

PRODUCT DESCRIPTION

THE ETAK NAVIGATOR

The Etak Navigator is the world's first practical automotive navigation system. It continuously displays the destination and changing position of a vehicle on a highly detailed map display. The navigator is totally self-contained, and operates independent of any external radio source.

Based on a revolutionary advance in navigational technology, the Navigator uses "augmented dead reckoning" to determine the vehicle's position solely by means of a compass, motion sensors, a computer, and a map data base. It requires no calibration or programming by the driver, and rarely accumulates positioning error during operation. Wherever the vehicle has been or is going, the Navigator determines and displays its current position to an accuracy of 50 feet--automatically.

The Navigator has been designed with the driver's needs foremost in mind. The key to its ease of use is the moving map display. As you drive, your position on the viewing screen, marked by a small triangle, remains constant. Instead, the map moves around you, assuring that whatever streets are ahead of you through the windshield are also ahead of you on the screen. The result is a continuous and immediate correlation between your view of the real world and your view of the map, and a remarkably instinctive feel for where you are going.

The driver can also choose specific views of the vehicle's position or surroundings. At a touch of a button, you can zoom-in for a detailed closeup of your position, with all streets shown and labeled. Or you can zoom-out for a less detailed overview of major streets. The widest zoom level shows the national interstate system. When the vehicle is stopped, the "North-Up" button fixes the electronic map in the standard orientation of paper maps -- and returns it to "Heading-Up" orientation with a second touch.

Looking for a particular street address, intersection, or landmark? By scrolling through the map index, the driver can select and display one or a number of destinations. The destination appears as a small flashing star, and the distance from his current location is shown.

This astonishing versatility and ease of use is made possible by the fact the electronic maps are not simply displayed in a fixed form. Instead, they are continuously created and recreated on the screen. The computer modifies them according to the driver's changing position and desire for particular information. At any given moment, the map on the screen is custom-made to tell you exactly what you need to know.

No matter why or where you drive, the Etak Navigator means losing less time getting lost, wasting less gas, experiencing less frustration and anxiety. The Navigator ushers in a new era of efficient, worry-free driving.

The Navigator System

The Etak Navigator consists of four basic components, none of which requires modification of the vehicle. Installation is similar to the installation of aftermarket audio systems or cruise control, and takes two to three hours.

Custom-designed navigational sensors are mounted near the wheels, and the special electronic compass, which is computer corrected for the magnetic effects of the vehicle, is installed in one of several inconspicuous locations.

The electronics package, containing the computer, display drivers, and the tape interface, can be placed under a seat or in the trunk.

The compact tape drive unit can be mounted anywhere in the vehicle, such as under the dashboard or in the glove compartment. Unlike standard audio tape decks, it contains no potentially troublesome capstan or pinch roller; the only moving parts are the motor drive shafts.

The high-resolution vector-graphic display comes in two sizes: Model 450, a 4 1/2" screen with a flexible stalk for passenger cars; and Model 700, a 7" screen ideal for commercial applications. Both mount with simple brackets, and include automatic brightness control and an anti-glare filter.

The Navigator has been designed to meet the most demanding operating environment a vehicle can inflict. It meets rigid specifications for tolerance of temperature, vibration, electrical stress, and electromagnetic interference. The modular design makes servicing easy.

The computerized maps, called EtakMaps, come in the form of inexpensive cassettes that are similar to audio tape cassettes. Each cassette contains every street and address for an area about twice that of ordinary street maps, as well as overviews of major state and regional roads and national interstates. In the future, EtakMaps will be easily modified for special purposes, such as showing tourist attractions or roadside service areas. The Etak map data base will be unique in the country for its breadth of coverage, completeness, and accuracy.

The Etak Navigator and EtakMaps will be widely available through auto sound dealers, consumer electronics stores, and land mobile communications outlets. The suggested retail prices for the Navigator are \$1395 for Model 450, and \$1595 for Model 700. EtakMaps will retail for \$35. National and regional sales offices of Etak, Inc. will serve corporate accounts and OEMs directly.

Coming: Automatic Vehicle Location

In the near future, an Automatic Vehicle Location system for dispatcher-controlled fleets will be available from Etak. Using The Navigator as the vehicle hardware base, AVL will make it possible for dispatchers to constantly monitor on a large video display the location and movement of every vehicle in their fleet. AVL will also provide capabilities for text communication, automatic data storage, and record keeping.

Specifications for The Etak Navigator

Power Consumption	12v, 36 watts - operating 12v, .12 watt - standby
Display	Model 700, 7" CRT Model 450, 4 1/2" CRT Vector graphic display 1024H x 770V resolution Automatic brightness control Anti-glare screen
Tape Drive	5" x 2 3/4" x 3 3/4" 80 ips
Electronics Package	12 3/4" x 6" x 2 1/2"
Compass	Solid-state flux-gate magnetic sensor
Navigation Technique	Dead reckoning, augmented with map correlation
Average Positional Accuracy	Under 50 feet
Map Scale	Variable from 1/4 mile to 4000 miles
Functions	Zoom, destination, calibrate, relocate, north-up, heading-up, help

BACKGROUNDER

INTRODUCING ETAK, INC.

Navigators on the oceans, in the air, and in space have reaped tremendous benefits from the latest advances in electronics and computer technology. But the motorist continues to rely on an awkward instrument best suited to very slow travel, and largely unchanged for centuries -- the paper map.

Now, a uniquely talented team of engineers and scientists has pooled its experience in remote measurements, over-the-horizon radar, ultra-precise radio navigation, missile and satellite design, and digital mapping. Through its quantum leap in navigational technology, Etak has created the world's first automotive navigation system--the Navigator.

By displaying electronic road maps on an easy-to-read viewing screen, the Navigator continuously pinpoints the locations of both a vehicle and its destination -- without depending on any external communications source or programming by the driver. The rugged system is easily installed, and no special training is required for its use.

No longer is it necessary to turn on the overhead light and unfold a cumbersome map over the steering wheel, shift it around to get the right bearing, and squint to read the street names -- only to discover that you've just missed your turn. No longer will valuable time and fuel be wasted while you hunt for an unfamiliar destination. The Etak Navigator ushers in a new era of efficient and worry-free driving.

HISTORY

Etak, Inc. was founded in May, 1983 by three engineers from the Remote Measurements Laboratory at SRI International, a prestigious research and consulting organization in Menlo Park, California. Working with astonishing speed and efficiency, Etak will see its revolutionary product, the Navigator, go into production by the end of 1984.

A Breakthrough in Navigational Technology

The Navigator is the result of remarkable engineering teamwork, and one man's deep interest in the problem of precisely locating an object's position on the earth. At SRI, Stan Honey led research programs in ultra-precise navigation, over-the-horizon radar, circuit design, and digital signal processing. After work, he applied much of his technical expertise to his lifelong avocation, sailboat navigation.

Stan is well known as a world-class navigator of racing yachts. He has navigated and won two Transpac races (Los Angeles to Honolulu), the Southern Ocean Racing Conference, and the Bermuda Race. Several of these victories were achieved with Stan's custom-designed navigational computers. A fellow SRI engineer, Ken Milnes, helped Stan build his second Trans-Pac computer.

Stan Honey met Nolan Bushnell through being asked to navigate and build electronics for Nolan's racing yacht. During several days at sea Stan and Nolan discussed applications for recent advances in electronics. On returning, Stan discussed these ideas with his colleagues, Ken Milnes and Alan Phillips. These discussions concluded in Stan's proposal to Nolan that he fund a start-up company to consider a variety of projects. Nolan agreed; so Stan, Alan, and Ken left SRI and founded Etak, having decided to develop a navigation system for land vehicles.

The initial team evaluated the possibility of using Loran, a system of radio transmitters developed years ago for maritime and air navigation. But reception of Loran signals is poor in the center of cities. Another possibility was the U.S. government's planned system of navigation satellites (GPS), which will beam radio signals more reliably from overhead. But this system is not yet complete, and it will require the use of an expensive microwave receiver. The ideal alternative would be a completely self-contained navigation unit, independent of all external signalling systems. But no one had ever successfully built such a unit, or even shown how something like it might work.

The initial breakthrough came when Stan Honey speculated that a car or truck could indeed be accurately navigated by "augmented dead reckoning," or by measuring the vehicle's movements and correlating them with map information. Stan's pioneering development of the complex computations necessary for augmented dead reckoning -- the "navigational algorithm" -- made the Etak Navigator possible.

The navigational algorithm was the first key step, but it was not the last. It showed that independent automotive navigation was possible. An equally important question was whether it was technically and economically feasible. A large number of tough problems would have to be solved, including the development of rugged and accurate sensors, a rugged and fast mass storage device, an easily understood map display, efficient software, and a vast data base covering the entire U.S. road system.

Here the shared experience and broad talents of the founders made all the difference. Stan, Alan, and Ken had already worked together at SRI on high-priority, state-of-the-art projects. And they had both complementary and overlapping knowledge in the relevant areas of digital and analog hardware, software, and signal processing. Within a month, SRI colleagues Jamie Buxton, George Loughmiller, and Jerry Russell joined the team. Their collaboration was synergistic. The result: a remarkable six months from the initial concept to a working prototype navigating the streets of Sunnyvale, California.

Etak: The Moving Map

The basic idea for the moving map display was chosen in the company's first month. As the car moves, The Navigator's electronic map is updated and recreated once every second, showing the driver's surroundings changing just as they change through the vehicle windows. The vehicle remains at the center of the screen, while the map features -- streets,

highways, landmarks -- move around it. What's ahead in the windshield is ahead on the screen no matter how many times you turn, no matter what the geographical direction.

The ultimate job of all the electronic wizardry is to make possible this uniquely instinctive way of navigating, in which there is always a clear correlation between the world seen through the window and the map seen on the screen.

As a long-time student of navigation, Stan Honey knew that moving maps were not new. For thousands of years the Polynesians have navigated tremendous distances on the Pacific Ocean without instruments. These expert sailors imagine their canoe to be stationary, and measure their progress by the movements of islands around them. The Polynesians call this general concept of navigation, and the islands' shifts in position, etak. Etak, Inc., using space-age technology to apply the same concept to automotive navigation, is named after the original moving map.

Completing the Team

An essential addition to the staff was achieved when Marv White joined Etak. One of the major technical hurdles was the development of the map data base. This involved two tasks. The lines and symbols of paper maps had to be converted into a system of numbers -- "digitized" -- in order to be read, manipulated and displayed by the navigational computer. And the data had to be arranged in such a way that adjacent

areas of a map could be found on a magnetic tape cassette and displayed rapidly.

According to Stan Honey, all roads of inquiry on these problems led to Marv White, a pioneer in automated mapping who left the U.S. Census Bureau to join Etak. Under Marv's direction, Etak's productivity in the process of map conversion is three times current industry norms. This will make possible the unprecedented feat of mapping in digital form every highway, street, and road in the continental United States.

As the Navigator's technical feasibility and market potential became evident, Etak's founders recognized the need to balance their engineering talent with a mature business team already well experienced in management, manufacturing, and marketing. Following an extensive nationwide search for a Chief Executive Officer, George Bremser joined Etak in October, 1983, bringing a strong background in general management and experience with the automotive aftermarket.

Bill Baker became Vice President of Manufacturing in January, 1984, after nearly twenty years of managing the manufacture of office automation products and mini-computers. And Ken Broome joined Etak as Senior Vice President of Marketing and Sales in April, 1984, following extensive experience in sales and marketing in the automotive aftermarket, as well as marketing consultation for high-technology companies.

In October, 1984, Jean Hackenburg became Etak's Chief Financial Officer, bringing several years experience as Vice President of Finance

and Planning in a billion dollar manufacturing company, as well as experience as CFO in a venture capitalized startup company. This completed Etak's management team.

Initial funding for Etak was provided by Nolan Bushnell, who was the first to recognize the potential of Stan Honey's idea. With this initial seed money, Stan and his associates moved into the Catalyst Technologies building and started work with equipment provided by Catalyst in May, 1983. Shortly thereafter, Nolan Bushnell's seed money commitment was formalized through a partnership, Catalyst II Partners.

In October, 1983, Etak's cash position was enhanced with the investment made by George Bremser at the time of his joining the company as Chief Executive Officer.

In November, 1983, Etak's first outside funding was provided by a special private offering limited to employees, friends, and others closely associated with Etak. The largest investor at this time was Catalyst Ventures, Ltd., a venture capital fund with several institutional limited partners managed by the Catalyst Group as General Partner.

A total of \$1.1 million was subscribed in the above transactions, providing sufficient funds for Etak to continue aggressive product development into mid-1984. In July, 1984, a round of financing, totaling \$2,740,000, was closed with a group of individual and private investors, including Security Pacific Capital Corporation, CFB Venture Capital Corp., Catalyst Ventures Ltd., and Newport Partners.

PHILOSOPHY

Just as The Navigator keeps the driver at the center of its continuously updated map, Etak, Inc. keeps the driver at the center of its engineering and marketing efforts.

Etak is a flexible, dynamic company that listens and responds to its customers' needs. It uses its resources thoughtfully, always working to ensure the reliability, cost-effectiveness, and effortless operation of its revolutionary technology.

Whether in engineering or marketing, Etak's approach is pragmatic: the test of an idea is whether it does the job. At the same time, Etak is committed to fostering the innovative perspective that only an active research and development program can provide.

Etak is determined to set and to maintain the standard in automotive engineering.

MARKET DESCRIPTION

The Etak Navigator offers clear benefits to its purchasers. By eliminating wrong turns and pauses for map reading, it will save gas, time, and aggravation. Delivery, service, and repair trucks will make more stops per shift, salespeople will squeeze more calls into the day, and the individual driver will enjoy more efficient, worry-free driving.

The U.S. market potential for a product offering such benefits is huge. It encompasses all 160 million cars and trucks currently in use. After receiving such marketing input as conversations with potential end users, dealers, and industry experts, formal market research, and numerous direct contacts with potential customers, Etak has selected five markets as initial targets.

1. Car rental companies. There are 550,000 rental cars in the U.S., 90% of which are owned by the four largest rental car companies. Drivers of rental cars are usually unfamiliar with their surroundings, and so are especially likely to benefit from The Navigator. Rental car companies could use The Navigator as a promotional tool with which to distinguish themselves from their competitors, and as a generator of additional revenues. The turnover in rental cars is rapid; they are replaced on an average of every 12 months.

2. National package delivery companies. The four largest package delivery companies operate over 40,000 vehicles. These companies compete on the basis of delivery speed. The Navigator will cut down on delays in both pickups and deliveries.

3. Commercial users. Commercial users maintain fleets of trucks or cars that are used for delivery, service, and repair. Of the approximately 6 million vehicles in this category, Etak will focus on the 3 million concentrated in cities. The high operating costs of these fleets, and the highly competitive nature of their business, mean that Navigator-equipped fleets will gain a substantial advantage over their competitors.

4. Business users. Over 10 million passenger cars are used for business in the U.S. The largest segment of this market is field salespeople. Individuals in small service, delivery, and repair businesses constitute another major segment. In addition, there is a large number of busy, affluent, and mobile business people who own mobile and cellular telephones. For these as well as other business people, "time is money," and the Etak Navigator will minimize the loss of both.

5. Personal users. There are over 115 million passenger cars in the U.S. which are used primarily for personal transportation. Their owners sustain a large and vital electronics aftermarket, which generates well over \$1 billion per year in sales of audio products. Within this large base of consumers, three groups

are excellent candidates for Etak products. These are the high-end car owner, who commonly spends \$1000 to \$2500 on aftermarket electronics; the owner of a recreational vehicle, who travels in unfamiliar areas and often spends thousands of dollars on electronic add-ons; and the driver who frequently gets disoriented, lost, and therefore frustrated.

MARKETING PLAN

Etak will establish a marketing and sales organization which can serve each of the five major customer groups with a full line of Etak products. This organization will consist of a national sales office which will serve national and OEM accounts, and seven regional sales offices which will serve large regional fleets. Other groups of sales representatives will serve smaller fleets as well as land mobile outlets, auto stereo dealers, and car dealers, which in turn will sell to business and personal users.

MANAGEMENT PROFILES

GEORGE BREMSER

Chairman, President, and Chief Executive Officer

Mr. Bremser has over twenty years of management experience with three large corporations. After early career experience in advertising and marketing management, including a position as marketing manager of the Maxwell House Division, he became marketing director and later President of General Foods International. He subsequently served as Executive Vice President in charge of all U.S. operations for Shaklee Corporation.

Mr. Bremser also spent nine years as Chairman, President, and Chief Executive Officer of the Texstar Corporation. In this capacity, he had overall responsibility for Texstar's ARA subsidiary, a major supplier of such automotive aftermarket equipment as air conditioning, stereo systems, and cruise control.

Mr. Bremser received his B.A. degree from Yale University in 1949, and his M.B.A. from New York University's Graduate School of Business Administration. He is currently a director of Butler International and PBI Industries.

STANLEY K. HONEY
Vice President Engineering

Mr. Honey is a founder of Etak, and the inventor of the navigational algorithm on which The Navigator is based. In May, 1983, Mr. Honey started work on his project and assembled the engineering group. Mr. Honey had spent the previous five years as a research engineer at SRI International. There, he was principal investigator and leader of programs that produced innovations in ultra-precise radio navigation, underwater optical instrumentation, over-the-horizon radar, spectrum surveillance systems, radio-frequency circuit design, and digital signal processing.

Mr. Honey's expertise in navigation is not limited to its engineering aspects. He is well known as a world-class navigator in offshore yacht racing. He has navigated and won two Transpac races, the Southern Ocean Racing Conference, and the Bermuda Race, and navigated the highest-scoring American boat in the 1981 Admiral's Cup. Mr. Honey built navigational computers that were instrumental in several of these victories.

Mr. Honey received a B.S. with Distinction in Engineering and Applied Science at Yale University and an M.S. in Electrical Engineering at Stanford University. While at Yale, he earned the Lamphier Prize for "proficiency in electrical engineering and initiative in research."

KEN BROOME

Senior Vice President Marketing

Mr. Broome joined Etak in April, 1984 after several months as the company's outside marketing consultant. He has an extensive background in sales and marketing. Mr. Broome began his career with positions as a field sales representative and national sales trainer for Skil Power Tools. After a period as Vice President Sales for Rainbow Industries, he joined Allen Group in 1975 as a regional manager. One year later, he became Vice President for Sales and Marketing of the Allen Test Products Division.

Immediately previous to joining Etak, Mr. Broome was President of Symposia Marketing, an organization that provides a variety of marketing and consulting services to high-technology companies. In this capacity, he developed the operational marketing plans for several start-up companies.

Mr. Broome received his B.S.M.E. from the University of Michigan, and has completed advanced course work in Marketing and Business Administration.

BILL BAKER

Vice President Manufacturing

Mr. Baker joined Etak in January, 1984. He has nearly twenty years of experience in several manufacturing and operations management positions. Mr. Baker began his career with the Singer Company, where he held positions in purchasing and materials management for several lines of office automation products. He then moved to General Automation, where he became General Manager of the division responsible for producing mini-computers.

Mr. Baker subsequently joined National Semiconductor, where he was responsible for material and production control and physical distribution in the \$50 million division which produces point-of-sale products. Most recently, Mr. Baker has been Director of Operations at Pro-Log Corporation. At Pro-Log, he reported directly to the company president, and served as a member of the Executive Committee with overall responsibility for production, materials, manufacturing engineering, and quality control.

Mr. Baker received his B.S.E.E. from Clemson University in 1958.

JEAN HACKENBURG
Chief Financial Officer

Ms. Hackenburg comes to Etak from Mad Computer, where she served as Vice President Finance and Administration, with total responsibility for accounting, financial planning, forecasting, cash management, human resources, MIS, and facilities.

Previously, she was with Atari, where she held a succession of accounting supervisory positions. She held the position of Vice President Finance and Chief Financial Officer for Atari's \$1.6 billion consumer division, and Vice President, Business Planning for Atari's corporate division.

Ms. Hackenburg received her B.A. degree from Grand Valley State College in 1969, and her M.B.A. from the University of Santa Clara in 1979.

WALTER B. ZAVOLI, Ph.D.

Director of Research and Development

Before joining Etak in March, 1984, Dr. Zavoli was Assistant Director of the Remote Measurements Laboratory at SRI International. There, his responsibilities included technical direction, promotion, and general line management duties for a 70-person, \$10 million research organization.

During his thirteen-year association with SRI, Dr. Zavoli developed an international reputation for his innovations in over-the-horizon radar technology, and provided direct technical and operational consulting to the Air Force and Navy in that area. Dr. Zavoli has led and supervised highly successful team efforts in detection, tracking, correlation, display, and signal processing systems. Additionally, he has been involved in the development of hardware and software systems for biomedical applications.

Dr. Zavoli received his B.S. in 1968 from Columbia University, and his M.S. and Ph.D. in Electrical Engineering from Stanford University in 1970 and 1977.

MARVIN S. WHITE

Map Scientist

Mr. White came to Etak from the U.S. Census Bureau, where he was a research scientist on the Applied Mathematics Research Staff. Mr. White was a principal designer of the digital map data base system now used by the Census Bureau in its large-scale digital mapping program (the DIME system). As an expert in automated cartography, topology, and graph theory, he established the foundation for automated mapping and geoprocessing.

Mr. White was the principal researcher in several projects that resulted in advances in multi-variate data storage and retrieval, record linkage, and interactive graphics. He provided direction and advice to federal, state, and local government agencies, and to private producers of geographic products. Mr. White is the author of 20 professional papers on digital mapping.

Mr. White received his B.S. in Physics with High Honors at the University of Illinois in 1969, and has done graduate work in physics at the University of Los Angeles.

ALAN C. PHILLIPS, Ph.D.

Senior Design Engineer

Dr. Phillips, one of Etak's founders, came from SRI International, where he was the senior hardware designer in the Remote Measurements Laboratory. Dr. Phillips is known throughout the world high-frequency community for his developments in receiver, synthesizer, and repeater designs. While at SRI, he was the principal designer of satellite receivers, medical electronics, high-density recorders, and the multi-channel receivers used in both U.S. and Australian over-the-horizon radar.

Earlier, Dr. Phillips was a member of the Ionospheric Dynamics Group of the Radio Science Laboratory at Stanford University, and before that worked in guided-missile design at the Hughes Aircraft Company.

Dr. Phillips received his B.S. in 1958 from North Carolina State University, his M.S. in 1960 from the University of Southern California, and his Ph.D. in Electrical Engineering in 1968 from Stanford University.