Only the Limits of Our Imagination:

An exclusive interview with RADM Grace M. Hopper

By: Diane Hamblen

Oftentimes stories of the past are just stories. But listening to philosopher and teacher, Admiral Grace Hopper, spin her rich and colorful tales is an example of history marching purposefully forward. In this interview, she made it clear that above all she wants the micro community to look to the future while firmly holding the hand of the past.

Admiral Hopper has had a long and distinguished career spanning nearly 40 years of uniformed service. "I'm retiring *involuntarily*." says Hopper. Even facing retirement, she continues to challenge us to keep pace with her forward march.

Chips Ahoy: Will Gramm-Rudman make serious inroads into our purchasing power for new ADP equipment?

Hopper: I don't know what Gramn-Rudman will do to us. But I suggested to Admiral Sutherland, and since then to Mr. Hancock, that we should threaten to turn off all the data processing computers. That should fix them! They won't know where anybody is or where the ships are. They won't know where any anchorages are. They won't know where anything is. They won't know what they have or what they are committed to. They can't run the Navy without our computers.

Chips Ahoy: If Gramm-Rudman cuts into to our ADP money, how long will our current micros last? Should managers get rid of their older models? Should a Government activity market its own used micros?

Hopper: Well, micros don't break down. Manufacturers just come up with newer models with better capabilities. But activities will have to upgrade because they'll need the new abilities. Now we're beginning to see second-hand computer stores. They aren't a chain yet, but they will be. The kids can buy computers cheap. Sell the old one; buy a new one. Just like a used car lot for computers.

From the govemment's point of view the prices are right. And if you're selling the old one, it's not costing you much to upgrade. I don't know what we do at present, but I know we should be selling them because there's a market in Africa, South America and Asia.

Chips Ahoy: Will we ever see a paper-free environment? What benefit will it be to us?

Hopper: Not until we get the younger generation in charge, we won't. At present, we're putting on paper a lot of stuff that never needed to be on paper. We do need to keep the records. But there isn't any reason for printing them. The next generation growing up with the computers will change that. When I say the next generation, I'm thinking about my grandnephew and grandniece. They're two and four.

"Magazines, newspapers and books are the only kinds of paper we should keep. Get rid of all this junk we pile up."

One form of paper that will remain is magazines, newspapers and books. Those we'll keep, but not all this junk we pile up. There is one guy in the Pentagon who gets a printout about a foot thick every day. Then he takes

yesterday's and puts it in a locked room. I know darn well he can't read that pile in 24 hours. What he must look for is the biggest numbers or the least numbers, and the computer could do it for him. But it's his security blanket. His job is getting a big pile of paper everyday. He does his job.

Chips Ahoy: What about the people who are losing their jobs because of the increased use of computers?

Hopper: They're not losing thier jobs because of computers. It's because the whole structure of organizations is changing. For example, after World War II, we went overboard on management. Everything could be done by management. We had MBAs and lawyers and tremendous staffs. With the recession, people began to find out they didn't need all that, and they tumed more toward operations. A lot of those staff people were totally unnecessary. And they were unnecessary from the very beginning. The Pentagon is loaded with them. Changing organizational structures dislocate people not computers or other new equipment.

Chips Ahoy: Computers will count beans, bullets and black oil. They will keep our data and process our words, but what new things are microcomputers going to be able to do for us?

Hopper: They're already doing new things, You're not looking at the small groups. For example, there is a magazine called *Genealogical Computing.* And under the New England Historical Genealogical Society, there's a computer club. These genealogical computer clubs are all across the country. There is some beautiful software; one is called Roots. They make all the spreadsheets of all your ancestors. The big genealogical center in Utah is going to go on-line soon so people can access it. There you have a whole community of people that you didn't realize were using computers.

Here's another one. If you do counted cross stitch, there is a program that lets you put your pattem on the screen. Two bars tell you right where you are on your pattem. I don't think people are paying attention to other people who are handling unique types of information.

Chips Ahoy: Are there many other hobby groups that need special software?

Hopper: I don't know. They're growing all over. I know of a fisherman who uses his computer to keep track of the fish in his lake. Every time he catches a fish, he notes in his file what part of the lake, what time of day, what the weather was, what lure he used, what kind of fish, how heavy it was. That's storing information and making it directly accessible.

Chips Ahoy: Are we relying too much on the computer?

Hopper: Either you use computers or you can't do the job. It has just gotten too big. Look at banking. You used to have a loan, a checking account and a savings account. That's all you could have. Look at what you can have now. They couldn't compute all those things for all those individuals and for all those individual services if they didn't have the computers. You used to buy an insurance policy on your house, your car, and your life. Now agents can write a policy for your entire family. Including your house, your car and everything else, tailored for your family. You have revolving credit accounts in stores, you couldn't have any of that stuff without the computer. All that personalized service depends on the computer. There aren't enough workers to cope with it. If AT&T and the telephone company didn't use computers there wouldn't be enough people to route the calls.

Chips Ahoy: That brings up the question of the telephone and the computer. Lots of people, especially in the Govemment, have old dial telephones. Is it going to become commonplace in an ordinary office environment for our computers to communicate with each other?

Hopper: Computers can call each other now. We have modems right in the computer. Commonplace? Oh sure. It has to. The computer does it -- if you have a modem.

"We won't have a weather computer until someone realizes it can be done. The computers have to be faster, store more data and access more data."

Chips Ahoy: What's next for the computer?

Hopper: We should be building a weather computer. We can't use a general purpose computer. A weather computer could take all the information we have and make better, long-term predictions. But until we have more powerful computers, we can't do long-term forecasting. The computers have to be faster, store more data and access more data. We don't have that capability now, and we won't see it until someone realizes it can be done.

NASA has a computer which consists of an array of 128 by 128 computers, 16,384 processors all in one computer. It's used to scan landsat data to see if the color of the desert changes. If the color changes, there might be oil under it. We could use it to track locusts that are attacking a crop. Wish we had one like that for the weather. We don't have one to find out about those waves at the bottom of the ocean that the Navy wants to study either.

Here's another more direct one. We're going to have to manage water. My sister lives in New Jersey. A couple of years ago they had a water shortage, and they were limited to fifty gallons of water each a day. Down in Florida they've pulled so much water out of the underlying aquifer that they've produced sink holes that they dump houses and cars into. They've taken so much out of the aquifer in Phoenix that the whole city is sinking, so it cracks open. Half of Colorado is short of water the other half has water. The eight great lakes' states and the two providences of Canada have formed a water consortium. They're going to manage the great lakes' water. They'll only-sell it at a very high price to those people in the southwest. You're going to have to manage water. Now you have a tremendous engineering job building more reservoirs and pipelines. You'll need a computer system that will ensure that every resident of the United States has their fair share of water. How would you like to tackle that job?

Chips Ahoy: Do you think we need another major weapons' system? Do you have any hesitation about a computer controlling it?

Hopper: Absolutely essential. It might not stop an all out Russian attack, but I don't think we'll get one. But there are still the crazies. And it would stop the crazies. If someone has four or five missiles, you can shoot them down. If you don't shoot them down, you'll start World War III. The computer will have to run the system. They're more reliable than a lot of people.

Chips Ahoy: What happens to the roll of the tactician? Will World War III have a tactician the caliber of General Patton now that we're letting the computer play the game?

Hopper: The computer will probably do it better. The computer's decisions will come from those very people. Computers don't do anything. People have to tell them what to do. Don't misunderstand me. The programmer doesn't have any thing to do with it. It's the person that feeds the information and the data in and says what you're going to do with it that counts. 'ne system design comes from some- one that knows the problem. The programmer just does as he's told. Programmers don't solve problems. Our tacticians will take on a new dimension. The tactician would say that under particular conditions we do this, and under other conditions we do that. That's the underpinning of artificial intelligence.

**"MYCIN is a good example of the artificial intelligence routine.
It's something we would no have thought possible a few years ago."**

There's a system for identifying infections called MYCIN. The experts have collected information from doctors all over the United States. When a doctor calls in with specific infection symptoms, the system comes back and asks him if he's noticed this or noticed that. The doctor answers. The system says, " I think you're treating such and such, and you should do this." It's probably something we couldn't have imagined a few years ago. But for infections, it's absolutely marvelous. MYCIN is an outstanding example of the very first of the artificial intelligence expert routines.

You do the same thing in tactical. You collect all the information from all the tactical experts, and the computer tells you what you have. It might ask you if you saw this or did you try that. And then it will recommend what to

do. You have the knowledge of the best people at your fingertips.

Here's another example. The captain of a ship might call down and ask you how many gallons of fuel he has. You could tell him how many gallons. But how much nicer if you told him, "You have so many gallons, you're steaming north by north west, into a north west wind, and you're using this many gallons an hour and you can keep that up for so many hours."

That way you're giving him a more complete answer to his question. Basically the questions haven't changed, just the depth of the answers and the ability to access them.

Chips Ahoy: Will everyone have quick access to information?

Hopper: Ultimately, in the next generation when our bright youngsters take over. I watched third grade students in Independence, Missouri write programs in basic and debug them. They'll be able to handle the computers when they grow up. My two-year-old grandnephew has a program that says "V". John looks at the keyboard and hits V. A big V comes up, and he cheers. He knows the whole alphabet and all the digits. He can type his name. His four-year-old sister thinks he should be able to type her name too. I think Deborah is a little too long for a two and a half- year-old. She has *Speak and Spell* and the *Little Professor.* She can do all her arithmetic. She knows how to spell a tremendous number of words. I don't know what she's going to do to her kindergarten teacher when she gets there. But it will be interesting.

Kids will be using computers instead of memorizing their multiplication tables. This will give them more time to solve word problems which is much more useful. That's the real problem. Not the arithmetic but the interpretation. Of course if someone doesn't upgrade those problems, they'll still be emptying that blasted cistem. There is a generation coming that will be different. We're already beginning to get the 17- and 18-year-olds in the Navy that have had computers and used them.

Chips Ahoy: Do you think the current popularity of micros is just a fad?

Hopper: No, the big mainframes are going to disappear. In fact I intend to scuttle them. They have to go. They'll be too slow. We'll build systems of computers. It will be a whole bunch of micros, and they'll all call each other up and talk. If you use a big mainframe, first you have to do inventory and then you do payroll and so on. You might just as well have a micro doing each of those jobs all working in parallel. That's the way you get the speed. The big pressure is going to be on faster answers. There never was a good reason for putting inventory and payroll on the same machine. The only reason you did it was because you could only afford to own one computer. That's no longer true. The micros are as big as the big mainframes were only 10 or 12 years ago. Back then a big mainframe had 64 K. That's smaller than today's micros by a long shot.

Chips Ahoy: Is there a limit of what micros can do for us?

Hopper: They'll only be limited if our imaginations are limited. It's all up to us. Remember, there were people who said the airplane couldn't fly.

Chips Ahoy. Why are you such a supporter of Chips Ahoy?

Hopper: I like the fact that it reviews hardware and software totally impartially. Chips Ahoy has never been attached to any particular computer. Almost all of the other magazines are either attached to one of the manufacturers or else they have inhouse a particular computer which slants everything.

Hopper: Now I have a question. Why don't you get the darn system fixed so people can get subscriptions? There are a lot of schools and businesses that want the magazine.

Chips Ahoy: We're trying Admiral. We've already asked the Govemment Printing Office for approval to sell Chips Ahoy.

Hopper: Why don't you just go ahead and do it? Remember,

"It's easier to ask forgiveness than it is to get permission."