

## INTRODUCTION

### DESCRIPTION OF THE TABLES

These tables, designated as Volume 1 of the three-volume series of Pub. No. 249, *Sight Reduction Tables for Air Navigation*, contain values of the altitude (to the nearest minute) and the true azimuth (to the nearest degree) of seven selected stars for the complete ranges of latitude and hour angle of Aries. The arrangement provides, for any position and time, the best selection of seven of the stars available for observation and, for these seven stars, data for presetting before observation and for accurate reduction of the sights after observation.

In the calculation of the altitudes and azimuths the mean places of the stars for epoch 2010.0 have been used; corrections for precession and nutation are given in Table 5, but their omission will not give rise to a positional error greater than two miles in the years 2007–2012. No correction for refraction has been included in the tabulated altitudes, so that the full correction must be applied to the sextant altitudes.

Although Pub. No. 249 was designed for air navigation, it is also used extensively for marine navigation. The main differences in the use of Pub. No. 249 for marine navigation are highlighted at the end of this introduction. Volume 1 may be used without reference to an almanac such as *The Air Almanac* or *The Nautical Almanac*. The tables in this volume may be used with a clock, or other device, giving sidereal time. With the normal procedure of plotting a sight from an assumed position, no interpolation is required for the stars tabulated.

### ENTERING ARGUMENTS AND ARRANGEMENT

*Latitude.* Tabulations are given for every whole degree of latitude from 89° north to 89° south. From 69° north to 69° south all data for a single latitude appear on two facing pages; from 70° to the poles, both north and south, the data for a single latitude appear on one page.

*LHA Aries.* The vertical argument on each page is the local hour angle of the first point of Aries (LHA  $\Upsilon$ ). It ranges from 0° to 360°; in general the interval is 1°, but between latitudes 70° and the poles it is increased to 2°.

*Selected stars.* The tabulated (or computed) altitude (Hc) and the true azimuth (Zn) are given for seven selected stars for each latitude and each entry of LHA  $\Upsilon$ . The selection of stars is used unchanged for each group of 15 entries of LHA  $\Upsilon$  (30° for latitudes over 69°, 15° for lower latitudes); within each such group the order of arrangement is that of the azimuths corresponding to the first entry. Of each selection of seven stars, three are marked with a diamond symbol ( $\blacklozenge$ ) as being suitable for a three-star fix.

A total of 41 stars are used, of which 19 are of the first magnitude (brighter than magnitude 1.5) and 17 of the second magnitude. The names of first-magnitude stars are given in capital letters. A complete list of the 57 stars selected for astromavigation is given in the front of this volume, and an asterisk is printed beside those stars not used within. The adopted names and numbers agree with those used in *The Air Almanac*. The S-4 magnitudes are applicable to astro-trackers employing S-4 photo-sensitive response.

Many factors were considered in selecting the stars, including azimuth, magnitude, altitude and continuity. Continuity was sought in regard to both latitude and hour angle, particularly for latitude where changes are not immediately evident by inspection.

### USE OF THE TABLES

The tables are intended for use for two distinct operations—the planning of observations, and their reduction. It is important that full use should be made of the tables for the planning of observations.

*Planning of observations.* Since only seven stars are given it is essential to refer to the tables before observation, in order to ensure that data will be available for the reduction of the observations. This is done by estimating latitude and LHA  $\Upsilon$  for the proposed time of observation, from a knowledge of the DR position and GHA  $\Upsilon$  from Table 4 or an appropriate almanac, such as *The Air Almanac* or *The Nautical Almanac*. On reference to the tables this information gives immediately