

Chess Life

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REVIEWS

Super Constellation: It's Time for Skeptics To Take a Second Look at Chess Computers

By David E. Welsh

Although recent sales of chess microcomputers have outstripped the gross national product of some of the world's smaller countries, many experienced chessplayers have remained skeptical. And for good reason. The performances of many machines have not kept pace with their manufacturers' claims about them.

And some of us have been stung. That happened to me in 1980, when Sargon 2.5 appeared on the scene sporting a performance rating in the 1600s. I immediately shelled out over \$300 for one, and I must admit at the time I was quite impressed. Soon, however, I found myself getting used to the way Sargon played chess, so much so that I could beat it at will. The machine ultimately received a USCF rating of 1474 — good for its day, but not what I needed in an opponent. Sargon has been collecting dust in my closet for more than two years. Many of you probably had the same experience with one machine or another.

I've been following developments in chess microcomputers for the past four years. I've watched them progress from class C (Chafitz's Sargon 2.5) to class B (Fidelity's Sensory Challenger 9, Novag's Savant) to class A (Fidelity's Prestige, Novag's Constellation). All of these machines were quite impressive at the time, and I have played many interesting games with them. But none was quite what I was looking for.

Today, though, chess microcomputers have outstripped their ancestors in playing strength. Now it's time for even the most die-hard skeptic to take another look. I have — and I'm going to buy one soon. The combination of playing strength, quality of design and manufacture, and price that I was waiting for has finally arrived.

the Novag Savant microcomputer. An upgraded version of Mychess was used in the Novag Robot Adversary, the first microcomputer capable of moving its own pieces.

Though Mychess was impressive for its day, it had a number of weaknesses. One that showed dramatically in games against other computers was the lack of what programmers call a "quiescence search," a term that demands explanation.

When evaluating a board position, chess programs look at all possible moves up to some fixed "depth." (For example, five "half moves," or "plies." A two-ply search involves looking at every possible move and every possible response by the opponent.) The program looks at each end position this "tree search" generates — many thousands of positions — evaluates each position, and then plays the move that should lead to the position that favors it most.

This is fine for many positions, but for some others it isn't. These positions are not tactically "quiet" — pieces can be captured, a King is in check, and so forth. Evaluating such positions by normal computer scoring factors leads to wildly inaccurate results.

Programmers have tried two ways to avoid this problem. The first, used in Mychess, is a "static exchange resolver," which computes the results of any exchanges possible in a position. The second — used in all the "brute force" mainframe programs — is a quiescence search, which continues the search from such positions, considering only captures and checks, until a tactically quiet position is reached.

The quiescence search has proven far superior. Dissatisfied with the static exchange resolver and other structural weaknesses of Mychess, Kittinger began

while other programs must do positional evaluations many thousands of times.

And it works. Aided by master consultants Hal Bogner and Scott McDonald, Kittinger was able to give the Constellation reasonable positional ability, an active, tactical style, and an effective opening book of 2,000 moves. At the 1983 U.S. Open, a 3-megahertz Constellation — only 83 percent as fast as the 3.6 megahertz Constellation being sold today — became the first microcomputer to beat a master in tournament play, after which it received a USCF rating of 1883.

Later in 1983, Kittinger extended the Constellation program, adding many more positional factors to the initial evaluation routine, endgame improvements, and a greatly enlarged opening book. A prototype of this new Super Constellation also com-

This personal "book" can be entered to a depth of up to 35 moves in any one variation, and the priority of these lines can be specified relative to one another and to the standard opening book. (Since the program selects lines from its book at random, it will seldom repeat a variation unless it has a high priority.)

The Elite has a modest standard opening book that can be supplemented by add-on cartridges, the CB9 (list \$78) with 8,160 moves and the C16 (\$120) with 16,100 moves. And there are five ECO cartridges (list \$120 each). The Elite also has a training mode for opening drill.

Both machines are far superior to earlier models in their opening-book capabilities.

• *Sportsmanship.* If you get the better of these programs, they will resign in some

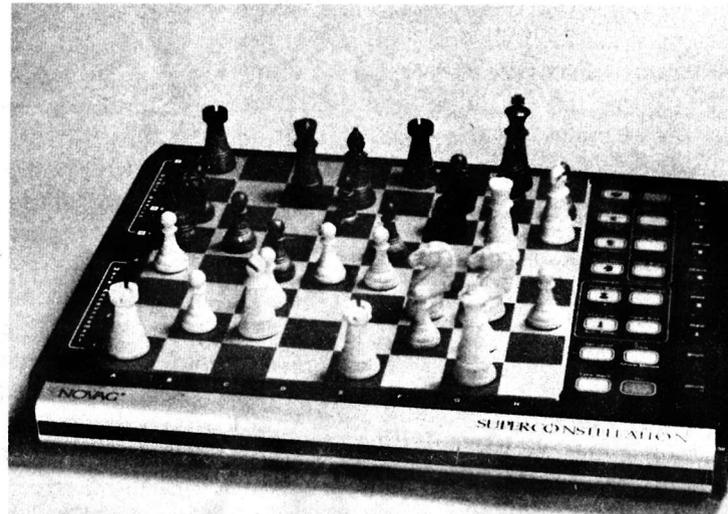
Super Constellation's play in pawn endgames is also quite impressive by computer standards. To begin with, the program understands the "square of the pawn" rule, with such refinements as whether a King can help its own pawn by taking squares away from the opposing King. This helps the program to accurately evaluate threats created by passed, or potentially passed, pawns. Super Constellation also knows to move Rooks behind passed pawns and to blockade passed pawns.

An unusual and impressive feature is the machine's ability to sacrifice a piece for a pawn to reach a drawn endgame.

In the middlegame, Super Constellation plays an active, tactically oriented game. It's unique initial evaluation routine also enables the program to formulate and carry out positional plans. This does not work perfectly (neither do my positional plans), but it greatly strengthens the program's play and also makes it an interesting opponent with a relatively "human" style. This initial evaluation routine contains about 160 specific instructions, which is quite an accumulation of chess lore for a computer. Half of these instructions relate to pawn play, half to play with other pieces. The total chess knowledge contained in this routine vastly outweighs anything that could be put into an evaluator function that must look at each end position in the search tree.

About 25 percent of these instructions act negatively; that is, they prevent the machine from making typical silly "computer moves." For example, many programs tend to play a move such as ... Bb4+, "thinking" that the only reasonable reply is Nc3. Some programs will even do this with a piece "en prise," losing after the unexpected reply c2-c3. Thanks to its initial positional evaluation, Super Constellation avoids this and similar blunders.

The other 75 percent of the instructions drive the machine into a search for active play. Slow maneuvering games are still beyond any computer's abilities, but Super



waiting for has finally arrived.

Each of the latest machines offers a unique combination of playing strength, features, and price. For example, the Fidelity Elite is housed in a beautiful wooden chessboard with 1½-inch squares, a feature I really like because I have difficulty relating to the smaller squares of other models.

For the average chessplayer, any of today's machines is a good buy. The best machines will give many experts an interesting game. Personally, I think the latest models are all good, and some are excellent. So check out several machines before making your choice.

I have made my own personal selection, a machine whose progress I've had a chance to observe over the past year. It is Novag's Super Constellation, scheduled for release this fall. The manufacturer's suggested list price is around \$400, and it will be available through U.S. Chess (with discounts to members) and probably through mail-order firms as well.

I chose the Super Constellation because I like to play fast games, and this is the first machine that can give me a consistently even game at speed chess. My over-the-board rating ranges in the 1900s and 2000s, but I probably play at about 2100 at speed chess. When I began playing speed chess with prototypes of the Super Constellation, I was amazed at the quality of its play. I lost my first speed match to the Super Constellation, and in subsequent rematches I've gotten at best an even score.

There are many other things to recommend the Super Constellation, and we can use these features to elaborate on the advances that characterize the latest top-of-the-line chess microcomputers.

A LITTLE HISTORY

The author of the Super Constellation, Dave Kittinger, became involved in computer chess in 1978 when he started work on the program Mychess. This program did well in competition, eventually acquiring a USCF rating of 1615. When Kittinger went to work for Novag in 1980, he reworked Mychess for

change resolver and other structural weaknesses. Mychess and Kittinger began work on a new program, which appeared in 1983 in the Novag Constellation.

The Constellation program is based on two premises: that search speed is the most important contributor to program performance, and that the positional blunders we think of as "computer moves" cannot be prevented by any practical amount of lookahead, but must be dealt with by giving the program advanced chess knowledge.

Typically, a program must look at a huge number of positions during its search — about 180,000 for a top microcomputer at tournament speed. Therefore, a program can't devote much time to each position, which means the factors the program considers in its evaluations must be very simple and rapidly calculated. Otherwise, the positional evaluation slows the machine down. That is, the more "chess knowledge" a program has, the slower it runs; the slower it runs, the fewer positions it can look at; the fewer positions it looks at, the more tactical shots it will miss. A vicious cycle.

Kittinger used a unique approach. He deliberately simplified his tree-search evaluation down to an absolute minimum, coding it very tightly so that it would execute quickly. Although this evaluator is not very smart positionally, it is excellent tactically, and fast enough to carry out an extended quiescence search.

To give his program positional knowledge, Kittinger added an initial positional evaluation routine that examines the board position before going into the tree search. The program assigns "strategy values" for each of the legal moves, depending on how much sense they make positionally. It also adjusts the values of the pieces depending on positional considerations, and assesses the values of the squares pieces are placed on. This initial evaluation is quite elaborate compared with the evaluation done at the tree-search level by any microcomputer program, and it takes much longer to execute. But this does not slow the program down, because the initial evaluation is executed only once, at the beginning of the search,

The Novag Super Constellation

peted in the 1983 U.S. Open, achieving a rating of 1919. The commercial version of the Super Constellation should be stronger — in addition to subsequent improvements to the program, it runs 25 percent faster.

THE TALE OF THE TAPE

Aside from its strong play, the Super Constellation offers a number of features that exemplify what today's top chess computers have to offer. Let's look at two of the very best, the Super Constellation and the Fidelity Elite (which comes in two models, the regular "A/S" and the stronger "World Champion.")

- *Styling.* The Super Constellation is similar to the Constellation. The 12x9½-inch unit has an 8x8-inch sensory board with plastic pieces. While the Super Constellation is nicely styled, the Elite models, with their nearly regulation-size wooden sensory boards and wooden pieces, remain the ultimate in computer chess beauty.

- *Peripherals.* Like the earlier Savant, the Super Constellation interfaces with Novag's chess printer (list \$150) and chess clock (\$90). The Elite models have a built-in clock, while a printer (list \$135) is optional. These handsome, high-tech accessories will appeal to the serious player who is trying to develop at speed chess.

- *Opening Book.* The Super Constellation's opening book contains a remarkable 21,700 moves, about one-fifth of the lines appearing in boldface type in the *Encyclopedia of Chess Openings*. Although this standard opening book (some variations are 22 moves deep) is more than enough for most players, the program's author has recognized the special needs of the strong player with an interest in opening theory. The machine accordingly features a special learner/trainer mode, which allows you to "customize" its opening book with up to 1,200 additional moves.

situations. They also recognize draws by threefold repetition of position and the 50-move rule.

- *Convenience Features.* Both Super Constellation and the Elites store the entire game, so that it is possible to take back any sequence of moves or have the machine replay the game for you from start to finish. (When using the printer, this also allows you to avoid distractions by printing the score after the game is over.) Both programs not only show you which moves to take back, but also which pieces were captured.

- *Playing Modes.* Both machines have eight pre-set playing levels ranging from 60 moves in five minutes (speed chess) to standard tournament times, plus an "infinite" mode that allows the machine to search until it finds a checkmate or you force it to move. The Elite's built-in clock also allows you to set any time control you wish.

- *Kibitzing.* During the game, both machines will show you at what depth the program is searching. For the Super Constellation, that can be up to 20 or 21 plies in infinite modes; at tournament levels, it searches to five or six plies in the middlegame, 10 or more in the endgame. Both machines also include features common to all good chess microcomputers: a "hint" key that displays what the program considers your best move; a "go" key to force the program to move; the ability to switch sides and to play itself; and an "easy" modes for novices.

HIGH-POWERED FEATURES

The Super Constellation's special playing features illustrate what the future holds in chess computers. For example, how many human players can mate with Bishop and Knight? This machine can carry out that mate — as well as all the other basic mates — at five seconds per move!

play. Slow maneuvering games are still beyond any computer's abilities, but Super Constellation has some impressive capabilities in more active positional operations. For example, it knows how to play a minority attack in the Exchange variation of the Queen's Gambit Declined, and it seeks pawn breaks to open up a position.

A really impressive feature of the program's middlegame play is its ability to make sacrifices on positional grounds. These are not always perfectly sound (neither are my sacrifices), but they usually are, and they nearly always lead to difficult and interesting tactical play. The program knows how to make the stock sacrifices on e6 in the Sicilian, and on h7 in the French when Black lacks a Knight at f6. And it knows how to follow through on them. It also recognizes opportunities for positional pawn and Exchange sacrifices by either side, and emphasizes fast development in openings — when "out of book" the program will give back a gambit pawn for development.

THE BOTTOM LINE

I think the new Super Constellation — like some other new chess computers, most notably the Fidelity Elite — is a quantum leap in chess capability. I have personally played enough games against this machine, and have observed it and its prototype play enough tournament games against strong players, to guarantee that the Super Constellation will be an interesting and challenging opponent for any class A player and most experts — particularly at speed chess.

Although I've been a dedicated skeptic about buying another chess microcomputer, watching the development of this machine has convinced me that it's time to take another look. The computer manufacturers, and also the distributors who sell these machines, are eager to get more business — so that prices are more reasonable than ever before, particularly considering the quality of the machines being offered.

Take another look at today's chess microcomputers — I'm convinced that you'll like what you see. ♣

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