Surveyor’s Notch

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Cheap “Surveys”
Caveat Emptor!
Until the early 1980s practically all surveyors used the Altitude Method to determine the astronomic direction of a line, based on a celestial observation of the sun. That method required the surveyor to measure the vertical angle to the sun, but did not require the accurate determination and use of time in the observation. For decades the Altitude Method had been described in ephemerides published by such companies as Berger, Gurley, and Keuffel & Esser (K&E). The method has severe limitations insofar as accuracy and observation time of day.

On the other hand, the Hour Angle Method can be used on any star whose position is known as well as the sun, plus it has essentially no accuracy or time of observation limitations. It does require a very accurate determination/measurement of time, but does not require the vertical angle to the body (which is inherently erroneous due to parallax and refraction). With the availability of cheap, highly accurate timing devices in the late 70s (“time cubes,” precise digital stopwatches, etc.) the long standing problem of a surveyor acquiring highly accurate time in remote locations was solved. The Hour Angle’s time had arrived and Joe Senne knew it.

By Marc Cheves, LS
Dick Elgin (L) and David Knowles (R) introduce their new ephemeris in the Lietz booth at the Fall 1984 ACSM convention, San Antonio, TX.
In the spring of 1984, Joe approached Dick and David about one of his lifelong dreams, to author an ephemeris. Joe joined the firm at that time and its name became Elgin, Knowles & Senne, Inc. They approached the Lietz Company about publishing the “Lietz Ephemeris” which would use the Hour Angle Method exclusively and also would include program code for HP 41 calculators which would reduce the calculation burden to practically nothing. A deal was struck, Elgin, Knowles & Senne, Inc. receiving a royalty from sales of the ephemerides. It would compete with the “K&E Ephemeris” which had been published for decades.

During the summer of 1984, Dick, David and Joe wrote the first edition of what would become the “1985 Lietz Celestial Observation Handbook and Ephemeris.” Twelve thousand ephemerides were printed in Kansas City, and the first edition (1985) was introduced to the world at the 1984 ACSM convention in San Antonio, Texas. The three authors were there to autograph copies. The ephemeris was a tremendous hit. That first year of publication a second printing of 6000 ephemerides was ordered and sold. The Hour Angle Method and HP 41 celestial observation programs had arrived. Unknown to Lietz and Elgin, Knowles & Senne, Inc. was K&E’s decision not to publish a 1985 version of their ephemeris. 1984 was the last edition of the K&E ephemeris. The “Lietz Ephemeris,” as it became known, was the only game in town.

The three partners started offering celestial observation seminars. Over the next few years they averaged about 10 seminars a year on celestial observations, mostly to state surveyor association conventions. The seminars offered instruction on determining the astronomic direction of a line (and its conversion to grid direction) based on observations of either the sun or Polaris. The seminars followed the ephemeris and discussed field methods, pointing techniques, errors, and calculations. It also explained the use of the HP 41 programs and covered the conversion of an astronomic direction to a State Plane grid direction.

Dick, David and Joe wrote a series of 16 articles on celestial observations for POB Magazine. In 1989 the series was expanded and compiled into the publication, Practical Surveying Guide to Celestial Observations.

The ephemeris provides tables of data necessary to determine the astronomic direction of a line by observing certain stars or the sun. The Elgin, Knowles & Senne, Inc. ephemeris uses a program written by Dr. Joe Senne to produce the ephemeris data. It is a very complex, large program which generates highly accurate ephemeris tables. Their idea was to reduce some of the algorithms in that program and place the program.
into a ROM module which could be inserted into the HP 41. After quite some development and with the aid of Hewlett Packard, in 1986, Elgin, Knowles & Senne, Inc. produced and began selling ASTRO*ROM, a module for the HP 41 calculator. It was the first internal ephemeris program ever produced for a handheld calculator. It sold for $130.00. It was followed in 1989 by ASTRO*ROM2 which had a few refinements. ASTRO*ROM was followed by ASTRO*DISK, precise internal software for the PC.

In 1987, Dick, David and Joe wrote, directed and produced a 4.5-hour instructional videotape, “Sun Observations for Astronomic Azimuth.” It came with a complete study guide and could be purchased or rented. Always the educators, the trio offered continuing education to surveying practitioners.

In about 1990, Hewlett Packard introduced the HP 48 and its G and GX models. They were to replace the venerable HP 41. (Old school HP 41 fans never thought the “48’s” were ever as good and easy to program as the HP 41.) For the HP 48, Elgin, Knowles & Senne, Inc. produced ASTRO*CARD, still offering internal ephemeris celestial observation software. They were sold for $175.00.

In the late 1980’s through the 1990’s, ASTRO*ROM, ASTRO*DISK and ASTRO*CARD were extremely popular. Many, many units of each were sold by Elgin, Knowles & Senne, Inc. Each came with a User Manual and the company’s phone number for free support. With the expansion, maturity and application of GPS, the necessity of the firm’s “ASTRO” products faded. By the late 1990’s sales of the firm’s various “ASTRO” products slowed substantially (the ASTRO*ROMs sold out in the late 1980’s). ASTRO*CARD and ASTRO*DISK, along with SPC83*CARD continued to be sold into 2008.

THE PLAYERS

Elgin, Knowles & Senne, Inc. began as Elgin & Knowles Surveying Consultants, Inc., formed by Dr. Dick Elgin, PE, PLS and Dr. David Knowles, PE, PLS in 1983. David was Dick’s PhD advisor at the University of Arkansas (1979 to 1982). During those years David directed the Associate Degree in Surveying program within the Department of Civil Engineering. As a Graduate Associate, Dick taught in David’s program while he pursued his PhD degree. Dick’s dissertation “Legal Principles of Boundary Location for Arkansas,” was a synthesis of over 1,400 decisions of the Arkansas courts relative to locating the boundaries of rights in real property. He received his degree in May of 1982, and later that year became Assistant Professor of Civil Engineering at the University of Missouri Rolla (UMR) (now the Missouri University of Science & Technology) where Dr. Joe Senne, PE, was Department Chairman. Dick and David expanded Dick’s dissertation and published a book by the same name (Legal Principles of Boundary Location for Arkansas, Landmark Enterprises, Rancho Cordova, California, 1984, now out of print). In only a few years, Landmark sold the 2,000 copies printed, most of the proceeds going to the Arkansas Geological Commission, which had funded Dick’s dissertation research.

In 1983, David and Dick and the late Robert L. Elgin, PE, PLS (Dick’s father) founded Elgin & Knowles Surveying Consultants, Inc. Initially, the corporation focused on consulting surveying services related to legal aspects of boundary location, litigation, solving unusual surveying problems, advising surveying instrument manufacturers, and providing surveying education through seminars taught by David and Dick. They established ties with the Lietz Company of Overland Park, Kansas and conducted seminars on a variety of surveying subjects for Lietz Company around the country.

Joe Senne had a life long fascination with astronomy that had grown from a hobby to an avocation and profession. In the 70s, a group known as the International Occultation Association (IOTA) was formed and for many years Joe served as Vice President for lunar grazing occultation prediction. A worldwide network of observers, using these predictions, helped to refine star positions and the profile of the moon’s edge. Joe also worked with the U.S. Naval Observatory in this obscure area of astronomy.
As Lietz became Sokkia, the name on the ephemeris cover changed. Since 1985 there were edits and upgrades. For a few years, HP 71 programs were included. A simple HP 42 program listing was added in 1990. In 1991, HP 48 program listings were added. Over the years the number of ephemerides sold faded. In the last few years most were sold to university bookstores. Academia seemed to still be teaching celestial observations after the surveying profession had embraced GPS. 2008 was the last year for the “2008 Sokkia Celestial Observation Handbook and Ephemeris.”

Dick Elgin, David Knowles and Joe Senne brought together knowledge, interest, research abilities, software development capabilities and academic backgrounds in celestial observations as well as their practical application to surveying practice. These talents coupled with business insight and acumen all brought to surveyors worldwide their practical application of celestial observations. They came along at the right time. The K&E ephemeris ended in 1984. Their ephemeris started in 1985, followed by the development of internal ephemeris celestial observation software, instructional materials and seminars which continued until 2008. They influenced half a generation of surveyors and raised the level of surveying practice from 1985 until 2008, the last year for their “Sokkia Ephemeris.” David Knowles is retired from the University of Arkansas and now devotes most of his time to his lifelong passion, fly fishing and tying flies. Dick Elgin sold his business (Elgin Surveying & Engineering, Inc.) in 2008 and now spends his time touring on his bicycle. Joe Senne has long been retired from the UMR, but is still involved with worldwide grazing occultation predictions and his other astronomical interests.

Marc Cheves is Editor of the magazine.