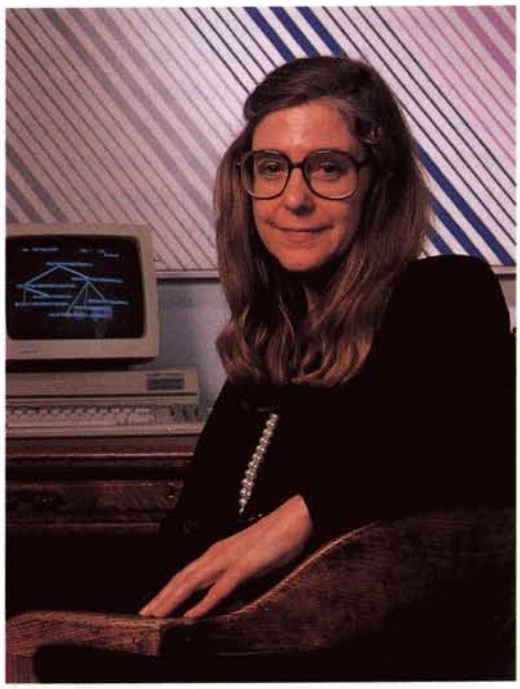
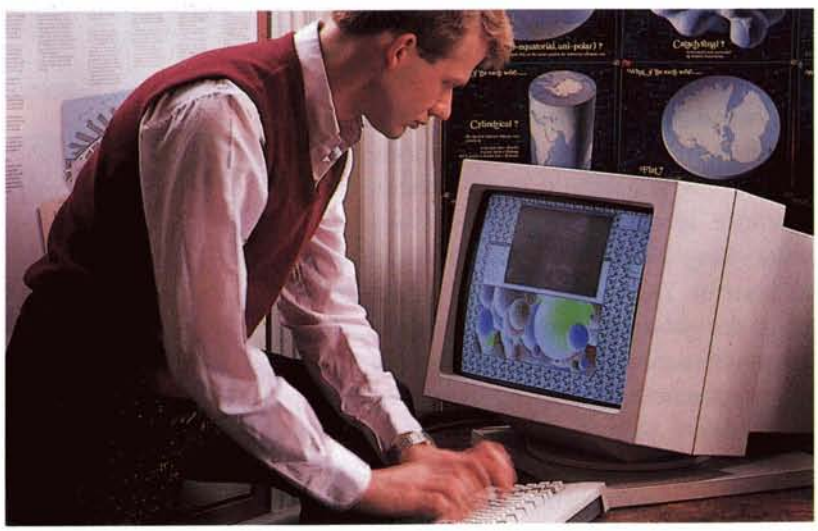
Error-free Software

Many computer engineers feel that error-free software, or even software close to error-free, is an impossible goal. Not Margaret Hamilton (right), president of Hamilton Technologies, Inc. (HTI), Cambridge, Massachusetts. A pioneer of ultrareliable software for more than 20 years, she believes it is possible to build ultrareliable software and her company is already offering a product that is capable of eliminating at least 75 percent of all software-related errors.



The product is known as 001™, described by HTI as "an integrated tool suite for automatically developing ultrareliable models, simulations and software systems." It has been applied in aerospace engineering, manufacturing, banking and software tools development.

Margaret Hamilton explains the 001 tool suite: "The essence of the 001 is that it provides the ability to simplify the complex. Its focus is to support the thinking process to be more reliable; it helps someone define his thoughts as simply as possible, but not simpler. The adherence to a philosophy of defining systems derived ultimately from a small set of reliable constructs is the reason why this approach is so powerful. 001 assumes that every system is a candidate for reuse. To build a reliable system, only reliable systems are used as building blocks and only reliable systems are used as mechanisms to integrate these building blocks. The new system becomes a reliable system for building larger systems."



A system developed with 001 can be prototypes or fully developed with production quality code. It is free of interface errors to a fine degree; it is consistent and logically complete and it has no side effects; errors of data and control flow, including those having to do with timing and priority, are eliminated. Says HTI: "Because of its features of reliability, automation, abstraction, flexibility and reusability,

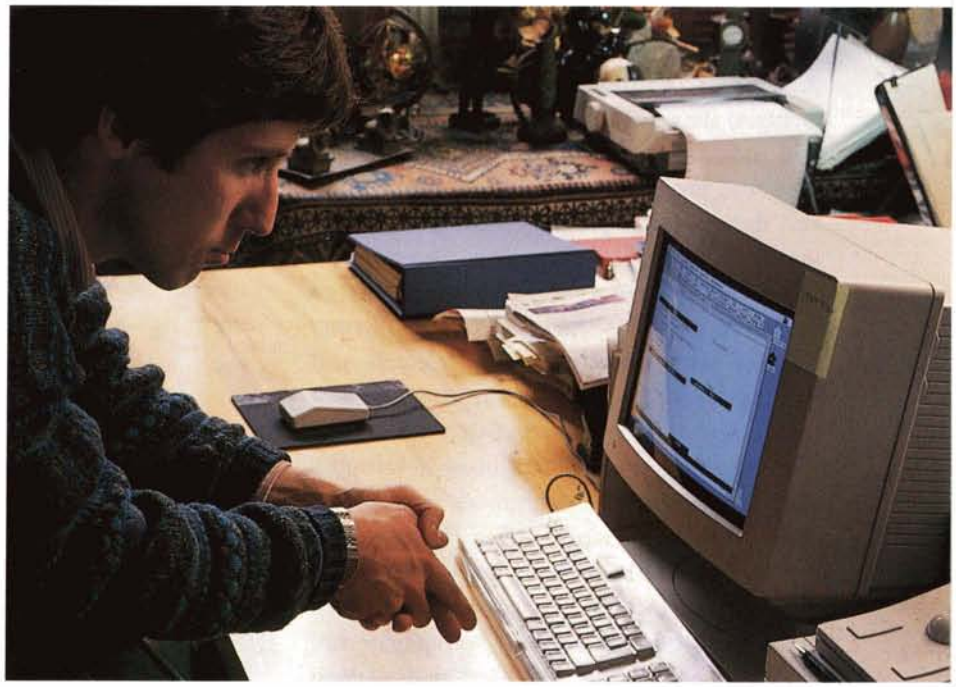
systems can be designed, developed and maintained with maximum productivity."

The 001 tool suite resides in the VAX/VMS environment but it can be ported to other machines. At left below, HTI software engineer Carl Kraenzel is working at a Sun System using the 001 tool for modeling; at right, HTI's Robert Poirier is creating a system on the Apple Mac 2.

The 001 tool suite represents a second development in Hamilton's quest for error-free software. She directed the research and development of an earlier product called USE.IT, the first computer-aided software engineering product in the industry, to concentrate on automatically supporting the development of an ultrareliable system throughout its life cycle. Both products, and the companies producing them, had their origins in NASA technology developed during the Apollo Lunar Landing Program.

For development of the onboard guidance, navigation and control system for the Apollo spacecraft, Johnson Space Center awarded a contract to the Charles Stark Draper Laboratory, Inc., Cambridge, Massachusetts. Hamilton directed development of Apollo onboard software; she led her staff in performing an extensive analysis of software errors and how they happen. This led to the formation of a theory—called Higher Order Software—that embodies control axioms for eliminating errors early. That work provided the beginning of 001.

In 1976, Hamilton left Draper to form Higher Order Software, Inc., also in Cambridge, and she served as the company's president and chief executive officer from 1976 to 1984. Hamilton founded HTI in 1986 to develop 001.



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