

anatomy of the

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CANADIAN PATROL FRIGATE

by Gene McCarthy

The Sperry Corporation advertisements say "at Sperry, we listen." The simple success story on the Canadian Patrol Frigate (CPF) program can be told in two words, *we listened*.

The emphasis must be placed on both words because the we represents an extremely enthusiastic and caring team of Defense Systems people. The *listening* made them dedicated to the dream of being partners in the development of the first-of-a-kind Distributed System Architecture. The result, the Canadian Patrol Frigate program, represents the largest single systems contract in the history of Defense Systems.

SHINPADS/UYK-502 Development Phase

The implementation of the dream started with the winning of the SHINPADS concept evaluation study contract. Defense Systems then overcame Litton, the other winner of the study contract, by conceptualizing the best answer for a Distributed System Architecture on a modern combat ship. We chose to listen to the decision maker.

We won the SHINPADS follow-on contracts because we had a good understanding of the Department of Natural Defense (DND), maintained relationships and above all, listened to the decision maker. Of course, the Systems Engineering team led by Dick Kuhns, with support from Dick Olson, Keith Myhre and others, was key in convincing the customer of our technical credibility and expertise.

The UYK-502 computer was a natural outgrowth of the Data Bus development. It was clear that a micro-computer was required to interface various kinds of peripherals and subsystems to the Data Bus. Paul Williams of Systems Engineering and Bob Jablonski of Product Engineering, in discussions with the customer, hit upon the notion of utilizing the basic design of the Low-Cost Processor to develop what is now the UYK-502.

Standardization Emerges

In parallel, an effort was being made within the Canadian Navy to standardize on a set of computers, displays and peripherals to be used on all newly developed subsystems. This standardization effort was the key step towards influencing the Canadian Patrol Frigate program before the CPF project office was started.

To move the SHINPADS and UYK-502 efforts to reality took a lot of prodding — and at times the most enticing route was the route of giving up. In retrospect, however, one cannot say enough for the trust, faith and support senior management placed in what we were trying to do.

They subsequently authorized the resources which brought success.

CPF Program Starts

Now that we had a start on the Data Bus and UYK-502, we were being told by DND Engineering people that the CPF effort was approved as a project. Capt. Derek Baker was assigned as the deputy project officer. The project office mandate was to select a prime contractor, through competition, for developing and building six patrol frigates.

The prime contractor was given the responsibility for delivering the ships, with all the necessary equipment and accoutrements, to meet Canadian Navy requirements. Furthermore, the DND believed that an electronics company should be the prime contractor.

With this knowledge in hand, with the standardization effort moving forward, with the U-1600 expanded memory, USQ-69, UYK-502 and SHINPADS Data Bus as the proposed standard products and a sound knowledge of the general CPF requirements obtained from the SHINPADS simulation effort, it was time to meet the big challenge — a major role on the CPF!

The next bit of knowledge we picked up was that the Canadian government did not believe any one company had the resources to be responsible for the entire program. It believed a team of companies would have to form a consortium, with one company in the lead. Wanting that lead role, we therefore initiated steps to secure it. First we researched the Canadian shipyards and ranked them. Next we presented our plan to Defense Systems' management — outlining the program, stressing the benefits and requesting that a Defense Systems project team be formed.

Defense Systems Initiates a CPF Consortium

Interviews were arranged with the two leading shipyards, Davies and Marine Industries. Davies was eliminated when we learned it was already committed to the Litton consortium.

Defense Systems' credentials were presented to Marine Industries, and the CPF program was explained, along with the reasons why Sperry Defense Systems and Marine Industries would make a good team. Other possible team members were discussed, with the role each would play.

Our next step was to come to grips with what Defense Systems' role could reasonably be. Our philosophy was to stretch for the highest role possible so that we would end up with a role with which we could be comfortable.

WIN



We ended up with the Combat System Architecture and overall Software responsibility, along with the Data Bus and Data Processing Hardware.

We invited Sperry Systems Management into the team discussions to manage the Combat System. This meeting was crucial in that we had to inform Sperry about the particulars of the program and define the roles we and Sperry would have, respectively. The roles were agreed to, and the SHINPADS Data Bus was introduced as the interconnect for the distributed system desired by the Canadian Navy. Then the Defense Systems team maintained the necessary pressure on the Combat System Prime to keep our level of involvement high throughout the program's preliminary phase.

Beginning in September 1977 with the phone call to Marine Industries, through the next six months of meetings, a winning team was formed with the additions of a second shipyard, St. John Shipbuilding; a naval architect firm, Gibbs and Cox, and a consultant, Acres Engineering. Marine Industries subsequently dropped out of our team, due to financial difficulties.

Defense Systems was also building a winning team to win one of two Contract Definition phase awards. Chuck Burk, Program Management, and Jim Ketchum, Tony Williams and others from Systems Engineering, were the key players to win this phase.

SCAN Marine (a Canadian subsidiary formed by Pratt and Whitney) and St. John Shipbuilding, our prime, were also awarded Contract Definition phase contracts. Both were proposing our products.

Distributed Architecture Promoted Worldwide

In the meantime, while the CPF teams were engaged in the CPF competition, another team of dedicated Defense Systems employees was steadily moving forward on the Data Bus development. Dick Olson, Steve Anderson and Walt Ruzick of Systems Engineering, and Gary Peterson, Marc Shoquist and Ross Starkson of Design Engineering, together with a number of supporting personnel from several organizations, were performing in an extraordinary manner. They were developing the SHINPADS hardware and software to the point where it would be one step away from production. This was a ground rule, for equipment was to be acceptable for inclusion in the CPF design.

In addition, a major promotional effort was underway, with demonstrations of the SHINPADS system being given in St. Paul to more than 100 audiences from all over the world. Dick Olson did a super, professional job in giving the large majority of the presentations. Throughout the entire demonstration period of over two years, the SHINPADS team never faltered or lost its enthusiasm.

With a team of totally dedicated Defense Systems employees, like the few named above (and they are but a few of the total who directly contributed or wholeheartedly supported those who did), we could only win! We felt like winners, acted like winners — and it showed!

Defence Systems Canada Key on Political Front

There was another group of young, eager and dedicated employees performing an equally important task, which directly contributed to our success. They were the Defence Systems Canada employees in our Winnipeg facility. They supplied a key member of the SHINPADS design team, Barry Cockerill, started the production of the UYK-502 computer, geared up for the SHINPADS production and were a tremendous boost to the Sperry image and credibility throughout the CPF winning effort. The presentations and tours given at our facility were absolutely essential in demonstrating Sperry's capabilities and intentions in Canada.

Gerry Smith, Director of Winnipeg Operations; Glen Johnson, Program Management; Bob Hoagland of Quality, and Neil Williams and Ken Beuchler of Engineering all contributed above the call of duty. This included not only their normal efforts, but involvement in the political realm as well. They worked to keep Manitoba provincial pressure on the federal government to provide jobs west of Ontario. This political support was a major contributing factor to our team's success.

CD Proposal Critical to Success

During the 15-month CD phase, Defense Systems provided Sperry and St. John Shipbuilding with an expanded group of system engineers led by Dave Bohne of Program Management. Dennis Abbott and Tony Williams were the key Systems Engineering players.

I can't think of a better compliment to give anyone than the one Sperry gave to Dave Bohne. He was named by Sperry to be the leader of the software negotiating team on behalf of St. John Shipbuilding when discussions were taking place with the government negotiators and evaluators. The software is the critical path item of the CPF, and Dave is the recognized Sperry team leader. He and his Defense Systems team felt and acted like winners, and it showed!

The last few months, prior to the CPF award, were critical months for — yes, listening. The CPF team, headed by Phil Auerbach, Vice President of Tactical Systems for Sperry Systems Management, and Andy McArthur, President of St. John Shipbuilding, did a super job of listening. The formation of Paramax in Montreal, the sharing of the shipbuilding with another shipyard (Marine Industries, no less) and the inclusion of the COMDEV SHINPADS display were all political moves made as a result of listening.

Yes, the success story can be stated in two simple words, we *listened*. It sure took many many of dedicated we and a heap of *listening* before we earned the right to shout, we *won*!

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AN/UYK-43

by Michael A. Bukovich

Homework and teamwork characterize the main ingredients in any win. This was also true of Sperry's win of the AN/UYK-43 Production Program, awarded on May 27, 1983, after 32 months of fierce, head-to-head competition with IBM.

Certainly our record in producing over 5,000 Navy standard computers with on-time deliveries assisted our cause.

On Sept. 30, 1980, we were awarded one of two full-scale engineering development contracts for development of AN/UYK-43. Our competitor, IBM, was awarded the other development contract. During 30 months of competition, including numerous design reviews, we *listened* to our customer and provided the technical solution the customer wanted.

Our AN/UYK-43 contained technological advances that the competition did not even consider. We perceived that the Navy's primary focus was high system availability. Embedded diagnostics, embedded fault-tolerant programs, 25 percent of the circuit logic devoted to built-in-test and a push-to-test maintenance philosophy all worked together to give the Navy what it wanted — namely, responsive casualty reaction enabling the system to be up and ready at all times.

Early in the development phase, the AN/UYK-43 was not technically visible to prospective users. Undergoing development, the AN/UYK-43 was not totally understood by the user community. We undertook the task of conducting an extensive sales campaign to aggressively promote the AN/UYK-43 for Aegis, NTDS Upgrade, Trident, PLRS, DDG-51 and numerous other programs. Newsletters, brochures, a technical description and a sales presentation were the main sales tools. The campaign showed the customer, PMS-408, our commitment to the AN/UYK-43 program and more importantly, helped them sell the program to the Navy community.

During the later stages of hardware development, our proposal strategies became clear. We recorded the overall strategy with a plan that told the story of why we should win. Included were discriminators between us and our competition and all the appropriate sales messages that needed emphasis. We focused on IBM's weaknesses.

The overall proposal planning took into account the usual, as well as the possibility of unforeseen closing items. Our team remained "ready" to respond to a Best and Final submittal which, combined with the original proposal, formed a total package fully responsive to our customer's RFP. Our proposal won over IBM's — a combination of technical superiority and low price.

The homework could not have resulted in the program win without teamwork. Engineering developed the superior product. Manufacturing produced in the past and showed that same excellence for producing in the future. Pricing provided a "deal" the customer could not refuse. And Marketing provided the leadership. Winning this contract continues our tradition as the U.S. Navy's proven supplier of low-cost, high-technology, reliable, standard computers.

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AN/UYK-44

by R.C. Elfering

The win of the AN/UYK-44 production contract can be best characterized by three aspects:

- An aggressive technical solution to the requirements.
- A strong management of the development program.
- A thorough marketing effort with the Navy Program Office and all potential users.

In order to be considered for the production contract, a contractor had to demonstrate a fully qualified and technically capable product. The fully qualified portion of the evaluation criteria related to the environmental and functional requirements, along with the reliability and maintainability requirements. The emulation of the UYK-20 instruction set and ability to execute UYK-20 programs were addressed in the technically acceptable portion of the evaluation criteria.

Two areas where Sperry took an aggressive technical position that was widely accepted by both the Navy and the user community were, first, the packaging technology and the SEM implementation approach and second, the approach to satisfying the built-in-test and diagnostic requirements.

The use of leadless chip carrier circuit packaging allowed the implementation of the functional elements in fewer SEMs than the other available forms of packaging. The fact that leadless chip carriers represent the industry's latest approach to electronics packaging also satisfied a wide range of potential users. The use of ceramic substrates as the circuit board also demonstrated an implementation approach that is seldom used by the SEM program. The combination of leadless chip carriers mounted on ceramic circuit boards provided heat transfer characteristics that promised a significant improvement in reliability over more widely used packaging techniques.

Sperry developed an approach to the built-in-test/diagnostic requirements that went beyond the specification requirements. The use of an embedded maintenance processor along with its microcode to not only detect failures, but also to isolate the failure to the specific module, provides the Navy with significant benefits in the areas of ease of operation, reduced training requirements and elimination of load devices for the storage of diagnostic programs. This is one case where a decision to go beyond the specification requirements resulted in capturing the votes of a majority of the evaluation team.

The very fact that Sperry took an aggressive approach to meeting the technical requirements, coupled with the short development schedule, provided a significant challenge to the management team. Add the fact that we had never qualified a module to SEM requirements, and we had a very difficult task.

The decision to develop the UYK-44 using leadless chip carrier packaging was made after a thorough evaluation of the major semiconductor vendors. Could they, when put to the test, deliver components in the quantities required to meet the delivery schedules? When the decision was made, the program management team had to make it happen.

Frequently, promised delivery dates by vendors were

not met. But the Navy's development schedule never changed. In every case, schedules were established to meet critical item deliveries and revised numerous times before the delivery was accomplished. Our commitment to out-perform the competition by satisfying all the technical requirements and meeting all schedules was kept.

Qualifying the modules to the requirements of the SEM program took a lot of effort. We were not familiar with the specifications, testing requirements or the Navy organization that manages the SEM program. We also felt that many of the SEM requirements should not apply to the UYK-44. After the contract was awarded, Sperry received an award from the Navy for outstanding performance on the SEM program — a tribute to everyone involved.

During the last months of the development schedule, it became apparent that an extra effort would be necessary to provide all the data to the Navy that would be required by the evaluation team. Again, Sperry's proposal team came through. Six large boxes of CDRLs were delivered to the Navy on the proposal due date, along with our price proposal. In the final analysis, the high quality of our data items proved a big factor in our selection.

At the beginning of the development program, it was

determined that a thorough marketing effort would be required to insure that the benefits of our approach to meeting the UYK-44 requirements were well understood. Every request for information on our approach was handled immediately. Technical briefings were conducted for every Navy Program Office and Prime Contractor that would listen. Each contact was followed up, to determine if additional information was needed.

The embedding requirements of the UYK-44 MRP presented special challenges. This represented a new area of system involvement for Sperry. It became necessary to establish a dedicated engineering group to support marketing in addressing specific embedded applications.

It all paid off with the selection of Sperry as the only contractor to supply advanced production equipment (APE) UYK-44s for the SQS-53C Sonar Program. This selection was made by the Navy a full 15 months before it was determined that we would receive the contract for production of the UYK-44.

In the final analysis, there were no special tricks or formulas to winning the UYK-44 production contract. It all came down to just plain hard work on the part of everyone on the UYK-44 development team.

Last call for winning wit

To-date, only four nominations have been received for the caption to Dick Holm's photos in the last *Challenge*. You were off to a good start — before the red border was complete, we had already received one entry. We've been told Dick has received numerous phone calls, but the nominations must be in writing to be considered.

Get those entries in. The contest will be continued until Third Quarter *Challenge*.

Entries received thus far are:

- "Maybe if you stood up straighter?"
- "Fartitude"
- "Better to have halitosis than no breath at all."
- "Graceful degradation"

new publications

Data Sheets

1652 Dual Monitor (old UDS 98034)
68394

1655 Intelligent Color (old UDS 68166)
68395