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# Computer Advances

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**Engineering productivity soars  
at Gulfstream Aerospace**



Using HP 9000 computers, aircraft design engineers at Gulfstream Aerospace Corporation have reduced development time substantially and improved productivity by more than 25 percent.

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# HP DesignCenter: integrated tools that boost engineering productivity

*Design automation tools from Hewlett-Packard lower costs while maintaining high standards from design through production.*

By Bill Parzybok

**T**o remain competitive in a global marketplace, you must get higher quality products to market faster than you used to. This is not an easy job because product life cycles are getting shorter, components more complex, and competition more fierce.

This means engineers have a harder job to do and less time to do it in. A computer-aided design and engineering (CAD/CAE) environment effectively addresses this problem by substantially streamlining the product development process. Using automation tools, engineering teams can plan, implement, and manage the entire design process, helping them do the job better and faster. For example, to test how a design will actually work during the critical analysis

stage, CAE simulators speed up studies of a potential product's behavior. When documenting what the product is or how it fits together, computers shorten the writing and editing time.

The key to CAE/CAD, though, is not just that each engineering design step is faster, but that all steps are integrated. With design automation, once engineers have an initial design, they never have to recreate it or enter repetitive information.


**HP DesignCenter:** integrated from idea to product. HP's definition of CAE/CAD includes multidisciplined tools that enable engineers to improve electronic hardware, mechanical parts and software development. Engineering auto-

mation moves a product vigorously from the idea an engineer has in the early stages of a project right through to efficient production for timely delivery. We bring engineers an integrated design environment called the HP DesignCenter™. The key platform of this environment is HP's family of engineering workstations—highly predictable, high-performance resources that can tie into a network of servers, mainframes, minicomputers, and personal computers. A system of networked workstations makes it possible to perform each part of the engineering task independently or as a team. With this approach, engineers work more rapidly through the design cycle while maintaining better control of quality.

HP DesignCenter has a core data-management system that cuts redundancy and

links many design components. An engineer might start a complex job on an HP 9000 Series 300 workstation, do a simulation on HP's new Series 800 Model 840 super-mini, and document the project on an HP Vectra personal computer. The engineering team uses the design database to share design data, programs, and resources.

**Unified approach improves engineering productivity.** The unified HP DesignCenter encourages engineering teams to see the many steps from design to manufacturing as an integrated process. With this view, engineers can anticipate and work on potential bottlenecks during planning rather than production stages.

We present you with a single-vendor approach while adhering to industry-standard networks, interfaces, and operating systems such as AT&T System V UNIX. Thus you can use in-place units from other suppliers and upgrade to a unified HP system. The HP DesignCenter—fully supported with documentation, consultation, worldwide service, and training—combines hardware and software into a total CAE solution that maintains HP's high quality standards and engineering excellence. 

Bill Parzybok  
Vice President and General Manager  
Design Systems Group  
Hewlett-Packard Company



# HP computers streamline development of space-age structures



*HP 9000 computers have helped design engineers at Space Structures International to more than triple yearly dollar output with no increase in staff.*

**“W**are entering a new era of computer-aided design in the building industry,” says W. R. Wendel, founder and president of Space Structures International Corp., a company whose engineers have created such dramatic, form-efficient buildings as the Omnimax Theater at Caesar’s Palace in Las Vegas, Nevada, and the Miami arch at the Miami International Airport in Florida. Over the years, the 15-year old Plainview, New York, firm has built a series of unique structures, including modern office complexes, restaurants, sports arenas, and prototype space stations—all conceived and designed on computers.

**Computer-aided elegance.** “Using a technological palette, we create structures that are efficient, economical, and elegant,” says Wendel. Space Structures’ technological palette consists of eight HP 9000 computers, all interconnected under Hewlett-Packard’s Shared Resource Management System. A sophisticated in-house software program called SSCAD (for Space Structures Computer-Aided Design) organizes and processes design and construction information to develop workable solutions to design challenges. The company’s powerful combination of hardware and software dramatically reduces the time required to arrive at these solutions and saves hundreds of thousands of dollars in the process.

Before acquiring the HP equipment five years ago, Space Structures relied on timeshared computer services, which the company found to be both expensive and inefficient.

“We were spending in excess of \$10,000 a month leasing computer time,” Wendel says, “and we were *wasting* time, because the machines and software were inefficient for our type of applications.”

Space Structures decided to buy an in-house system and spent about three months evaluating equipment. “We finally settled on Hewlett-Packard,” Wendel says, “based on system performance and the company’s reputation for service.”

**Integrated for high performance.** “We took our time putting this system together,” continues Wendel, “and we finally arrived at a completely interactive network.” Space Structures’ SSCAD software running on the HP 9000 computer is a complete computer-aided design tool that enables an engineering team to move a project from the proposal stage through design, analysis, materials management, and fabrication. “The design, the analysis, the drafting—everything is interconnected, which makes our system faster than anything else around,” adds Wendel.

“In the old days, we labored over our designs and generated a mound of blueprints. These days, all that information is




Architectural elegance and simplicity: The Omnimax Theater in Las Vegas, Nevada. Inset: An HP 9000 computer screen displays a three-dimensional view of Omnimax’s Triaframe dome.



stored in the HP 9000 computer. It streamlines our design processes and has improved our productivity substantially. Since 1981, when we bought our first HP 9000 system, we have more than tripled the dollar value of projects shipped out the door. And we’ve done it without adding engineers to our staff,” says Wendel.

Space Structures plans to put more and more functions on the system, so that it will eventually encompass all production and general project management—thus, fully computerizing projects from start to finish.

“Computers are essential tools in this business,” concludes Wendel, “and they are going to get more and more important as our work becomes more complex. It’s the direction of the future, and we’re ready for it.” 

# Engineering productivity soars at Gulfstream Aerospace

*In 1984, managers involved in the development of a revolutionary new commercial aircraft at Gulfstream Aerospace Corporation realized they had to abandon traditional computing resources and give their engineers more desktop power. The result: Engineering Productivity Centers featuring HP 9000 Series 500 computers, and a giant step forward in engineering productivity.*

**B**efore the Gulfstream IV executive airplane development began at Gulfstream Aerospace Corporation, engineering went on as it does almost everywhere else in the aerospace industry. It was primarily tied to huge FORTRAN applications submitted as batches to giant mainframe computers.

Mainframe computing was adequate for most projects at Gulfstream but design engineers wanted even more efficiency, flexibility, and control. For example, the batch processing procedure did not support varied "what-if" analyses. And engineers could not create their own reports, tables, charts, and letters.

The decision at Gulfstream to undertake the development of the ultimate executive jet aircraft brought all these needs into sharp focus. Gulfstream managers knew they had to make optimum use of all company resources, particularly in view of the crucial time constraints sur-

rounding the Gulfstream IV project. It was time to look for alternatives to mainframe computing.

#### **Mainframe power on every desk.**

The search for an optimum engineering computing system began in March of 1984 and continued for one year. What evolved out of the desire for local control of computing resources was a concept called the Engineering Productivity Center (EPC). The idea was to provide each engineer with mainframe power right on his desk.

"We went through a competition of about five vendors, two of whom were mainframe suppliers," says Ed Flinn, manager of aero/propulsion and engineering and scientific computing at Gulfstream. "Out of that study we elected to go with a distributed processing workstation concept. We decided on a UNIX operating system environment and that led us pretty quickly to Hewlett-Packard as the obvious choice."





Beyond distributed processing and a UNIX operating system, Gulfstream had several other criteria by which they measured their potential computer vendor. These included:

- interactive programming capabilities,
- the availability of special applications,
- ease of use,
- turnkey vendor support,
- flexible, inexpensive growth potential,
- minimum facilities requirements,
- a variety of inexpensive peripherals,
- easy application of existing software,
- strong maintenance support, and
- open lines of communications with other vendors.

HP scored high in almost all areas.

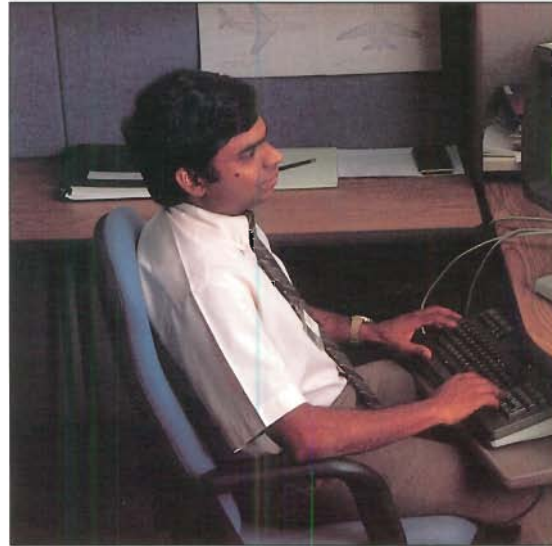
**Dramatic productivity improvement.** As it finally evolved, each EPC consisted of one HP 9000 Series 540 processor, a printer, a plotter, and four or more graphics terminals. Workstations were tied together via a local area network and in addition were tied to remote mainframe computers, including an IBM 3081, a DEC VAX-11-750, a CRAY, and a CYBER.

The change in engineering productivity was dramatic. "As a result of the EPCs, the vehicle design and flight sciences department picked up at least a 25 percent improvement in engineering productivity. There are many people who would say it was much more than that," says Flinn. In some cases, the engineers performed work that could not have been done without the EPCs. In other cases, they were able to do more complete and thorough analyses. Finally, their increased efficiency enabled them to devote newfound time to other staff in such areas as sales, marketing, design, and production.

Time saved through higher productivity is well-spent at Gulfstream. With the capability to do "what-if" analyses quickly and conveniently right at their desks, engineers can work through a more comprehensive range of situations now—this enhances the ability to achieve design requirements with minimum project risk.

Designed with the help of an integrated system of HP 9000 computers, the Gulfstream IV executive jet is a startlingly beautiful 19-passenger aircraft.


One of HP's most prominent contributions to the development of the Gulfstream IV has been in the computational aerodynamics group where the primary aerodynamic design of the airframe is done. Gulfstream engineers were able to do a great deal of design work on the computer before using the wind tunnel. The



Dr. Reuben Chandrasekharan, lead engineer for the computational aerodynamics group, uses the HP 9000 computer to test different configurations of the Gulfstream IV aircraft.

wind tunnel tests became not design iterations, but design confirmation exercises, thereby saving substantial amounts of time and money.

"In terms of what the EPCs meant to the schedule," recalls Flinn, "the HP computers made it achievable. Our prior engineering computing resources just wouldn't have supported the schedule we've been working to."

"What a larger aircraft manufacturer would have done in the same 2½-year period, we've done with fewer people. I'm really proud of this company," concludes Flinn, "and appreciate the engineering and scientific resources our corporate officers have supported." 

UNIX is a trademark of AT&T Bell Laboratories.  
VAX is a US registered trademark of Digital Equipment Corporation

# Perspectives on the Spectrum program

*On February 25 Hewlett-Packard announced a new foundation for HP computer systems—HP Precision Architecture. The HP 3000 Series 930 and 950 are the first computers to use the new architecture for integrated business systems. Now, with the introduction of the HP 9000 Series 800 Model 840 technical computer (see New Products on the following page), HP offers systems for business, manufacturing, and engineering design based on HP Precision Architecture. Here's what a few industry experts had to say about our announcement in February.*

**“I**t's great to see someone taking technology forward. Hewlett-Packard is really living up to its stated corporate goal of developing products that contribute to the industry in which they participate.

“I'm impressed that HP has come out with an architecture that truly provides growth from single users to thousands of users. They've set the groundwork for a vast family of products.

“The migration strategy could not have been better. Migration from current HP 3000 systems will be painless.

“I was also impressed with ALLBASE [HP's new database management system for the new HP 3000 Series 930 and 950]. Especially the fact that you can expect your throughput performance to grow with the system and become faster and faster.”

**Sandy Gant**  
InfoCorp

**“H**ewlett-Packard's announcement of their Precision Architecture products confirms the belief that RISC [for reduced-instruction-set computer] will likely be the foundation of future architectures on a widespread basis. And HP is certainly in a prime position to take advantage of this with their early start.”

**Bill Rosser**  
The Gartner Group, Inc.

**“A** real advantage of HP's announcement is that they didn't just build a RISC machine, they built a full system based around RISC. There's a new processor, a new database management system, communications, specialized compilers. . . you name it.

“The HP Precision Architecture is definitely workable. It's not a major gamble for HP because it's been carefully tested and is widely installed within HP. It's going to be a very workable solution for HP and their customers.

“The real benefit for HP customers, though, is the architecture's scalability. It will last for 15 years or more, and that's a conservative estimate. It can be used for small, medium, or large computers, and the software is compatible all the way up the line.”

**George Colony**  
Forrester Research

**“H**P has definitely demonstrated that RISC can, and does, provide real benefits in system performance. And the scalability of the architecture will pay real dividends well into the 1990s.

“The migration strategy is extremely well thought out. I was impressed with the modularity. The whole Spectrum program has been developed from the perspective of the customer, so that they can implement it as they need to.”

**Grant Bushee**  
InfoCorp

# First technical computer system using HP Precision Architecture helps integrate design and manufacturing



The newest product from Hewlett-Packard's Spectrum program, the HP 9000 Series 800 Model 840, is the first technical computer system that uses HP's new HP Precision Architecture, based on the principles of reduced-instruction-set computing (RISC).

This new high-performance system serves applications in both engineering and manufacturing environments. As such, it extends the high end of HP's existing computer-aided-design and engineering systems (the HP 9000 line) and computer-integrated-manufacturing systems (the HP 1000 line).

The Model 840 sets new standards in price/performance when compared with similarly configured competitive systems. Because of HP Precision Architecture's simple design, the system is smaller, with lower cooling and power requirements, and lower support costs than typical competitive machines. "Like our first HP Precision Architecture systems—the HP 3000 Series 930 and 950 business systems announced in February, 1986—it demonstrates the potential of RISC-based systems to deliver price/performance and cost-of-ownership benefits on a new scale," says John A. Young, HP president and chief executive officer.

"Today's introduction also reaffirms HP's commitment to employ this new architectural foundation across all our major computer systems for many years to come. The

existence of a single, innovative architecture and a common database-management system, called HP ALLBASE, makes broad-based systems integration

much more readily attainable to our customers," Young adds.

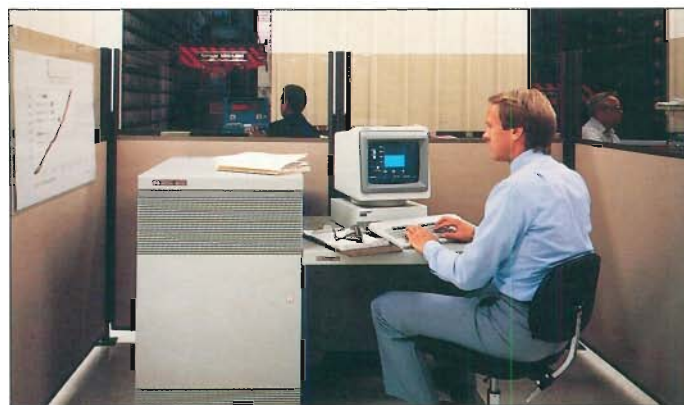
The Model 840 features industry-standard networking, graphics, languages, and databases, as well as HP-UX, which adheres to AT&T's UNIX System V. By featuring a UNIX operating system on the Model 840, HP now offers one of the broadest lines of compatible engineering systems in the industry and is believed to be the first major manufacturer to offer a UNIX operating system with real-time enhancements for factory-floor applications.

Migration from current HP 9000 systems to the new Model 840 will be simple because these machines all use a UNIX operating system. In addition, we offer extensive porting and migration tools to assist customers who want to migrate software from existing HP 1000 systems (which use the Real Time Executive operating system) to the new Model 840.

The decision to converge the HP 1000 and 9000 product lines at the high end reflects a growing desire on the part of manufacturing customers to link computer-aided design and engineering (CAD/CAE) to computer-integrated manufacturing (CIM), for reasons of production efficiency and quality.



The new HP 9000 Series 800 Model 840 extends the high end of the HP 9000 computer line for computer-aided engineering (CAE), computer-aided design (CAD), and general technical applications.



The Model 840 is a high-end computation machine that combines full compatibility using a UNIX operating system with the real-time response and control features needed for factory-floor applications.



■ **Support agreement.** ITT Corporation and HP last month entered into an interface and support agreement in Austria that is expected to serve as a model for similar agreements in other countries. The two companies will both provide support to Austrian users of the ITT 5200 digital private branch exchange (PBX) and HP 3000 in order to achieve integration of office communications. Certification testing to insure product compatibility was recently completed by the two firms in Austria. In case of equipment breakdown, ITT and HP will work together to determine and correct the problem.

■ **Trainless Training.** When Southern Pacific locomotive engineers learn how to run a train, they do it with the help of a train simulator run by an HP 1000 computer and state-of-the-art software developed by Dynamic Sciences, Ltd. The "locomotive" in the railroad's training center in Cerritos, California, has seen more mishaps in its day than any other, but no one criticizes its high accident rate. It's a computer-controlled replica of a locomotive cab that uses laser disc technology to simulate the sights, sounds, and working environment of a real locomotive operating in freight service.

■ **Earthquake protection.** Engineers at EPI-Center in Palo Alto, California, use The HP Portable computer, along with its built-in spreadsheet software, to analyze building structures to determine what a major earthquake would do to a building and its inhabitants. The copyrighted mathematical model, called the Seismic Survival Indicator (SSI), was co-developed by EPI-Center and Stanford University's Earthquake Engineering Center. It provides advice to building owners on possible structural changes that can protect lives and improve the building's survival chances.

## HP DesignCenter adds pc design and microprocessor development systems

Two new products have been added to the Hewlett-Packard DesignCenter environment: the HP Printed Circuit Design System and the HP 64000-UX Microprocessor Development Environment. HP's DesignCenter is an integrated design environment for electrical, mechanical, and software engineers that consists of systems, software, and support for computer-aided engineering, design, and manufacturing (CAE/CAD/CAM).

**HP Printed Circuit Design System.** HP's Printed Circuit Design System (HP

PCDS) is a computer-aided design solution that integrates printed circuit board layout with electrical engineering design, manufacturing, and test. Based on the modular HP 9000 Series 300 Model 320 technical workstation and HP-UX operating system, HP PCDS automatic features can help create highly manufacturable boards that perform as the electrical engineer intended.

A tight link with the HP Electronic Design System (formerly HP Logic Design System) automatically transfers circuit information. This eliminates time-consuming data entry, reduces the chances for errors to be introduced, and synchronizes versions on both systems. To ensure the completed layout is accurately transferred to manufacturing, HP PCDS automatically generates many reports and files. In addition, data can be generated automatically for the HP 3065 board test system, eliminating up to two weeks from the product design cycle.

**HP 64000-UX Microprocessor Development Environment.** The next generation in microprocessor development tools—the new HP 64000-UX Microprocessor Development Environment—evolved out of HP's 64000 Logic Development System while remaining fully compatible with existing HP 64000 systems. The new HP 64000-UX shortens the microprocessor-based system design cycle by combining advanced software development, real-time emulation, hardware/software analysis capabilities, and the power of the HP-UX operating system. With the HP 9000 Model 320 technical workstation as the host computer, the HP 64000-UX becomes an integral part of the HP DesignCenter environment.

The significant new enhancements built into the HP 64000-UX Microprocessor Development Environment include an open system with versatile networking to popular microprocessor software development environments, such as DEC VAX and IBM PC and multiuser access to

analysis and emulation tools. In addition, 32-bit microprocessor development support and computer-aided software engineering tools help to increase the efficiency and accuracy of software specifications and lower development costs.



The HP Printed Circuit Design System integrates printed circuit board layout with electrical engineering design, manufacturing, and test.



Central to the HP 64000 software design environment is the HP 9000 Series 320 workstations running the HP-UX operating system, high-performance HP peripherals, and advanced software.

*To find out more about Hewlett-Packard or its products and services, please call your local Hewlett-Packard sales or service office. Note: Not all HP computer products are sold and supported in all countries.*