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—but 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 (Chait’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 was very dramatic 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-plply 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. Disappointed 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 1985 U.S. Open, a 3-megahertz Constellation—not 85 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 BCO 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 ... Bd4+, “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...
The Novag Super Constellation

The Novag Super Constellation was introduced 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 take a look at two of the very best:

- **Convenience Features.** Both Super Constellation and the Elite 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 offer an option to force back, but also which pieces were captured.

- **Playing Modes.** Both machines have 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 force you to move. The Elite's built-in clock also allows you to set any time control you wish.

- **Kibitzer.** During the game, both machines will show you at what depth the program is searching for a solution. 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" mode 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 move as quickly as Bishop and Knight? This machine can carry out such a move — as well as all the other basic moves — at five seconds per move!

Slow maneuvering games are still beyond any computer's abilities, but Super Constellation has some impressive capabilities that I think many players will find useful. For example, it knows how to play a minority attack in the Exchange variation of the Queen's Gambit Declined, and it seeks from Black to open up the 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 c4 and d4 in the French when Black lacks a Knight at f5. And it knows how to follow through on them. It also recognizes opportunities for positional pawn and exchange sacrifices, and emphasizes finding 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 in positional operations — is a quantum leap in chess capability. I have personally played enough games against this machine, and have observed it and its prototype play against strong humans, 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, producers, 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.