Consumer

Self-contained electronic games

New toys, from chess to football—and all designed with dedicated microcircuits and LEDs—make their debut this holiday season

An ongoing, intriguing aspect of the microcircuit revolution is its impact on consumer goods that undergo "electronic metamorphosis." Desktop calculators, sewing machines, and even automobiles have all successfully adopted the new technology. And this holiday season it is the toy and game industry that's cautiously coming to market with its first self-contained microprocessor-based products: electronic games that need no TV set monitor. In most instances, microcircuits provide the "randomness" feature so important to keeping games challenging even to experienced players. Game speed or deviousness may also be externally selectable to help in this respect. Armed with a proprietary mask program, microprocessors keep track of scoring, monitor game play, and can initiate audio/video effects that add interest and excitement.

The new games: a digital decathlon

Microprocessor-based tests of skill and wit should not be confused with games that contain an occasional battery-powered lamp or buzzer to complement an otherwise passive product. Enormous amounts of engineering and programming time have gone into developing the microcircuits that are the heart of all true electronic games. In fact, manufacturers such as Parker Brothers, Salem, Mass., steer clear of novelty games that are overnight sensations (e.g., TV tennis). They feel the challenge and excitement derived from an electronic game must be based on the same principles that have made Monopoly a family favorite for decades. Games that preserve some element of chance while testing each player's interpretive and deductive reasoning power retain their appeal and remain fun to play. Parker's CODE NAME: SECTOR, an electronic "search-and-destroy" submarine hunt, was developed with just such a philosophy in mind (Fig. 1). Here, players are "friendly adversaries" in that they must share information to find and sink the submarine. It's a multifaceted contest involving both "man vs. man" and "man vs. machine" rivalries.

Another approach involves updating already successful board games or popular sporting events with electronic interpretations. For instance, Milton Bradley, Springfield, Mass., has taken its long-time favorite Battleship and used it as the basis for Electronic Battleship, a programmable version of the original that rewards players with sonar sounds, flashing lights, explosions, and a victory "war whoop" when the game is won.

Meanwhile, Mattel, Inc., Hawthorne, Calif., has announced three hand-held electronic games: Football, Auto Race, and Missile Attack. These calculator-sized challenges have light-emitting-diode (LED) playing fields and scoreboards. Sound effects accompany play and scoring. And Football (Fig. 2) includes a relentless ticking, reminding you that time is running out—even when your keyboard-controlled running back has avoided immediate danger. Rockwell International, Anaheim, Calif., supplies Mattel with microprocessors and LED arrays.

Those more nimble of mind than finger can take heart because chess, the intellectual favorite, is now available in an electronic version. Though not capable of outfoxing a grandmaster, Chess Challenger from Fidelity Electronics, Ltd., Chicago, Ill., has three levels of play that can be selected, depending on the "challenge" desired. Beginners should find it a helpful teaching aid if they are not "in check" at a list price of $275 (sometimes discounted). While Fidelity claims that it is almost impossible to *always* beat Chess Challenger's 8080 microcomputer, they explain that after a number of games, average chess players should find they win 25 to 70 percent of the time. Also under development at Fidelity are Electronic Backgammon and Computer Checkers.

However, backgammon is already available in electronic versions from at least two other independent developers: Tryom, Inc., Cleveland, Ohio; and Texas Micro Games, Inc., Houston, Tex. Tryom has been selling its GAMMONMASTER II through major department stores like Bloomingdales and Bambergers since June 1977, and Texas Micro Games announced production of its Computer Backgammon in October 1977. Both products retail for about $200.

Fidelity Electronics' involvement with electronic games is particularly interesting, considering that its primary expertise is in biomedical products. The company is best known for myoelectric hand systems, electric elbows, and neural-muscular trainers. Hy Schechet, director of marketing for Fidelity Electronics, explains that a chess-playing employee proposed the original game idea and was encouraged to develop it further. And in-house microcircuit expertise, gleaned from myoelectric prosthetic developments, enabled Fidelity to handle all the necessary programming chores. Mr. Schechet further remarked that since its introduction in January 1977, Chess Challenger has literally "sold itself." Large retailers such as Sears, J. C. Penney, and Montgomery-Ward have found the game an attractive item despite its premium price.

Don Mennie Associate Editor

At any given moment during play, CODE NAME: SECTOR's microprocessor knows everything about four destroyer ships (players) and one "enemy" submarine. With this information, the microcircuit acts as a double agent: While helping the destroyers find the sub, it also controls the sub's movement. A crayon and straight edge help players follow the action and plot strategy on a large "seascape" marked with grid coordinates. The shiny surface is easily erasable.

However, all the major game and toy companies we spoke with are universally opposed to high costs at retail. Their long-established marketing methods and distribution networks are geared to moving a huge quantity of low-priced merchandise. Sales volumes could not be maintained if prices jumped dramatically. A close look at the design history of Parker Brothers' CODE NAME: SECTOR illustrates how a complex but interesting game concept, first demonstrated with the aid of an $800 programmable calculator, was engineered into a consumer product selling for $30–$45 (subject to retailer discounting).

An idea gets in the door

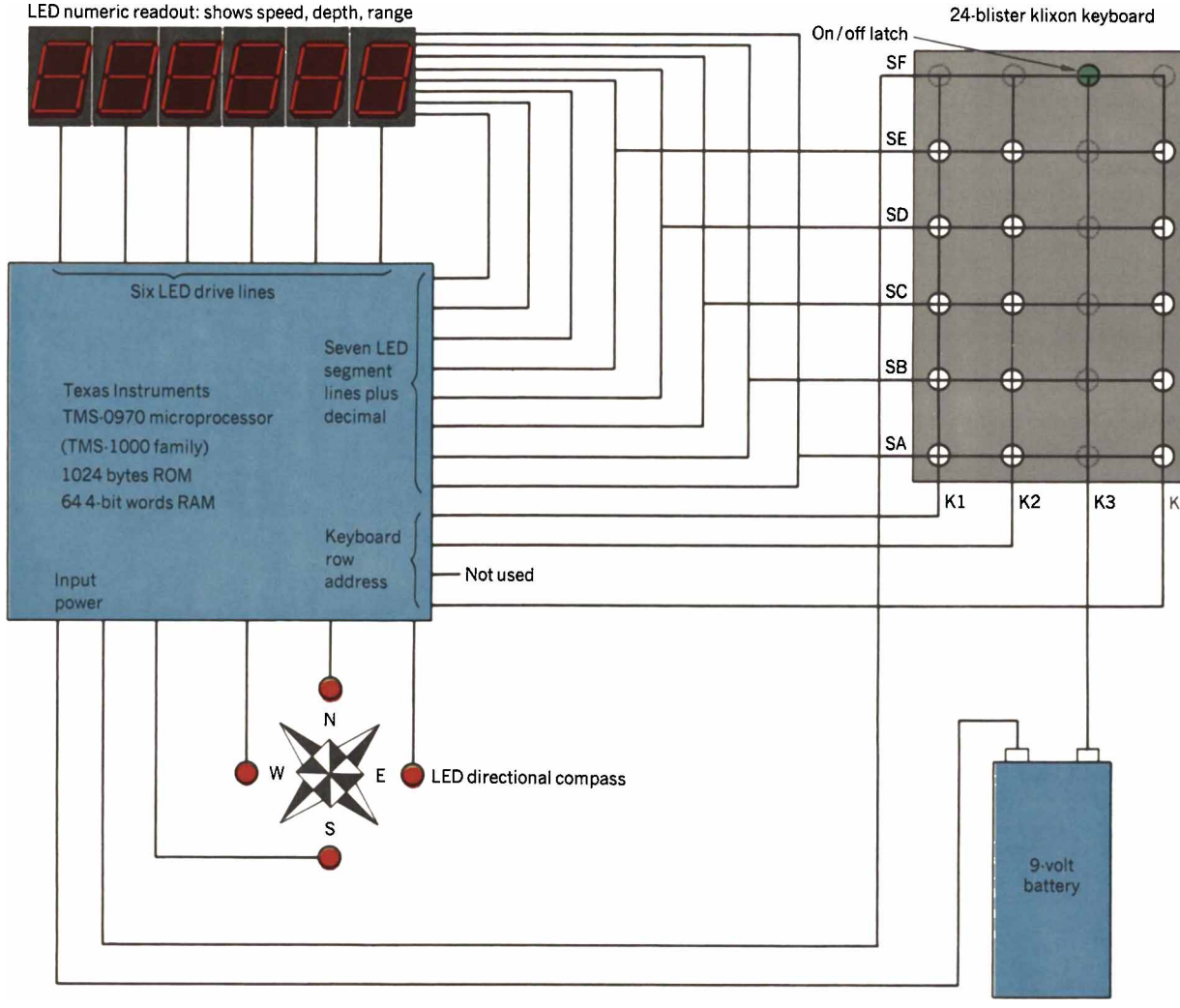
CODE NAME: SECTOR had its origins in the imagination and enthusiasm of Robert O. Doyle, vice president of MicroCosmos, Cambridge, Mass. About three years ago, this small microcircuit design/consulting firm began to approach the toy and game industry with suggestions, ideas, and demonstrations designed to stir interest in developing electronic games. Dr. Doyle sent out dozens of inquiries, but only a handful of firms invited him in to talk. Parker Brothers was one of those companies showing initial interest.

The first round of talks was a learning experience for all concerned. Parker found that microcircuits could handle complex game formats in a manner that held the interest of both novice and experienced players. MicroCosmos discovered that it did not yet have a marketable game, just some promising know-how. Parker encouraged Dr. Doyle to rethink his brainchild in terms of the board game market. Among the most important criteria were requirements for low retail cost and true randomness of play. Any detectable bias in the way the microcircuits responded to player strategy would greatly weaken the game's long-term appeal, and put beginners at an unnecessary disadvantage.

Just a few weeks after his initial visit, Dr. Doyle and his partner, Wendl Thomis, returned to Parker with some board game ideas. Soon afterward, an agreement was reached in which MicroCosmos was to develop electronic games on a royalty basis and license them exclusively to Parker. Arthur Venditti, Parker's manager of product development, began working closely with Dr. Doyle during this design phase.

Early engineering models of CODE NAME: SECTOR consisted of a rather large control box and a suitcase-size package of programmable logic and memory circuits. Much of the design work at this point consisted of Doyle and Thomis writing game rules and a matching logic program. Parker management monitored progress closely, and made many specific demands about game

[1] Eight blister contacts on CODE NAME: SECTOR's klixon keyboard (K3 row, SF column) were sacrificed so a ninth contact (green) could serve as a latching switch. Parker Brothers adopted this design to save the cost of a separate SPST device for turning the game on and off. A 9-volt battery eliminator can supply power for extended periods of play.



play features considered "musts" before comitting funds for custom microcircuit development.

The task of implementing Dr Doyle's game program on a single custom chip was handled by Texas Instruments MOS Division, Houston, Tex. It was a calculated gamble at first, because no one was sure the Parker game would fit on a 4-bit microprocessor chip with just lk bytes of read-only memory (going to larger devices was not economic). But TI's mask programming skills prevailed, and the task was accomplished—with a few bits to spare!

A click becomes a latch

While the details of CODE NAME: SECTOR's microcircuit programming remain Parker's most closely held secret, careful, cost-conscious design is clearly evident in the game's less proprietary electromechanical features. Take the keyboard for example. It contains the same bimetallic "klixon" element that is used in TI hand-held calculators. It is a four by six rectangular array of 24 "blisters," each blister normally serving as a single momentary contact when depressed by an adjacent plastic key. But in addition to push-button controls, Parker needed a latching switch to turn its new game on and off. Buying a separate single-pole single-throw device for this function was considered too expensive, so Mr. Venditti found a way of making an otherwise unused klixon blister contact into a latch. A sliding plastic wedge holds this blister depressed whenever CODE NAME: SECTOR is turned on.

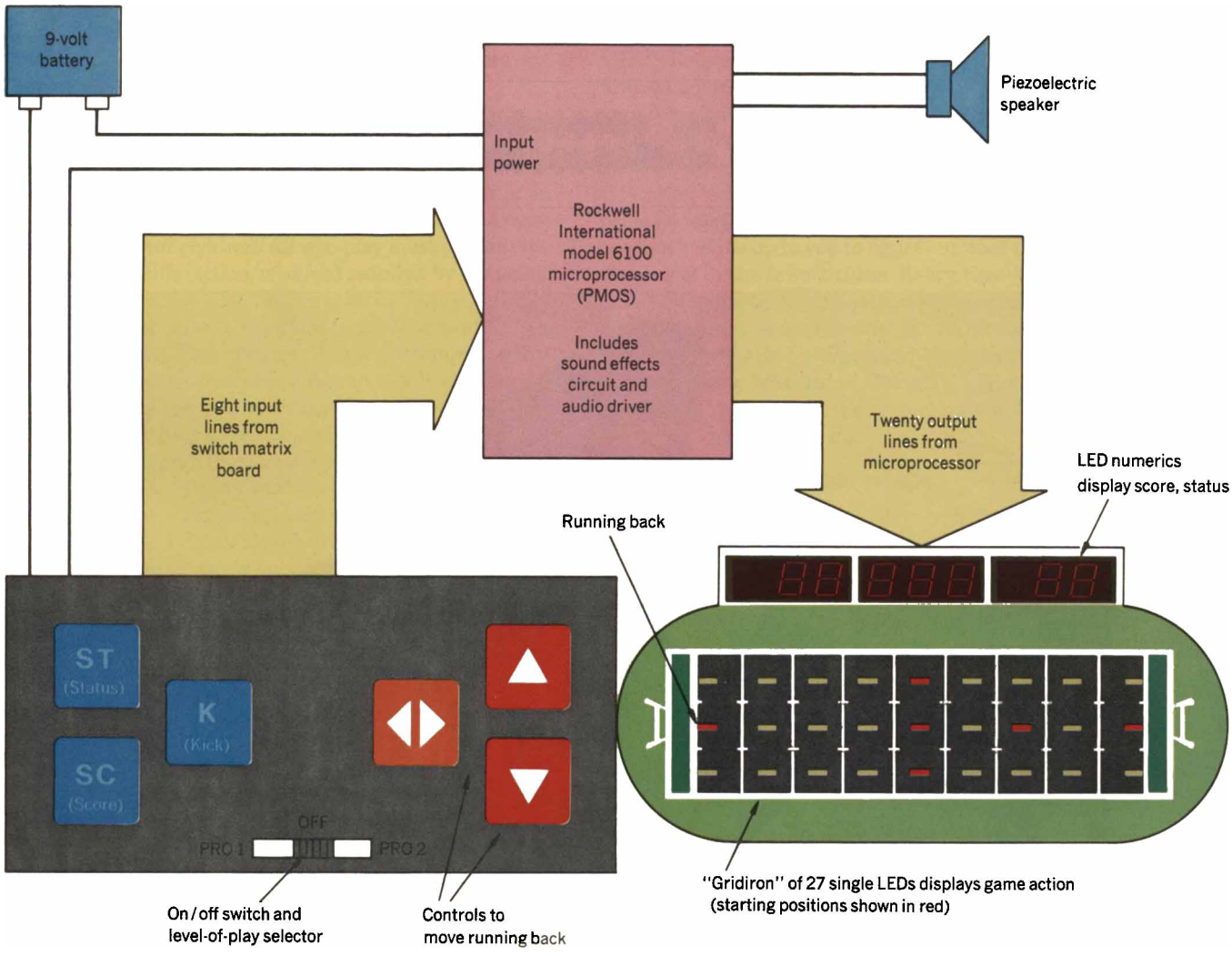
The game's "combat information center" contains an LED display that also created a challenge for Mr. Venditti. Small LED numerics fitted with a standard magnifying lens cap were chosen to save money and extend battery life, but the available lens cap made the angle of best LED visibility too shallow. The solution was a small prism that, when mated with the lens cap, bends the LED image along a plane better suited to player visibility.

But Mr. Venditti didn't run computer simulations or call in an optics expert to solve the problem. He simply had a model shop turn out some sample prisms in clear plastic (each thin prism was cut at a slightly different acute angle), and proceeded to try them all with the original LED lens caps until a good compromise was found.

Sound for the animated game

Parker's CODE NAME: SECTOR is an engaging package because it features a self-teaching mode for new players. This allows anyone to proceed through a sample "sub chase" and learn all the fundamentals before playing a real game. Close attention must be paid to the combat

[2] Electronic Football from Mattel allows two people to match wits with a microprocessor. Players take turns controlling a single "running back" offense; the back must dodge five "computer-controlled" defensive tacklers to score a touchdown. The LED numerics and the LED "gridiron" share several of the microprocessor output lines.

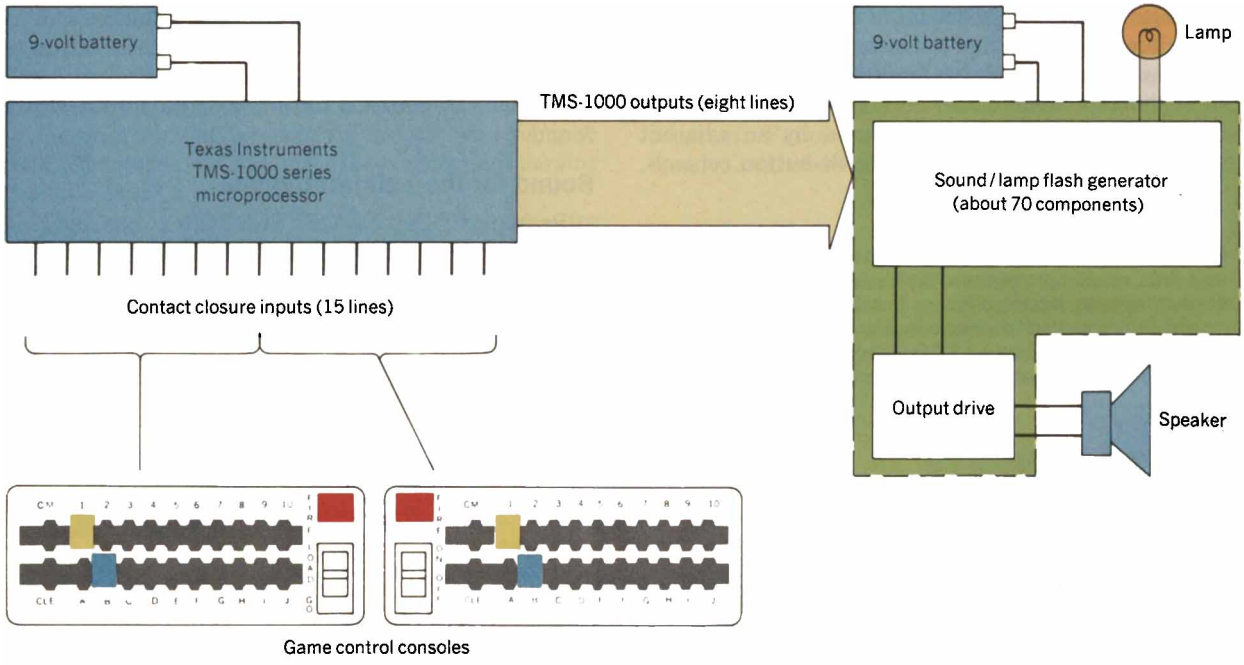


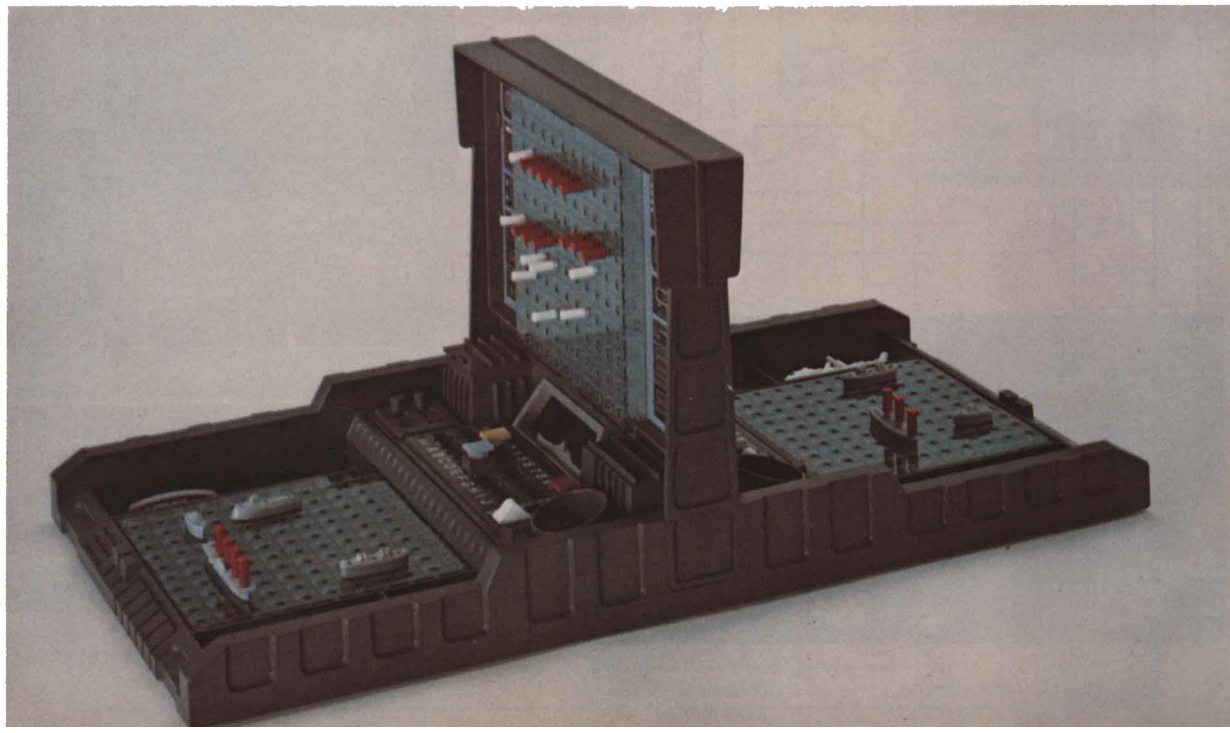
information center's LED readouts because they provide the only feedback from the microcircuits as play progresses.

Not so with several other new electronic games we saw. Borrowing from the "bells and whistles" of coin arcade action, these games stimulate players with the sounds of sonar, explosions, engine noise, a referee's signals, and perhaps an occasional cheer. An excellent example is Electronic Battleship produced by Milton Bradley. Steven Krol, a design engineer with Milton Bradley, explained the game's basic operation and features.

Each player enters 17 "positions" into Electronic Battleship's microcircuit memory before the game starts. Arranged in linear groups of two, three, four, or five, these positions represent opposing fleets in a simulated sea battle. The first player to erase all 17 of his opponents' positions wins. To ensure that the game memory is programmed correctly, prompting "beeps" are given as the players key in their chosen positions. Pressing the "fire" button initiates an "incoming missile" sound, and a flash—followed instantly by an explosion—occurs whenever a coordinate containing part of a ship is hit.

[3] Two players at separate control consoles face each other while playing Milton Bradley's Electronic Battleship. Before a game can begin, each player must program the TMS-1000 microprocessor with all the correct pegboard positions representing his or her fleet. Sonar, incoming missiles, explosions, and war whoops are among the sound effects that accompany each sea battle. These sounds are controlled by the microprocessor, but generated in separate multicomponent circuits.





Sonar sounds are generated continuously during play, and multiple war whoops signal the end of of a game.

Like Parker Brothers, Milton Bradley engaged Texas Instruments to create the custom circuits they required to produce Electronic Battleship. Rules, strategy, and game play were to be identical with the original non-electronic Battleship. A TMS 1000-type microprocessor was used along with a 555-type timer that clocks all sound effects, a quad op amp, a quad bilateral switch, and diode buffers for the TMS 1000. Two 9-volt batteries supply all the required power (Fig. 3).

Milton Bradley, looking ahead to future electronic games it might like to develop without depending entirely on semiconductor industry expertise, has invested in a TMS 1000 emulator that allows Milton Bradley engineers to simulate new game chips with in-house programming. To date, the semiconductor industry has maintained a hand-holding relationship with those toy/game makers getting into microcircuit applications for the first time. Electronics entrepreneurs having good game ideas and a determined spirit should probably seek licensing agreements now, *before* game and toy companies hire many full-time microcircuit designers.

Human factors, game play, and randomness

Established companies have the manufacturing and distribution resources required to place a new game on the market. Game inventors need access to these resources if their ideas are ever to be commercially developed. Successful partnerships can best be arranged if the inventor understands the product development philosophy endorsed by a potential client. And there are certainly as many contrasting philosophies as there are successful game makers.

Take the New York-based Mego Corporation, for example. Director of product development John McNett explains that where electronics is concerned, Mego wants to develop arcade-style games, but without the use of an expensive CRT. Nothing in a Mego electronic game must favor adults over children. All who play must practice the same motor skills (action/reaction) required by the game, and experience a similar "learning curve." In fact, a child may get better faster than a less motivated adult.

Mego's Star Trek Phaser Battle incorporates this thinking in a plastic console powered by a 9-volt battery eliminator (this keeps line voltage isolated from all game components). Single "enemy" spacecraft appear randomly among seven fixed positions in a moving star field. Players must do two things at once: line up their "phaser" and fire on the enemy ship, and also defend themselves against attack. Enemy attack may come from the right or left, and the player is only given the necessary information a brief moment before his "ship" will be hit. The correct defense button must be activated before retaliation against the enemy spacecraft can continue. Object of the game: highest score before an enemy attack breaks through your defenses. There are three levels of play, automatic scorekeeping, and electronically generated sound effects to accompany the action.

By contrast, consider Parker Brothers' main concerns about developing CODE NAME: SECTOR. They wanted a game that could not be realized without a microprocessor. Electronics was called upon to add a new dimension to board game play, affecting novelty, difficulty, and the "flow" of the game's action. The randomness aspect previously mentioned was also considered extremely critical because a "new" enemy submarine is created by the game's microcircuits each time an "old" enemy sub has been found and sunk. Position, direction of travel, and depth of each new sub must not be predictable by the players.

Parker obtained the needed spontaneity by having the game circuit's random-access memory store a six-digit number that continually changes at the chip's 100-kHz clock rate. Each "random" action required during game play is determined by a single digit in this rapidly changing number. Players cannot hope to anticipate which of approximately 25 000 valid starting combinations the microprocessor will select when a new submarine is generated. Many hours of field tests were conducted on preproduction CODE NAME: SECTOR games to verify that the desired randomness had been achieved. Last-minute glitches and mask programming errors were discovered and corrected by Mr. Venditti and others at Parker Brothers who served as CODE NAME: SECTOR marathon players.

Gamblers anonymous: casino on a chip

Microprocessor-generated randomness, this time harnessed to simulate casino-style blackjack, is responsible for UNISONIC 21, a $50 pocket-sized electronic gambling game from Unisonic Products Corporation, New York, N.Y. (desktop models are also available). According to company spokesmen, UNISONIC 21 can provide a challenge even to experienced blackjack enthusiasts. Players can split, draw, or stand, and even make an "insurance" bet if the dealer is showing an ace. The deal is changed after 38 cards are played—just as "house rules" dictate in Las Vegas, Freeport, or Monte Carlo. And, as a bonus, UNISONIC 21 converts to a standard four-function calculator at the flick of a switch.

Or perhaps you would enjoy a challenge based on deductive reasoning and logic. If so, a candidate for consideration is Milton Bradley's Comp IV. This tabletop game generates a three-, four-, or five-digit numeral at random and it's up to you to figure out what that random number is in the fewest turns. Every time you key in a guess, Comp IV tells you how many numerals are correct, and how many numerals are in the proper position. Sometimes your first estimates will be completely wrong, but by making best use of Comp IV's clues it is often possible to "zero in" on the correct numeral with just a few carefully executed tries.

In the works but under wraps

The toy and game industry is notoriously close-mouthed about any new product developments not yet in production, and electronic game innovations are no exception. In addition to the handful of such products now on store shelves, many other electronic games are expected to be introduced during 1978. However, the 1977 holiday season remains a very important "first test" of consumer acceptance that electronic-game makers will be monitoring closely. Development costs for electronic games are said to be high, so return-on-investment will be substantial only if the games sell steadily over a relatively long period.

Has the toy/game industry created a new Monopoly or just another pet rock? Only time and experience will tell as electronic games earn their reputation catering to a very competitive, cost-conscious, and often fickle consumer market. ◆