitate the identification of stars and make for more certainty in identification. The position of a star, determined by means of altitude and azimuth on the template superimposed on this star chart, may be found from either the star symbol or the appropriate point on the star path when LHA ♈ at the time of the observation differs from the value of odd tens of degrees for which the star symbol is printed on the star chart.

Example 4.—Three unknown stars with the following data are observed from lat. 50°N:

Zn	*h*	*LHA* ♈
028°	22°48′	70°
029°.5	25°00′	66°.5
152°	26°16′	61°

Required.—Identify the stars.

Solution.—For LH
Since the azimuth figu
the black latitude sca
is 50°N. (If the obser
placed at −50°.) The
star chart coincide.

At the intersectio
is found. The body is i

For LHA ♈ 66°.5
of the star chart, the

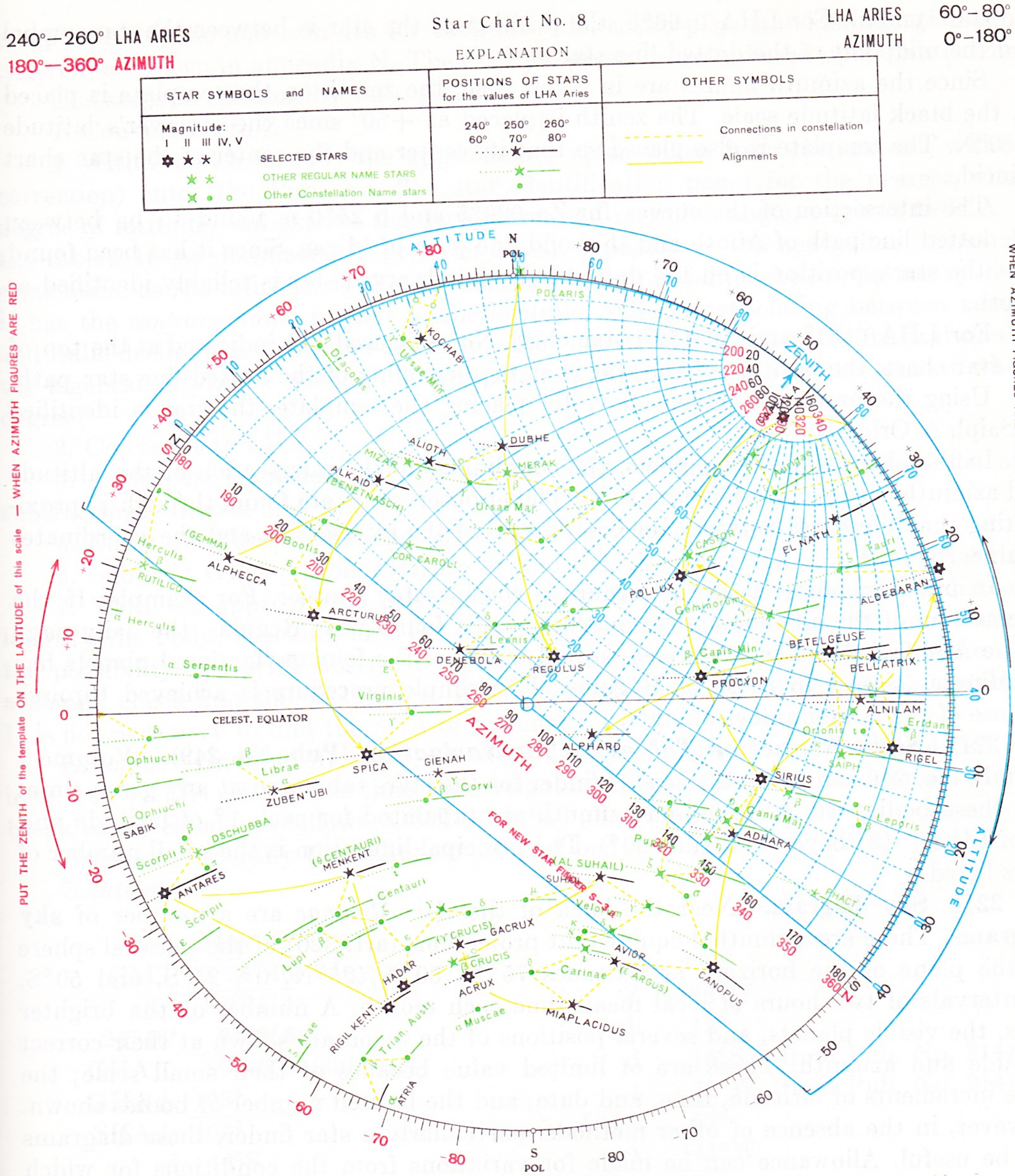

FIGURE 2210d.—Kotlarić's Star Finder and Identifier.

Solution.—For LHA ♈ 70° and Zn 028°, star chart No. 8 (fig. 2210d) is used. Since the azimuth figures are in black type, the zenith on the template is placed on the black latitude scale. The zenith is placed at +50° since the observer's latitude is 50°N. (If the observer's latitude were 50°S, the zenith on the template would be placed at −50°.) The template is also placed so that its center and the center of the star chart coincide.

At the intersection of the curves for Zn 028° and h 22°.8, the symbol for Mizar is found. The body is identified as Mizar.

For LHA ♈ 66°.5 and Zn 029°.5, star chart No. 8 is used. As indicated at the top of the star chart, the position of the star is on the dotted line path extending from

the star symbol. For LHA ♈ 66°.5, the position of the star is between the star symbol and the midpoint of the dotted line star path.

Since the azimuth figures are in black type, the zenith on the template is placed on the black latitude scale. The zenith is placed at +50° since the observer's latitude is 50°N. The template is also placed so that its center and the center of the star chart coincide.

The intersection of the curves for Zn 029°.5 and h 25°.0 is found to be between the dotted line path of Alioth and the solid line path of Mizar. Since it has been found that the star's position is on the dotted line, the observed star is reliably identified as Alioth.

For LHA ♈ 61° and Zn 152°, star chart No. 8 is used. As indicated at the top of the star chart, the position of the star is at the beginning of the dotted line star path.

Using the procedures given above for placing the template, the star is identified as Saiph (κ Orionis).

In the identification of planets, the coordinates of the intersection of the altitude and azimuth curves corresponding to the planet observation are found through approximating the differences between the coordinates of the intersection and the coordinates of a nearby star.

In practice, however, the procedure is considerably simpler. For example: If the intersection of the altitude and azimuth curves is found near Regulus, the daily page of the *Nautical Almanac* is scanned to find which of the four navigational planets has coordinates closest to those of Regulus. This simple procedure is achieved through the use of the large number of stars.

2211. *Sight Reduction Tables for Air Navigation* (Pub. No. 249).—Volume I of Pub. No. 249 can be used as a star finder for the stars tabulated at any given time. For these bodies the altitude and azimuth are tabulated for each 1° of latitude and 1° of LHA ♈ (2° beyond latitude 69°). The principal limitation is the small number of stars listed.

2212. Sky diagram.—Near the back of the *Air Almanac* are a number of **sky diagrams.** These are azimuthal equidistant projections (art. 320) of the celestial sphere on the plane of the horizon, at latitudes 75°N, 50°N, 25°N, 0°, 25°S, and 50°S, at intervals of two hours of local mean time each month. A number of the brighter stars, the visible planets, and several positions of the moon are shown at their correct altitude and azimuth. These are of limited value because of their small scale; the large increments of latitude, time, and date; and the limited number of bodies shown. However, in the absence of other methods, particularly a star finder, these diagrams can be useful. Allowance can be made for variations from the conditions for which each diagram is constructed. Instructions for use of the diagrams are included in the *Air Almanac*.

2213. Identification by computation.—If the altitude and azimuth of the celestial body, and the approximate latitude of the observer, are known, the navigational triangle (art. 1433) can be solved for meridian angle and declination. The meridian angle can be converted to LHA, and this to GHA. With this and GHA of Aries at the time of observation, the SHA of the body can be determined. With SHA and declination, one can identify the body by reference to an almanac. Any method of solving a spherical triangle, with two sides and the included angle being given, is suitable for this purpose. A large-scale, carefully-drawn diagram on the plane of the celestial meridian, using the refinement shown in figure 1432f, should yield satisfactory results. A simple method of computation is by Pub. No. 214. Following the tables of