Speakout

Jim Treybig On:

Mismanaging Engineers

The ideal business organization wouldn't need managers. In this type of organization, people—collectively and as individual contributors—are responsible for the work done by themselves and others. It's called peer management. In a true peer-management organization, someone not doing his job would be driven out by peer pressure.

For this to work, you need ideal, perfect individuals. But the fact that people aren't ideal creates a need for managers. The task of a manager is to perform those activities that aren't efficiently handled by a group of individuals: encouraging creativity, commmunicating strategy, recruiting and developing people.

At some companies, managers not only perform management functions, they also take away some of the individual's opportunity and responsibility for doing a job. This is not efficient; it's a waste of money. But good management—developing and supporting individual contributions—is not a waste of money at all.

It's clear that the closer you come to having outstanding people the less management you need. In fact, someone who has outstanding people working for him or her doesn't have a full-time job as a manager, because outstanding people need less management, and people who aren't good need more.

Managers who say that their whole time is consumed in managing are saying one of two things: they don't have good people, or they're not delegating. As a manager, you should have some free time because you want to force delegation. You want to give people responsibility so they develop. That's critical in high-growth companies.

> ***"At some companies, managers not only perform management functions, they take away some of the individual's opportunity and responsibility for doing the job."***

Management, almost by definition, takes some responsibility away from the individual—like coordination, for example. But this can be carried too far, especially in an engineering environment.

There are several tell-tale indications of engineering mismanagement. Projects stopped in the middle or changed regularly. A lot of product-management people. A big engineering-paperwork burden.

You have mismanagement when a review committee, consisting of development and marketing people, spends six months defining *exactly* what a new product will be. Many companies are highly structured and this process seems to go on forever. The basic problem with this approach is: Until you're in development of a PC board, for example, you really can't see the trade-offs, like cost versus performance.

Now some people might claim that they can see the trade-offs ahead, but if you so restrict what the product is—by defining it explicitly—then there's no room for development people to be creative as they learn. I generally don't believe in PERT charts because they don't allow for flexibility of the target date to encourage creativity. You may discover, halfway through the project, that the final product would benefit if additional time is taken to make it better in some way.

Rather than telling engineers exactly what product they should design and pinning down the schedule to the last second, a manager should spend time early in the project helping them see *why* the product is needed. As I mentioned earlier, really good engineers always need less management than you think, but what they need is knowledge—understanding—in a broader sense than just engineering. They need to interact with customers and they need to understand the direction of the market.

Once the engineers understand the philosophy of the product, they should have responsibility for the development. There will be tradeoffs as the development progresses and the engineers should have the flexibility to do things the best way. The manager is there to interact with on things they would like to change.

Another sign of engineering mismanagement and poor engineering thinking is the transfer of responsibility for product quality from the engineering department to an isolated QA department. If you say: "This group builds it and that group tests it," then the group building it doesn't feel

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James G. Treybig
President, CEO
Tandem Computers

Jim Treybig learned the difference between management and mismanagement during stints in technical sales and marketing management at Texas Instruments (1965-1966) and Hewlett-Packard (1967-1973)—two companies highly regarded for their effective (but different) management styles. Along the way he added an MBA from Stanford to his two undergraduate degrees (BA and BSEE) from Rice University.

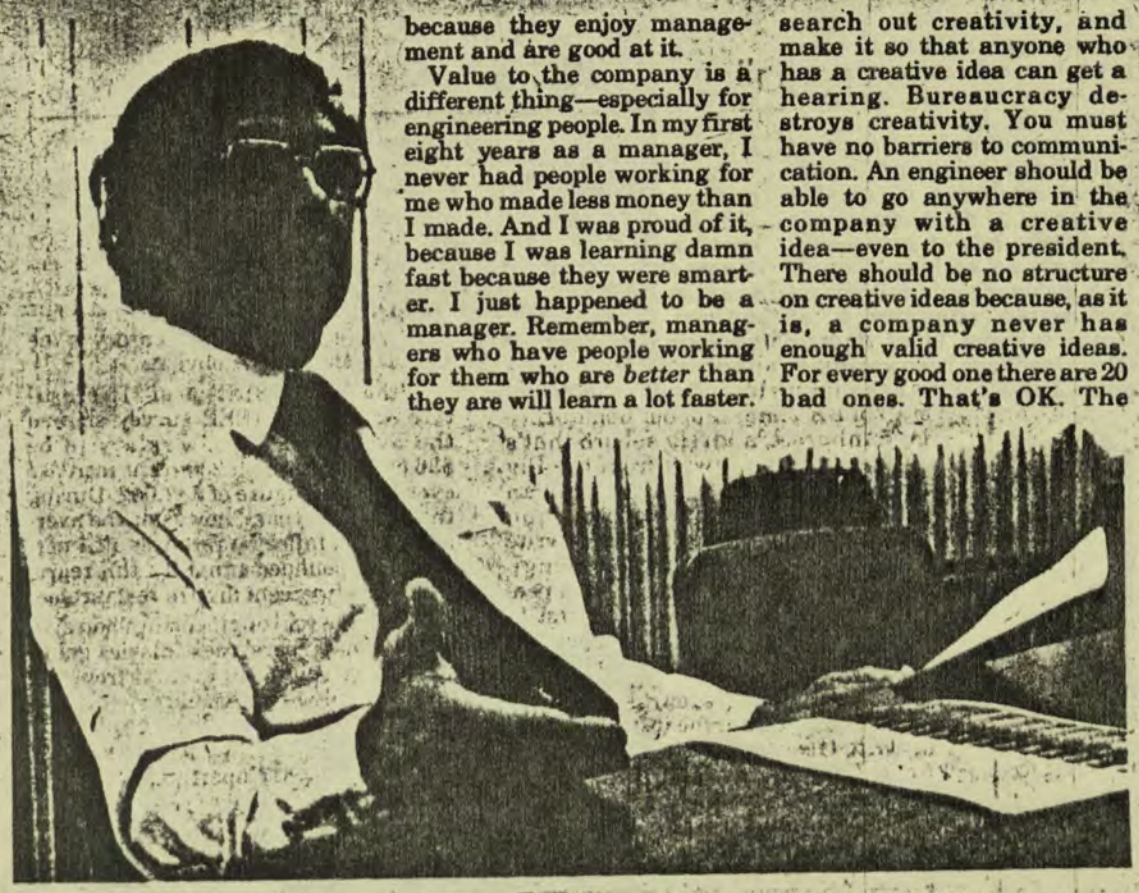
Though he says that HP was and is a "fantastic large company," his entrepreneurial bent would not be denied. In 1973, Treybig joined the San Francisco-based venture capital firm of Kleiner and Perkins, with an idea in the back of his head to form a company to make computers that would keep on working even if key system components failed.

In November 1974, Treybig, along with computer veterans from HP, Amdahl and Diablo, formed Tandem Computers to do just that: design a fault-tolerant multiprocessing computer. The company has grown rapidly behind the so-called "nonstop" approach, with annual sales and profits nearly doubling in recent years. Tandem's sales are currently at a $200 million-plus clip.

A native Texan with a "down-home" style of speaking "QA'in," "growin," "hirin"), Jim Treybig is an avid handball player, but his real passion (after his wife and three kids) is "hammin" it up as an amateur radio operator, that is. A

couple of times a year—when the sunspot activity is just right—he heads off to some little-inhabited island to set up his ham shack and establish rare contact with hams around the world.

Most recently, Treybig spent a week in the Cayman Islands in the West Indies; before that, it was the Cook Islands in the Pacific Ocean near New Zealand. What's the allure of a hobby that typically allows only 20- or 30-second contact with someone thousands of miles away? "It's the propagation that's interesting," he confides. "To understand it is an art—it's really not theoretical."



kinds of QA activity—one that occurs during product development, and one that continues after a product ships. Both should feed back to the development engineers because *they* are ultimately responsible.

QA groups shouldn't become important only when a product is close to shipping. In software development, especially, you should have a group working alongside the engineering team developing products to test and feed test results back to design. If you have too much emphasis on testing once the design is complete, you're less likely to design the quality in. In the semiconductor area, the Japanese have designed quality in, most people would say, and the Americans try to test it in. That's the difference. It's always better to design the quality in.

Why do engineering managers sometimes take away the design, scheduling and quality responsibilities from the engineers? Because either the engineers are not capable—and should be changed—or the manager can't delegate responsibility. One reason some managers don't delegate is that they're still engineers at heart, but they chose to go the management route for higher pay. A good engineer may not make a good manager and, in fact, may be worth more as an engineer and should be paid more than his manager.

Engineers should not be forced into management solely for higher pay. If they choose that route, it should be because they enjoy management and are good at it.

Value to the company is a different thing—especially for engineering people. In my first eight years as a manager, I never had people working for me who made less money than I made. And I was proud of it, because I was learning damn fast because they were smarter. I just happened to be a manager. Remember, managers who have people working for them who are *better* than they are will learn a lot faster.

So, what should the manager be doing if he or she has good people who are largely self-managing? A manager's role is to encourage creativity, open communications, ensure that all people are treated right, work on longer-term thinking and strategy, work on educational development—the things that don't get done in a normal environment.

Most of the things done by engineers don't relate to creativity, they relate to a logical progression of a better way. I put creativity on a higher plane. If an engineer, by using a certain chip, makes a circuit better, I don't really call that creativity. It's intelligence. Creativity, to me, is when you can see things that aren't logically extrapolatable.

search out creativity, and make it so that anyone who has a creative idea can get a hearing. Bureaucracy destroys creativity. You must have no barriers to communication. An engineer should be able to go anywhere in the company with a creative idea—even to the president. There should be no structure on creative ideas because, as it is, a company never has enough valid creative ideas. For every good one there are 20 bad ones. That's OK. The important thing is that management opens its doors and talks about it.

An open-door policy works only if managers like people and have some free time. If people walk through the door and the manager doesn't care about people, then they will never walk through the door again.

At some companies, lower management isn't interested in creative ideas from engineers. If that's the case, the engineer should go to the next level. He should never give up. He should keep going to the next higher level. See the president, if that's what it takes. The president should then get the people together who weren't interested. If the engineer's right and the idea is indeed a good one, they've all made a bad mistake.

I once had a development engineer come to me when we were introducing a new product and say: "We're screwing up the representation of the product." He didn't like the logo on the product. So I got him and the marketing people together and we all sat in a room for a long time until we arrived at something that both sides thought was right. That's a main function of management—enhancing communications.

The wrong kind of management always has a tendency to reduce creativity. The right kind of management can enhance it because, in general, good creative ideas come from a little spark of an idea that's built through interaction.

It turns out that creativity is easier to destroy than nurture. We have a rule at Tandem that, if someone comes up with a new idea, noone can say anything negative for five minutes. They can only contribute to growing the idea and looking at the good aspects of it. Poor managers may not want to hear about different ideas.

Everyone from the company president on down should

> ***"Some of the smartest people are never willing to admit that someone else may have a better idea."***

One of management's primary communication responsibilities is making sure all employees clearly understand the company's direction. At Tandem, we share the essence of the five-year plan with every employee and spouse or spouse equivalent. Every secretary knows it. I don't know many other companies that do this, because management thinks it's a secret.

Explaining the company's long-term direction to engineers is especially important so you won't waste R&D dollars going to the wrong place.

Another critical function of management is to evaluate and hire good people. If your company is growing very fast, you'd better "over-hire": Hire a better person than you need for the job today. If you're growing at close to 100 percent per year—as Tandem is—you'll need the new recruit somewhere else in six months. Keep in mind that if your growth drops to zero you could have a lot of frustrated people. So the hiring must be consistent with the implementation of your growth plan.

Hiring is truly an art. When you're interviewing people, you're trying to predict their future—how well they can do. A poor manager may primarily use the past to predict the future.

Poor interviewers use the past because they're weak at predicting and evaluating people. The *important* thing is the future, and the past isn't the only way to measure that. You want outstanding people. Their grades may be indicative; they may not.

In fact, some of the worst people are the people who made good grades. Some of the most brilliant people we have don't have a whole lot of formal education.

One important thing is whether a person did something outstanding. It doesn't matter what it was, if he or she is basically intelligent and has always done some things better than others—even if it's chasing the opposite sex or playing football or knitting. You want people who excel at whatever they want to excel at. Outstanding grades say that a person wanted to excel at grades. Look carefully to see if they did that at the expense of personality or human relationships or caring about other people. All of those things are important in an engineer—unless the development job takes only one person. Some of the smartest people are never willing to admit that someone else may have a better idea.

There are certain innate things you look for in every person. The first is honesty. If a person wasn't honest before, he probably is not going to be honest tomorrow—at least, it may not be worth taking that chance. If a person never worked hard in his life, he's probably not going to work hard in the future. These characteristics are pretty fixed.

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Tandem Computer's president James Treybig (right) with senior vice-presidents Michael Green (left) and Robert Marshall

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INC. 100 Profile

TANDEM HAS A FAIL-SAFE PLAN FOR GROWTH

If Jim Treybig has his way, his computer company will get bigger without losing its entrepreneurial style.

By Susan Benner

Jim Treybig only knots his tie tightly when he meets bankers, representatives of the financial community, and customers. Usually his tie is loose and his sleeves are rolled up, and most employees at Tandem Computers call him Jimmy.

Today, though, the knot is right up to his shirt collar. His jacket is on, and his manner is formal. Tandem's 40-year-old president is talking to a group of European airline executives about a $500,000 sale that in two or three years could grow into $8 million worth of business.

Salespeople in the field have already convinced the three visitors that the young company's fail-safe computer system can satisfy their technical requirements. What these potential customers have come thousands of miles to Tandem's Cupertino, Calif., headquarters to assess is whether the relatively small, fast-growing company will meet the needs of the future—servicing, expanding, updating, staying at the forefront of new technology—or whether it will succumb to the problems of fast growth that tripped up other high fliers in the past.

The visitor who speaks first is older than Treybig and nervous. His hands shake as he says, slowly and carefully, that the large company he represents is seeking more than a system that will satisfy its needs today. Like most potential first-time buyers, it has used IBM equipment almost exclusively for all of its data processing in the past. Although Tandem's system offers clear price performance advantages for users that demand fail-safe systems—dual processors that will work together, or in the event of component failure, take over the job on their own—the sale won't be made until the potential customer is convinced that he has found a partner who will be almost equally fail-safe.

Treybig is well prepared to argue that Tandem will. With fiscal 1980 sales nearly $109 million and pretax profits of $21 million, it is easier for the Houston-born entrepreneur to be convincing than it was seven years ago. Then, all he had to sell were the résumés of Tandem's founders, a product concept, and a vision of an untapped (and untested) market. Tandem aims to be a billion-dollar company by 1985, and Treybig and his team have come within a million dollars of all but the first year's annual revenue projections in the original five-year plan.

At the prospect's request, Treybig discusses Tandem's technological preparations for the future. He mentions satellite communication links replacing telephone land lines, large-scale integration ("In 10 years, a computer the size of ours will be on one chip"), the emergence of video in data processing, and electronic mail. He says that trends in computer design toward redundancy and modularity favor Tandem's kind of system. He adds that the changes Tandem is working on are both the evolutionary kind that are compatible with the existing Tandem system and have been going on all along and the revolutionary kind that are more like starting over. He sums up by saying that technology changes so rapidly that no one can predict specific developments farther out than a couple of years, but that Tandem plans to be at the forefront of whatever comes up. Expenditures in 1980 for research and development were up 89% over 1979, he adds. Tandem grew 95%.

"Revenues grew by 95%?" asks the leader, raising his eyebrows.

"Yes," Treybig says and pauses. "Earnings grew 117%."

The potential customers sit back a little and smile. In his flat Texas drawl Treybig reels off the kind of numbers that most business people only dream of. A quarter-by-quarter increase in sales and income since the first profitable quarter that ended June 30, 1977. A growth rate that even without acquisitions ranks it fourth on the 1981 INC. 100. Pretax profitability of 19.3%, almost twice the American Electronics Association surveyed median. Almost no debt. A 68% increase in the number of employees over the last year, from 828 to 1,387. (By the end of March 1981, the number was up to 1,890.)

The growth, Treybig points out, is impressive but not unique. Data General, Digital Equipment, and Prime Computer, the minicomputer stars of the '60s and early '70s, grew just as quickly—in fact, their growth curves provided the model for Tandem's. But Tandem plans to be more than just another fast-growing, highly profitable computer company. It aims to be a billion-dollar company that stays entrepreneurial and a fun place to work.

"There's no fundamental reason a company can't be good at a billion," insists Treybig. "You can keep that small company feeling for longer than anyone thinks, but for sure you won't keep it if you think you can't keep it past a certain size. When you say you can't, you never pioneer. You never find out the limit."

It's more than a personal preference for working in an informal and unstructured environment that makes Treybig and the other managers want to keep the excitement alive. They're convinced that maintaining the sense of purpose, challenge, and excitement typically thought characteristic of a start-up or a small company is one of the most important, and usually overlooked, keys to a fast-growing company's continued vitality, creativity, and success.

There's nothing magical about this idea, insists Treybig. "It's hard work, and as the company grows larger, it gets harder. You have to demand and reward creativity. You have to preach it, you have to stress it. If every manager you have doesn't believe in it, you won't have it."

James Treybig (right) with senior VPs Michael Green and Robert Marshall: "When you say you can't, you never find the limit."

Photos by Christopher Springman

The other thing you have to do, he points out, is make sure that everyone understands the direction the company is moving in, and the goals. "Why do we talk about the billion dollars?" says Treybig. "It doesn't really matter whether Tandem is a billion-dollar company in 1985 or 1986. But we want everyone to understand the challenges."

Treybig knew he wanted to start a company in 1973 when he left his job as a marketing manager in the computer and peripheral equipment division at Hewlett-Packard to join the San Francisco venture capital firm of Kleiner & Perkins. Since his background included a degree in electrical engineering from Rice University, a couple of years of selling at Texas Instruments, an M.B.A. from Stanford, and five years at H-P, computers were an obvious choice. But at the time it seemed as if most of the significant niches in the computer industry had been filled.

Over a year or so, Treybig considered several high-technology ideas. The one that seemed most likely to support the kind of company he had in mind was computer-related. He figured if a company could produce a system that wouldn't fail or destroy data and that didn't cost more than existing alternatives, then it could sell "a whole lot." He started collecting notes on companies he'd heard about that were hooking computers together to produce a custom-designed fail-safe system. He identified a possible multi-industry market for fail-safe equipment of about $200 million—and more importantly, it seemed to be growing fast.

In 1974, the stock market was low, capital gains taxes were high, and venture capital money was very scarce. Seed money was even scarcer. But Thomas Perkins and Eugene Kleiner were an unusual pair of venture capitalists. Both helped found companies of their own (University Labs, which later merged with Spectra-Physics, and Fairchild Semiconductor, respectively), and they encouraged Treybig to keep working. Two of the first people he talked to were old Hewlett-Packard associates, Michael Green and James Katzman. Green had designed the minicomputer industry's first time-sharing system for the H-P 2000 in 1968, and Katzman had designed the H-P 3000.

Green and Katzman liked the sound of the technical challenge and the idea of a new business adventure. Katzman had already left Hewlett-Packard to work at Amdahl Corp., and Green was tired of reorganizations and canceled projects at Hewlett-Packard. Though Treybig's concept of the system was a little sketchy, "something you could draw on the blackboard in about 10 seconds," says Green, he was attracted by Treybig's enthusiasm and the sense that he seemed to know what he was talking about.

At the same time Perkins was working at University Labs, he was also the general manager of the computer division and the director of corporate development at Hewlett-Packard. There he'd had the chance to observe Treybig, Green, and Katzman at work. He liked what he had seen enough to decide in mid-1974 to put up $50,000 to recruit Green and Katzman to start working on the definition of a system that could fit the market application that Treybig perceived.

Over three or four months, Treybig, Green, Katzman, Perkins, and another Kleiner & Perkins partner, John Loustanou, had an opportunity fairly rare in start-ups—to think out the company's development in detail before starting. "We worked out all aspects in advance—people, finance, manufacturing, everything," says Treybig. "We could afford to do it because we weren't starving to death. One reason we have been able to grow so fast and not have problems was that we thought through most potential problems before we started."

They worked together exceedingly well. "We didn't have to discover each other," says Perkins. "We had all worked together. There were no problems about who was boss, no politicking, no three vice-presidents who wanted to be president. Many of the troubles that can plague a new venture weren't there."

From the beginning Tandem's strategy was clear and, Treybig claims, simple. The goal was to produce a price-competitive computer system that didn't fail, that didn't destroy data, that could be expanded from the power of a minicomputer to that of the biggest mainframe, and also networked with as many as 255 systems in other locations, without changing software or hardware. The challenge was to do it technically, and to grow fast enough to be able to fend off competitors and provide opportunities for the talented and aggressive people they expected the venture to attract.

At the end of four months, progress seemed good, and the group was ready to go out after more money.

"Who needs another minicomputer company?" was the reaction of most potential investors Kleiner and Perkins approached. Treybig and the rest of the team had never started a company before, and no one was sure that the technical problems of building a fail-safe, modularly expandable computer could be solved.

But Perkins and Kleiner never doubted the plan or the management, and they decided the odds on the technical risk were good enough to put in an additional million of their own—a sizable investment for an $8-million fund. And John Loustanou decided to join the Tandem team as chief financial officer.

A year later, with a formal plan, 10 employees, and a much more detailed design of the new system, the venture

Tandem Corp.: 18,659% growth without acquisitions

	1976	1977	1978	1979	1980
Revenues ($000)	581	7,692	24,305	55,974	108,989
Net income (loss) per common share	(2.17)	.03**	.30**	.59	1.06
R & D expenses ($000)	979	1,094	2,169	4,654	8,786
Current assets ($000)	2,616	4,665	19,500	39,328	81,663
Current liabilities ($000)	388	2,319	5,798	12,232	20,431
Working capital ($000)	2,228	2,346	13,702	27,096	61,232
Current ratio	6.7	2.0	3.4	3.2	4.0
Long-term debt* ($000)	313	316	715	1,144	1,651
Return on equity (%)	N/A	6.2**	23.6**	20.9	21.0
Number of employees	71	137	446	828	1,387
Number of processors shipped	12	81	257	646	1,299

*capitalized lease obligations **before extraordinary credits

Tandem's environment helps keep turnover low and productivity high.

had built up enough momentum to raise another million from outside investors, though neither the market nor the capital gains tax rates had improved. One of the investors and now a member of the board, Franklin "Pitch" Johnson of Asset Management Co., a Palo Alto, Calif., venture capital firm, points out that the track records of Perkins's and Kleiner's other ventures added to the attraction of the deal. Johnson, whose company's initial $60,000 investment has increased in value more than 5,000%, has yet to sell a share.

Tandem delivered its first system in May 1976, to Citibank, and except for a brief hiccup in the last quarter of 1976, when the company had no orders in October, November, or the first half of December, growth seemed steady and almost uneventful. Though the first year's business was about half of what had been expected, after that revenues and income caught up to the original projections, sales of $7.7 million in '77, $24.3 million in '78, $56 million in '79 and $109 million in 1980. Expenses came in as projected, and partially because of the support of Kleiner & Perkins, cash crises never materialized. Tandem was one of six small companies to have an initial public offering in December 1977, raising almost $9 million for about 21% of the company. A total of 770,000 shares were sold at $11.50 per share. The stock price is now in the 80s, with almost 12 million shares outstanding.

Today Tandem occupies 302,000 square feet in three connected cement-and-glass buildings next to a shopping center in Cupertino. Floor-to-ceiling windows in the cafeteria look out on the company pool and volleyball courts. In Silicon Valley, the company is recognized as a leader not only in growth, but in attracting and keeping talented people. Turnover is low, about 8%, less than a fourth of the American Electronics Association median. And productivity is high, sales of $98,400 per employee in fiscal year 1980, about twice the AEA median.

The door to Treybig's office is usually open, and his calendar for the days he spends at Tandem is mostly blank. He likes to reserve his time for thinking about company strategy, for drop-ins—managers who would like his help selling the company to a prospective customer or employee, employees who have a problem their manager can't solve—and for projects like putting "everything you need to know about running a company" and Tandem's five-year plan on one piece of paper.

Treybig is probably the only chief executive who has distilled his wisdom on everything from hiring to asset management on a flow chart. On a three-by-two-foot piece of paper, in type about half the size of the letters on this page, he has codified 100 management concepts into little homilies like, "Fund growth with equity, use debt for insurance," and "Never compromise on quality (in hiring), the major stress of being a manager is people problems." And then he's connected these little sayings with an intricate pattern of lines, so that anyone who looks at the chart (with a magnifying glass) can see how something like asset management affects employee wealth and benefits.

"A company is just a bunch of loops," says Treybig. "You can't have good employee benefits if you don't have money. This chart shows how everything ties together and is important." Every employee at Tandem gets a copy.

"Why do we put it all on one sheet of paper?" he asks. "Because it's interesting. Asset management is damn boring. But it's important. So you want everyone to understand why it's important, what they do that impacts it, how asset management impacts other things. It's kind of like a big M.B.A."

Treybig doesn't show the chart to customers, of course. He wouldn't want them to know Tandem's five-year plan. In fact, any employee who gives that "big M.B.A." to any outsider except his or her "spouse, spouse equivalent, or loved one" gets fired. (No one at Tandem has been fired for this infraction so far.) But even in a sales presentation he makes a point of talking about the importance of every employee understanding the company's direction. "You truly can't manage 100% growth in the classical sense," he says. "There's less emphasis on management and more on information, on systems of providing information so people can work independently. You have to work to delegate as much responsiblity as fast as you can. You want everyone to understand the fundamentals. You've got to concentrate on everyone understanding how to make the right decisions overall."

Treybig takes this opportunity to point out that one of the keys to Tandem's information system has been its own product—an on-line data processing system that ties together the company's 63 locations with a network of computers around the world. Information on inventory, orders, costs, hiring, and payroll is entered into the system and can be monitored by management the same day. "We know immediately if there's a problem," says Treybig. "And we pick up the phone. You can afford to make a lot of mistakes if you know about them the minute you make them. The problem is when you make a mistake and don't know about it for a long time."

Another major factor is a flat management structure. Treybig walks to the blackboard and draws three little circles in a line. "This is me," he says, pointing the chalk at the little circle in the middle. "And these are Robert Marshall and Michael Green, our senior vice-presidents." And then he draws 13 little circles in a row underneath them. Tandem's vice-presidents. "A hundred-million-dollar company doesn't need 13 vice-presidents," he says. "But a billion-dollar company does. By the time Tandem reaches a billion, these people will be too busy to get to know each other. But they're working together now, building an understanding for the future. So when they're scattered all over, they'll have the cohesiveness to make decisions quickly." He tosses the chalk into the tray and sits down.

"What about competitors?" the potential customer wants to know. Though none of the established computer companies has announced definite plans to enter a market long perceived as a narrow, specialized niche, several start-ups aim to produce fail-safe systems. One of those companies, August Systems of Salem, Oreg., sees its prospective market—industrial process control applications for power stations and oil refineries—as outside of Tandem's interests, but the other two, Stratus Computer of Natick, Mass., and Synapse Computer of Menlo Park, Calif., probably will compete more directly. August delivered its first system this April, Stratus expects to have a product by the beginning of 1982, and Synapse is planning its first delivery for sometime in the next two years. Treybig claims he doesn't even know their names.

"Our concern is within ourselves," he says. "To keep working hard, to keep earning, to keep wanting a better product. We have a seven-year head start. The challenge is not to worry about other people, but to worry about yourself."

"What makes a company good?" Treybig asks. "It's having the right product and market, the right direction, the right business strategy. If you have the right business strategy you can make a lot more mistakes than if you have the wrong one. Another thing that makes a company good is having fantastic people. If you have the right business plan, you can attract better people. The other thing you need is money. Without money, eventually you lose good people. Those three things were right at Tandem. We had the right business product/market concept. We started with outstanding people, which allowed us to hire more. Then we were able to do what we said we'd do, and that let us get more money and better people and keep growing in the right direction." □

Susan Benner is an associate editor at INC.

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Tandem's President James Treybig

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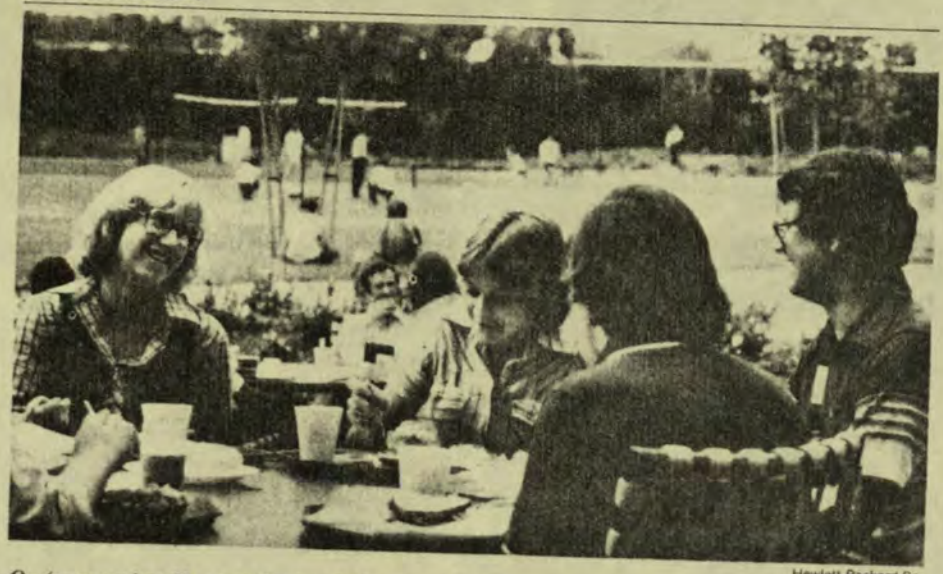

Hewlett-Packard Co.

On 'campus' at Hewlett-Packard: Camaraderie—and very tough management tools

The Silicon Valley Style

It stretches along the western shore of San Francisco Bay, from the tree-lined suburban streets of Palo Alto through the urban sprawl of San Jose. Its starkly modern, crisply manicured "campuses" house the highest concentration of Ph.D.'s in the world—and, in fact, they look more like community colleges than manufacturing plants. But California's "Silicon Valley" is to the burgeoning semiconductor industry what Pittsburgh was to steel: birthplace and manufacturing mecca of a technology that will drive America's productive engines for years to come. And, appropriately enough, its executives are creating a brave new corporate world—a striking new managerial style that combines Japanese paternalism with a uniquely American entrepreneurial spirit. "Silicon Valley is not simply a geographical location," says one architecture critic in San Francisco, "but a kind of heightened industrial consciousness."

What the lords of Silicon Valley are forging is a kind of egalitarian meritocracy where competence is king, financial and psychic risks are shared and individuals—from the most senior vice president to the lowliest technician—are held strictly accountable for their actions. Offices are anathema, titles shunned, formality rejected. Still, even though corporate policies and problems are typically thrashed out with the openness of encounter sessions, there is always a flinty eye on the bottom line. "We assume people are adults," says Jim Katzman, 34, a vice president and a founder of Tandem Computer, Inc., a Cupertino-based computer firm that grew by 4,000 per cent between 1976 and 1979. "We give them a lot of responsibility and tell them where we want them to go. The 1 per cent who abuse the freedom, we fire. It's that simple."

Atomized: The management style evolving in Silicon Valley owes its existence to two vastly different companies. Fairchild Camera & Instrument Corp., the industry pioneer, flourished in the early years under a highly centralized management that pitted employee against employee in ferocious competition. But its managers did not foresee the boom that eventually created a shortage of skilled labor and a turnover rate exceeding 100 per cent in some companies. "Fairchild didn't realize the need to hold on to people," says Richard Pascale, a management expert at Stanford Business School. "It didn't understand that keeping experienced people is an immense competitive advantage." As a result, Fairchild had atomized by the 1970s—many of its best people spinning off to Intel Corp., National Semiconductor, Advanced Micro Devices and other industry infants.

Work at Tandem: 'We assume people are adults'

Blumensaadt—Matrix

Hewlett-Packard Co. took the opposite approach. Founded in 1939, H-P had a tradition of paternalism, hiring with meticulous care, generously sharing profits and imbuing its employees with the Zenlike precepts of the company philosophy, "the H-P way." The idea was that the company ought to "make meaning" as well as money. H-P's managers decided early that they would not run a hire-and-fire operation. When semiconductor orders slumped in 1970, everyone in the company took a 10 per cent cut in work and pay, and no one was laid off. In addition, H-P has been a leader in instituting flexible work schedules tailored to its employees' individual needs. The approach has paid off: Hewlett-Packard's record of high productivity and top-quality products is the envy of many a competitor.

Partly because H-P's style proved so much more successful than Fairchild's, it has become what San Francisco consultant Peter Sherrill calls "the role model for the industry." Today Silicon Valley companies wage constant war on bureaucracy and hierarchal structures. The emphasis is on instant communication, the bias toward quick action. Psychologist Jerry Pieters, an assistant to Signetics Corp. president Charles Harwood, learned that lesson shortly after he arrived at the company from more sedately paced Corning Glass. Several Signetics executives suggested a meeting, and Pieters took out his calendar and began looking at dates a month or so away. "What are you doing?" asked one puzzled executive. "What's wrong with Tuesday?" Point No. 21 on Santa Clara-based Rolm Corp.'s printed list of attributes for management success sums up the philosophy neatly: "Don't cover your ass or look for fault in others; solve problems."

Perhaps most important, Silicon Valley managers believe in spreading the wealth. Rolm maintains an athletic complex for employees with two swimming pools, tennis courts, racquet-ball courts, a gymnasium, sauna and Jacuzzi. Tandem holds regular Friday beer blasts around the company pool—parties attended by everyone including company president James Treybig, known to all employees as "Jimmy T." At Advanced Micro Devices (AMD), everyone including the janitors and secretaries participates in regular stock distributions. AMD's flamboyant president, W. J. (Jerry) Sanders III, has thrown the two biggest parties in San Francisco history in his employees' honor. The last one cost $350,000 and treated 7,000 AMD workers and spouses to champagne, caviar, roast beef and a 50-foot dessert table.

But Silicon Valley companies are hardly country clubs. "Beneath all the camaraderie and teamwork are very tough, sophisti-

James D. Wilson—Newsweek

Jacuzzi at Rolm: And there are Jimmy T's beer busts and Jerry Sanders's bashes

cated management tools," says Stanford's Pascale. The chief tool is mailed-fist management control in setting objectives and velvet-glove handling of employees in meeting them. "The financial controls are very tight—and if people don't meet their goals, they fail," explains Rolm executive vice president Leo Chamberlain. "What is loose is how they choose to meet those objectives." Meeting them is not easy. Managers in Silicon Valley typically spend twelve hours a day, six days a week, on the job. At Intel, a company computer switches off all lights at 7 each evening so that workers are forced to leave.

Divorce: The pace and intensity take their toll. Burnout is a problem, and the divorce rate in Silicon Valley is higher than the rate for California as a whole. "Wives are often very frustrated," says Silicon Valley psychologist Dennis Hinkle. "They feel like their husband is married to a chip."

There are other woes in Eden, too. Real-estate prices in the area have soared, driving workers farther from the office to find affordable housing. The eight-lane freeways that serve the valley are choked with traffic. And local zoning boards are beginning to rebel against the industry's growth. Last year the Sunnyvale City Council voted a four-month moratorium on all new industrial projects. Palo Alto demanded that any industrial developer contribute toward housing and transportation facilities to serve new projects—a move that cost Hewlett-Packard $250,000 more than it had planned to spend on a new headquarters.

Even their eye-popping growth poses a challenge to the Silicon Valley companies: how to maintain the high level of worker involvement. But the companies clearly intend to try. Hewlett-Packard, for instance, has been spinning off divisions when they exceed 1,500 employees to sustain the sense of small, autonomous units. "If we're going to improve productivity in this country," argues Tandem president Treybig, "workers have got to care about their company." In the years ahead, as the U.S. semiconductor companies meet a head-on challenge from Japan, Silicon Valley managers will learn whether their homegrown approach to the problem makes the grade.

GERALD C. LUBENOW in Silicon Valley

BUSINESS

Polaroid Focuses On a Better Line

The hoopla began at Polaroid Corp.'s annual meeting in April when the company said that it would introduce an entirely new instant-photography system in June, but it left the details to the imagination—and to tantalizing hints by insiders. Early last week the teaser campaign had gotten out of hand. Unnamed Polaroid insiders, using such terms as "unbelievable" and "brace yourself," told the Wall Street Journal that the new system might blunt the growth of the more sophisticated 35-mm photographic market. Polaroid stock jumped 10 per cent the day the story appeared.

The new 600 system did represent an improvement. Ultra-high-speed color film and a built-in electronic flash help produce clearer pictures in truer colors than Polaroid's current SX-70 system, and elimination of flash cubes reduces the cost of each picture by about 30 cents. But the initial cost of the 600 system could be a drawback. The cameras are listed at $70 and $95 and while the 600s are certain to be heavily discounted, 80 per cent of buyers in the past have paid less than $30 for their instant cameras.

Still, Polaroid is looking for the 600 system to revive its prospects. Unit sales of its cameras have been declining; its instant-movie system has been a dud, and the company's profits today are barely higher than they were five years ago. The question remains whether an evolutionary product like the 600 system can substantially improve the fortunes of a company that has never fully capitalized on the truly revolutionary products it developed in the past.

TRANSITION

MARRIED: Cheryl Tiegs, 33, top fashion model with the all-American look, and photographer/environmentalist **Peter Beard,** 43; in Montauk, N.Y., May 24, both for the second time.

DIED: Soong Ching-ling, 90, widow of Sun Yat-sen and China's elder stateswoman; of leukemia, in Peking, May 29. Born into a wealthy Christian family and educated in America, Madame Sun was the second of three illustrious sisters. (Her surviving younger sister is the widow of Nationalist Chinese leader Chiang Kai-shek.) She broke with her family to side with the communists, serving as negotiator and as foreign-policy spokeswoman for Peking. Last month Madame Sun was admitted into the Communist Party and named honorary president of China, the nation's highest tribute.

George Jessel, 83, actor, comedian and indefatigable public speaker; of a heart attack, in Los Angeles, May 24. Following a juvenile career in vaudeville, Jessel produced, wrote and acted for Broadway, starring in "The Jazz Singer." (He lost the movie role to Al Jolson.) He produced 24 films for Twentieth Century-Fox, and later became a patriotic, humorous and sentimental speaker at political and fund-raising functions, earning the title "Toastmaster General of the United States."

Mary Lou Williams, 71, one of the first women jazz greats, a pianist who swung from ragtime to Dixieland to be-bop during her 60-year career, and composer of such

George Jessel (1960), Rosa Ponselle (1936)

Pictorial Parade Photos

hits as "Froggy Bottom," "Roll 'em" and, after her religious conversion in the 1950s, of several Masses and liturgies; of cancer, in Durham, N.C., May 28.

Rosa Ponselle, 84, world-renowned dramatic soprano and leading singer with the Metropolitan Opera for nineteen seasons; of a heart attack, at her home, Villa Pace, in Stevenson, Md., May 25. Ponselle made her Met debut opposite Enrico Caruso in Verdi's "La Forza del Destino" in 1918. The first singer to appear there without European training or experience, Ponselle sang 22 roles at the Met, including Norma, Violetta, Santuzza and Carmen and, after retiring in 1937, served as artistic director of the Baltimore Opera for more than 25 years.

Dr. **Sterling Wortman,** 58, plant geneticist who developed high-yield grains as a leader of "the Green Revolution," an effort to fight famine in underdeveloped nations; of cancer, in Greenwich, Conn., May 26.

TANDEM

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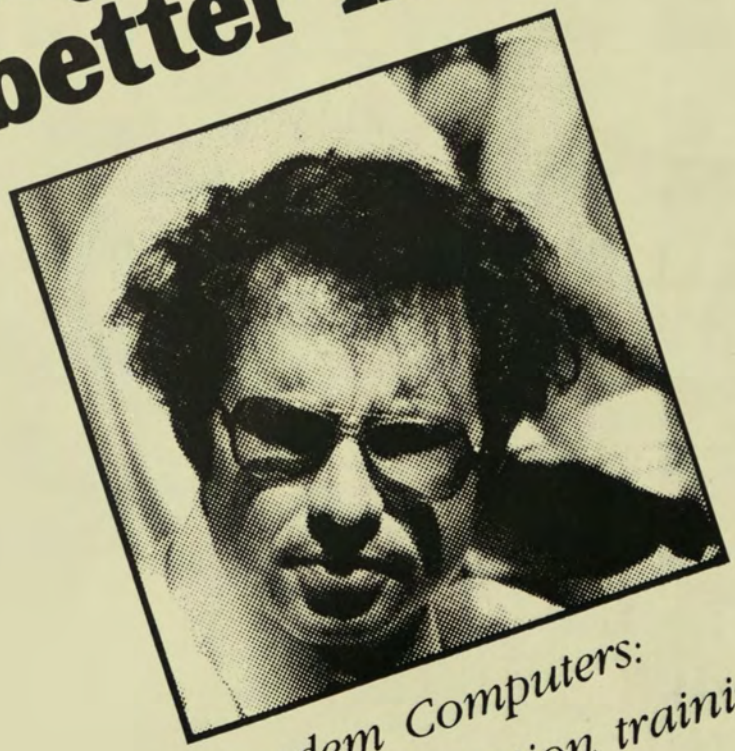
Forbes

Beyond the better mousetrap



Tandem Computers: Some simulation training for the big day.

Tandem Computers figures it has the machines to take it to $1 billion, so it works at preparing its people for problems of bigness.

Beyond the better mousetrap

Tandem President James Treybig sharing corporate culture with employees
Seminars and stock options for all on the way to $1 billion sales.

By Kathleen K. Wiegner

IN TOM WOLFE'S book *The Right Stuff*, he reveals the key to training the first astronauts. The astronauts, writes Wolfe, were taken through simulations of space orbit so many times that when they actually made it into space the trip was as familiar as driving to work. Any problems had to be so familiar that they would seem routine.

Like astronauts, the senior and middle managers of little Tandem Computers Inc. are being put through a training course in expectation of the time—set for internal purposes in 1985—when $109 million (sales) Tandem becomes a $1 billion company. In two-day seminars they run through courses on hiring, delegating responsibility, new markets, new-product development and Tandem's basic corporate philosophy. When the great day arrives, the problems and differences that come with bigness should seem old hat.

"We use $1 billion not as a sales forecast but to think about the problems that come when you get that big," says James Treybig, 40, Tandem's president. "We need to anticipate growth so people can recognize the problems that come with growth." Eventually all of Tandem's 1,890 employees will take that training in anticipating growth.

Planning for $1 billion in sales is neither arrogant nor farfetched. The Cupertino, Calif.-based minicomputer company has one of the hottest track records in a hot industry. Since going public in 1977, Tandem's revenues have soared from $8 million to $109 million; earnings have risen

from $325,000 to $11 million. For the first six months of this fiscal year—which ends Sept. 30—revenues surged to $88 million, from $45.7 million in the first half of fiscal 1980, and net income equaled the $11 million Tandem made in all of last year. In order to reach $1 billion by 1985, revenues must grow at a compound annual rate of 50%.

Treybig, a lean Texan with a bachelor's degree in electrical engineering and an M.B.A. from Stanford, worked for more than five years as a marketing manager at Hewlett-Packard before he started Tandem with three other H-P employees in 1974. He also spent over a year as a limited partner at Kleiner, Perkins, Caufield & Byers, the San Francisco venture-capital firm, working on his business strategy and his plan for a better mousetrap.

The mousetrap that Treybig and two computer engineers came up with was a way of linking two or more central processing units together, so that if there was a failure anywhere in the system, work would automatically shift to another part of the system while the faulty parts were fixed. The computer could keep running. The Tandem NonStop system—Treybig says he got the idea from Hewlett-Packard customers who were looking for such capability—was an instant hit with banks, hospitals, distribution outfits, government agencies, even racetracks where betting is computerized. "If you run a business with a computer, whether you're a big bank or a travel agency, your computer can't be down," explains Treybig. "Every customer we talk to says *his* is the worst problem."

Because Tandem's computers can be linked together without any software changes, a bank or hospital can start with two processors—which sell for around $200,000—and eventually add on 14 more of the boxes. This system in turn can be hooked up with other systems anywhere in the world. First Chicago Corp. currently uses 31 Tandem computers in a worldwide network to manage everything from currency transactions to its automated tellers.

Having established his niche, Treybig so far has shown that he has a good grip on financing Tandem's explosive growth. The company has almost no long-term debt, earned a tidy 21% on equity last year, and uses its $99 million in cash balances to produce interest income amounting to 25% of this year's first-half pretax earnings.

When he needs capital to finance the next phase of Tandem's expansion, Treybig can go again to the equity market, as he has done three times since going public. He avoids debt, he says, because "when you're selling against larger companies like IBM or Data General you have to look safe financially to your customer."

And also because he can get equity money dirt cheap and without dilution while Tandem sells at around 48 times this year's anticipated earnings of $26 million, or $2.15 a share. At the recent price of $103 a share—for a company that earned $1.06 a share last year—investors are buying the vision of the multibillion-dollar company Tandem may become.

Is that vision realistic? The prospects at least are bright. "Tandem has several more years of well above 50% annual growth based on its existing customers [most of them large companies] adding new equipment," says Michael De Santis, a partner at San Francisco's investment banking firm Robertson Colman Stephens & Woodman. Nationwide banking and the acceleration of electronic funds transfer are trends that will send Tandem's financial customers scurrying back for more computers.

But most reassuring of all is that Treybig's Tandem is developing corporate muscle tone now, in the heady growth days, that should serve it well when the going gets tougher.

Tandem buys most of its components and such peripherals as terminals and printers from outside companies, and one set of circuit boards essentially fits all systems, so it gets the cost advantages of volume manufacturing. In addition, only 30% of the subassembly of these circuit boards is done by company employees—the remainder is farmed out to subcontractors. This arrangement keeps Tandem's labor costs down, reduces the need for high-priced new capacity and also precludes future layoffs in slow periods.

Laying off and rehiring people is frowned upon in the electronics business. First, it's expensive. But it also erodes the spirit of joint effort that companies such as Tandem strive to instill in their employees. At Tandem, all 1,890 employees get stock options. Every Friday afternoon Tandem holds "beer bashes" on the company's patio, where suppliers, managers and assembly workers swap information and complaints. In that balmy strip of northern California known as Silicon Valley, where skilled people are hard to find and often harder to hold on to, Tandem's tennis courts and flexible work hours are not merely examples of "laid-back" California, but practical industrial relations tactics.

Life at Tandem is anything but relaxed. Worker productivity is twice the average for the computer industry, which is as a whole devoutly entrepreneurial and fiercely competitive. Treybig's paradox is that Tandem must grow big or be swallowed up by a larger competitor; yet, to grow, it must keep the kind of people who often function best in small, freewheeling organizations.

Treybig is under no illusion that IBM, Data General, Digital Equipment or Hewlett-Packard won't someday offer different—possibly better—solutions to the problems that his NonStop system now solves. Tandem will need other ideas for new products and new markets. And such ideas come from motivated people, not machines. With the seminars, the benefits, the emphasis on corporate culture, Treybig is doing more than training or rewarding people—he's involving them. Tom Watson, who built IBM, would understand that very well. ■

Engineers seek new adventures at Tandem Computers now that Data General's Eagle has landed

By Evelyn Richards
Business Writer

Rust-colored carpeting, picture windows and posters from art exhibits are the makings of a castle for Carl Alsing and Ed Rasala.

To this pair of engineers, the natural wood Tandem Computers building where they work is a palace compared with the cramped, windowless basement they had known for 18 months before.

Alsing and Rasala had been elated captives of Data General Corp., assigned to a project that awarded them challenges and gratification they dearly hope to match again in their professional careers.

Even if it would mean a return to dingy quarters.

Alsing and Rasala were key managers on the team that in a hectic year and a half produced Data General's "Eagle," its entry into the 32-bit minicomputer market.

Alsing and Rasala were key managers on the team that in a hectic year and a half produced Data General's "Eagle," its entry into the 32-bit minicomputer market.

"There was a high to it," Alsing said with sentimentality during a recent interview. "It was an adventure."

Author Tracy Kidder chronicles their tale in the very readable book, "The Soul of a New Machine," released Aug. 26.

Not surprisingly, the volume is a hot seller in Silicon Valley, where so many engineers' toils go untold. B Dalton Bookseller's Sunnyvale and Cupertino stores, for example, report selling about 20 copies a week at $13.95. Because of early demand, publisher Little, Brown and Co. already has sent "The Soul of a New Machine" into a fifth printing.

Kidder, who sat long hours with the 30 men and women, brings drama to their frenetic attempt to catch up with Digital Equipment Corp., their No. 1 competitor.

In April 1980, the computer, called the MV/8000, was introduced to the market and quickly became a smashing success. Last fall, the project team was disbanded and its members assigned to other projects. For the engineers, the emotional letdown was similar to that on the Sunday

Continued

Ron Burda — Business Monday

Carl Alsing and Ed Rasala relax at Tandem

Profile

Engineers seek new adventures

Continued from Page 1D

after the Big Game. So last fall many of the Hardy Boys (the nickname for those who designed the Eagle's hardware) and the Microkids (those who wrote codes that fused software with hardware) went job-hunting.

Alsing, a small-framed man who speaks softly, almost delicately, became disillusioned with the big-business atmosphere at Data General. A year ago he set out to find "a smaller place where (the president) knows what's going on." At age 38 he gave up management, left Westborough, Mass., and accepted a job as an engineer at Tandem. He calls himself "an individual contributor" at the company's Sunnyvale offices.

A few months later, Rasala followed, also to accept an engineering post at the manufacturer of "fail-safe" computers. Heftier than Alsing and balding, the 35-year-old Rasala has a staccato manner of speech that grabs attention.

Two other Eagle team members now work in Silicon Valley, one also at Tandem and one at Rolm Corp., the Santa Clara telecommunications equipment and computer company.

Reflecting on the book that has pulled back the curtains on engineers' usually private lives, Rasala and Alsing said Kidder's dramatic account was accurate. As the bosses of the Hardy Boys and Microkids, Rasala and Alsing recruited college graduates who, they said, "in their professional careers probably won't be able to match the excitement."

What constitutes excitement for a computer designer?

The No. 1 criterion, the men said, is that the product will come to market.

Large companies, say an IBM, can afford to spend millions of dollars and years of engineers' time on a project that gets shelved.

Nothing could be worse for morale.

But once a good engineer is put on a project with a future, there's no limit to his dedication. At Data General, the engineers worked many 70-hour weeks in their spartan quarters, seduced by constant reminders that the company was depending on them.

"There is a lot of talk (since the book has been published) about manipulation," Rasala said. "I didn't feel that. There was excitement that made it all worthwhile."

A sense of worth is important to any worker. "There is a lot of concern about general disinterest of the working force," Rasala said. "The energy was there because the people wanted to (work). It was something that was building their company, their profession, their career. It's unfortunate maybe they did not get the monetary rewards. But they got personal fulfillment."

> "Data General is a bottom-line driven company. The motive is to be profitable. Tandem's approach is to be successful by making the people successful."
>
> — *Ed Rasala*

When the excitement of Eagle was over, even higher pay or stock options may not have been enough to keep ambitious engineers who had tasted accomplishment.

In the end, it appears what engineers want is a sense of recognition. When employers care about their workers and what they are doing, it builds dedication.

Spacious offices with picture windows and carpets are just manifestations of that concern, Rasala and Alsing said. What's important, Alsing noted, "is not the windows, but the oscilloscope."

"Data General is a bottom-line driven company," Rasala said. "The motive is to be profitable. Tandem's approach is to be successful by making the people successful."

"It appears (Tandem) is going to be concerned about my professional development," said Alsing, who plans to take advanced courses. Data General, he said, turned down his requests to take management training classes, even though he had been promoted to a managerial post. He described the attitude as, "Let's make money this quarter and this year. Let next year take care of itself."

Being a small, fast-growing company has a lot to do with that ability to look ahead. Tandem, founded in 1974, has at least doubled its sales most years and in 1980 reported revenues of $109 million.

Data General was that type of firm, too, when Alsing arrived in 1969 after working at Digital Equipment. His was Data General badge No. 150. Even when Rasala came on board in 1974 after his first post-college job at Raytheon Corp., Data General had an entrepreneurial spirit and sales of less than $100 million.

By the time Eagle was in the marketers' hands, the company was doing about $600 million of business a year.

Despite its fast growth, Tandem is "small enough the president knows what we're doing," said Alsing, who gets frequent visits from president James Treybig even though Treybig works five miles away in Cupertino. Communications lines are open. In the lounges near their offices, "some random person is going to sit down," Rasala said in engineer's lingo. Engineers from different departments might even exchange ideas, something that seems natural there but Rasala said was discouraged at Data General.

"Let's face it," Alsing said in contrasting company atmospheres, "there is less fear" at Tandem.

They pair wouldn't call Tandem "laid-back," though. They find the critical sense of urgency is created differently. Instead of trying to catch up, Tandem scientists slave to keep the company's edge.

"Every product has a market window," the time when it is supposed to be sold, Rasala explained.

"On a Tandem product, the window is a little further out. You break down your task into subtasks. You make commitments to a large group of people working together. You create peer pressure. That keeps you going. What you do is think about what you want to have by Friday."

Said Rasala, "Tandem is a very aggressive company. I don't want to work on a project that is not aggressive. I like working 50 or 60-hour weeks."

Alsing agreed. Even while admiring the carpeting and plants placed along the way to his office, Alsing said he would leave those comforts for a task that would match the high-energy environment of Eagle.

Despite the uncomfortable working conditions, no one can take away from the Eagle team an engineer's ultimate reward — building something that works.

With a smile of satisfaction, Alsing said producing a product "makes you feel you have your head screwed on right."

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THURSDAY, NOVEMBER 5, 1981

THE WALL STREET JOURNAL.

INSIDE:

Now the Latest In Computers Is 'Fail-Safe'

By WILLIAM M. BULKELEY
Staff Reporter of THE WALL STREET JOURNAL

Companies that depend on computers get hurt when their computers go down. The risk can be averted, but only at great expense, by employing *two* computers, one of them as a back-up that can go into action if the first fails. Now entering the market, however, are systems that computer engineers believe are practically fail-safe.

Tandem Computers Inc. introduced the first one, its NonStop system, in 1976. The company says NonStop has become a phenomenal success. Tandem's success has attracted other entries into the fail-safe market. Stratus Computer Inc., a new company based in Natick, Mass., yesterday introduced its own "fault tolerant" system, and another new Natick company, Sequoia Systems Co., plans to develop a similar one by 1983.

The market for super-reliable computers could become large. Strategic Inc., a San Jose, Calif., market research firm, estimates that sales of what it calls survivable systems reached $75 million last year and will grow at a compounded rate of 45% a year for the next six years to reach $1.44 billion in 1987.

Comparable Prices

Tandem prices its NonStop around $190,000 and upward; Stratus prices will begin at $123,350. The prices are comparable with those on other minicomputer systems with similar performance.

"Our objective is to make the computer as reliable as the telephone," says William Foster, president of Stratus. Interactive computing, in which a user employs a terminal to communicate directly with a data processor, has increased the interest in systems that don't go down, he says. Interactive systems are becoming widespread in offices, factories, stores and banks.

That has made business more dependent on the computer; when the system fails, it's much like halting a factory assembly line. Airlines can lose reservations and customer good will; banks can lose funds transfers and large sums of interest.

Pitney-Bowes Corp., the postage-meter company in Stamford, Conn., started using a Tandem system in 1979. Pitney-Bowes was marketing a remote postage-meter resetting system by which a computer could increase the amount of postage available to a user by telephone line. The service required approval of the U.S. Postal Service, which demanded reliability. Customers also wanted assurances of reliability. Pitney-Bowes says the Tandem it installed is up "over 99.9% of the time," far greater than the big Univac that the company uses for most of its corporate data processing.

No Crashing

Knight-Ridder Newspapers Inc.'s commodity news service in Kansas City, Kan., uses a NonStop system to collect and edit reports from its news bureaus and direct the news to subscribers. "We can't have something that will go down," says Carl Arbers, director of systems operations. Since September 1980, he says, unscheduled downtime has totaled only three-and-a-half minutes, and that was caused by power failures. "Reporters never lose their copy because of system crashes, either," he asserts.

Telecredit Corp., Tampa, Fla., verifies checks and credit cards for stores equipped with small computer terminals. Telecredit installed a Tandem computer, says David Hatala, manager of communications, because if the system stops "our business stops."

Fred Meyer Savings & Loan Association, a Portland, Ore., subsidiary of American Savings & Loan, bought a Tandem system for its automatic tellers. The Tandem also backs up the S&L's main computer to allow human tellers to serve customers when the main computer, an International Business Machines Corp. processor, goes down. The Tandem, says Gerald Neuburger, systems programming manager, is down "four to five hours a year. With the mainframe, we're probably down that much a week."

Lots of Redundancy

Tandem manages its reliability by making use of multiple storage and processing units that can perform their own chores as well as take over if another unit fails.

Stratus' new computers, the first of which is scheduled for delivery in January, employ low-priced, high-performance circuitry to duplicate every function in the computer. So much redundancy, or duplication, is wired into the computer that a customer can remove and replace a circuit board while the system hums along.

Despite its reliability, Tandem's NonStop has gone into relatively few data processing locations. Gerald L. Peterson, director of marketing, says part of the trouble lies in establishing Tandem's credibility, because it is a relatively new and unknown firm. Many customers, he says, have bought NonStop systems to try in new operations instead of taking a bigger step and replacing existing systems with NonStop. And airlines, which require high reliability, haven't yet bought NonStop. "They have a tremendous investment in their mainframes," he says, "and the software that runs those systems. No airline is going to move real fast to make big changes there."

Barclays offshoot to upgrade with Tandem

LOUTH . . . failures will remain transparent to the user.

AMONG the first customers for an expanded transaction processing system announced worldwide by US company Tandem Computers last week will be Mercantile Credit, the finance house subsidiary of Barclays Bank.

Barclays and Mercantile are current users of NonStop, the multiple processor system which ensures a very high degree of user availability by duplicating processors, input/output facilities, memory and peripherals. Mercantile is likely to move to NonStop II, as the bigger system is called, to support over 200 interactive terminals.

Tandem, which is five years old and claims to be the fastest growing publicly quoted computer company in the US, says the NonStop II system is expandable up to 16 processors addressing a maximum 16,000 megabytes of virtual memory.

A 32-bit data access architecture, and a separate processor to monitor the system and advise on failures have been introduced. But UK managing director John Louth emphasises that, as with the original NonStop, failures are transparent to the user because double the absolute minimum processor capacity acceptable is always supplied.

Processors are independent, with their own I/O channels, power supplies and memory. Data is read from one but written on to two disc systems, for example, so that each mirrors the other. "Spare" processor capacity is typically taken up with interruptable applications, while printers and other peripherals are duplicated.

According to regional customer engineering manager Noel Johnston, a theoretical analysis has shown system failure is likely to occur once every 56 years.

Applications flexibility for the future is provided by a loadable control store for adding instructions to microcode as part of normal software update and with "minimal" interruption, says Tandem, and the system is compatible with the original NonStop.

Speaking at the company's California head office, vice-president David Mackie said: "This means that our users . . . will be able to retain virtually all their original investment in software and most hardware if they choose to upgrade to the NonStop II."

Turnover for the whole company rose to $108 million last year, an increase of almost 100% on the year before. Louth expects revenue to double again this year.

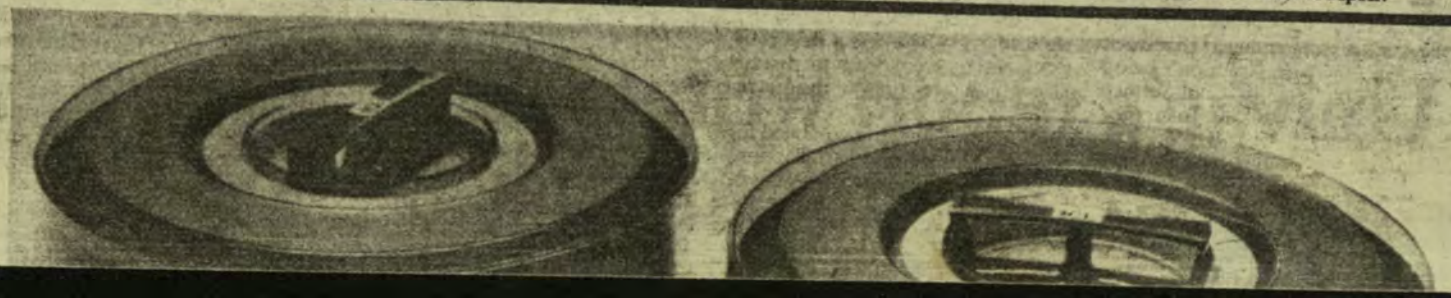
Burroughs-China talks

by Kevin Cahill

BURROUGHS is expected to announce a significant order for Chinese sourced components later this month, according to Herb Hayde, a senior manager in the company's Pacific/Canada Division.

Herb Hayde visited China in February with Bill Conlin, vice-president and group executive of Burroughs International group.

The executives were in the People's Republic of China in advance of Burroughs chairman Michael Blumenthal, who will visit Peking at the end of April.



Smith Barney Harris Upham & Co. Incorporated **research**

data processing

Release date: April 30, 1981

TANDEM COMPUTERS, INC.* - TNDM (OTC)

Peter Labé, CFA
(212) 399-6122

Price (4/28/81)	88	EPS 1982E (Sept.)	$2.90
52-Week Range	92-31	EPS 1981E	(+) $2.05
Indicated Dividend	none	EPS 1980	$1.06
Current Yield	none	Price/1982E	30.3x
DJIA (4/28/81)	1016.93	Common Stock	12,432,000

(+) Revised. Previous estimate was $1.95.

Tandem recently released second quarter results, commented upon below. In addition, on April 14, Tandem announced a new processor, called NonStop II,™ an evolutionary but significant enhancement of the NonStop processor first announced in 1975 and delivered in early 1976.

In the quarter, revenue progression was in line with our expectations but a slightly higher level of profitability and higher portfolio income due to good yields and less cash consumption developed a little better earnings than our forecast. We are not revising our full year revenue estimate of $207 million but adjusting the profit ratios slightly higher and portfolio income higher which leads us to revise our full year EPS from $1.95 to $2.05. The quarter is summarized below.

	1981	1980	% Change
Revenues ($000)	$47,417	$24,877	90.6
CGS % of Rev.	36.9%	37.2%	-
R&D % of Rev.	8.6%	8.1%	-
SG&A % of Rev.	35.6%	37.5%	-
Operating Profit ($000)	$ 9,012	$ 4,253	111.9
Operating Profit Margin	19.0%	17.0%	-
Other Income	$ 3,726	$ 576	546.9
Pretax Income	$12,738	$ 4,829	63.8
Pretax Profit Margin	26.9%	19.4%	-
Effective Tax Rate	49.2%	50.0%	-
Net Income	$ 6,476	$ 2,414	168.3
Average Shares (000)	12,432	10,234	21.4
EPS	$ 0.52	$ 0.24	116.7

Cash at the end of the quarter was $97 million, down moderately from $106 million on December 31, and with a current ratio of nearly 9 to 1 and essentially no debt, Tandem maintains a powerful financial condition.

In addition to excellent operating results, Tandem had a good quarter for new account penetration even though a little more than half of revenues was repeat business. Productivity of the sales-system analyst force remained high and even increased despite a good level of new hires. The quarterly trends in this data are shown below.

	-- FY 81--		----------FY 80---------				--------FY 79----------			
	2Q	1Q	4Q	3Q	2Q	1Q	4Q	3Q	2Q	1Q
No. of New Customers	41	40	40	32	29	29	23	31	19	14
No. of Processors Shipped	279	239	203	168	138	144	160	137	106	87
Revenues ($mil.)	$ 47.4	$ 40.6	$ 34.1	$ 29.2	$24.9	$20.8	$ 18.1	$15.0	$12.5	$10.4
Salesmen	148	134	111	96	91	80	65	55	48	45
Systems Analysts	284	250	221	185	164	130	109	96	83	72
Revenues Per Salesman/ Analyst ($000)	$109.7	$105.7	$102.7	$104.0	$97.6	$99.0	$104.0	$99.3	$95.4	$88.9

Looking ahead to fiscal 1982, we anticipate a revenue gain in excess of 80%, to around $380 million, but such rapid growth will require substantial increases in working capital and with capital spending including outfitting a large new plant in Reston, Virginia, much higher capital spending can be expected as well. As a result, we believe non-operating income will decline more than 50% from an estimated $12 million this year. With a higher number of shares and a slightly lower tax rate, we are retaining our possibly conservative $2.90 per share opening line. In other words, operating performance will be far greater than the apparent earnings comparison.

By our figures, Tandem will have drawn down its cash by the end of fiscal 1982. Should the company anticipate this by having another equity offering late this year, it would be anti-dilutive and our estimate would be increased to over $3.00.

Tandem has announced several interesting linkages to other equipment in recent months, which should be supportive of its business and increase its exposure to potential sales situations. One is "TIL," the interface to IBM central processors which in effect makes a Tandem system appear as a tape drive to the host computer; one is an adaptor to Network Systems' HYPERchannel,™ for users desiring high speed computer to computer or data file links; and one is an interface to the SWIFT network in use mostly with European banks. While these interfaces help and reduce sales obstacles, perhaps most of the attention is now centered on the new processor, NonStop II.

NonStop II is a fast 16-bit minicomputer with many of the same performance specifications as the earlier NonStop, naturally with the fail-safe redundancy, data integrity and modularity that is a hallmark of Tandem's product approach, and it retains full compatibility with NonStop at the application code and network levels.

Where it differs principally is in a 32-bit data access architecture in the machine and in a new Operations and Service Processor designed to provide local and remote diagnostics and on-line reporting of hardware faults. The new data access architecture is the key, because it permits extended addressing and the implementation of

virtual memory (up to one billion bytes per processor, 16 billion bytes in the maximum 16 processor configuration).

The standard 16-bit addressing mode gives the user the high speed access in an executing program as he now has. The extended 32-bit mode is primarily used by the operating system, but relocatable extended addresses are available to all applications. Since virtual data so addressed must move into real memory for execution, Tandem provides 1,024 high speed registers which reside in ultra-fast 30 nanosecond bipolar random access memories. Coupled with a 16-fold increase in the size of input-output buffer space and transfer size and a high speed burst mode for channel transfer, the increase in overall input-output is dramatic compared with NonStop.

The initial significance is to broaden the market, since clearly NonStop II is designed for large transaction processing applications which may require hundreds of interactive terminals and communications lines, customers with large distributed data bases, and in input-output intensive applications where previous capability was limited. Longer term, we believe Tandem will have much greater capability to add software tools in this architecture to ease the difficult task of on-line programming as well as add microcode assist features through reloadable control store.

The question is often asked why Tandem does not offer full 32-bit equipment. We believe that not only would it raise considerable compatibility questions relating to the existing 16-bit machine and existing software, but it would not gain very much in typical Tandem applications. Most on-line applications have very small program modules and need to be executed very fast, and this is addressed very well by 16 bits. As an editorial aside, we believe that over time a number of 16-bit mini manufacturers are likely to turn to 32-bit data access as well, to gain the increased functionality in their systems and to enable them to compete with and distinguish themselves from microprocessors.

From a financial point of view, the approximate price of the NonStop II processor appears to be about $100,000, roughly 50% more than NonStop, but in a typical large system with peripherals, the new system will be in the area of 15-20% more expensive. While performance will be highly application-dependent and we have no comparative performance data, (in fact, the millions of instructions per second rating on both machines is the same), the huge increase in functionality will lead to customer migration to the new system as we see it. In this connection, Tandem is offering existing customers a unique exchange program. NonStop users who exchange their processors for NonStop II receive zero credit now, 40% in 6 months, then 70%, and in 15 months 100%. Tandem intends to refurbish returned NonStop processors and re-ship to customers whose applications are appropriate. Despite the exchange program, we see no impact on profit margins. NonStop II is the same technology as NonStop and utilizes only five additional boards, i.e. it should be a low cost processor to manufacture, and new configurations shipped will probably average around $270,000 compared with a current average of about $225,000, with an accompanying positive impact on margins.

NonStop II has been delivered to six customers of which only Telenet has been publicly identified. We expect a gradual shipping buildup and estimate it may be two years before shipping volumes exceed NonStop.

To summarize, Tandem's performance and outlook remains very strong and we believe the new product announcement is very constructive. The stock is not especially cheap at over 30x our fiscal 1982 earnings estimate, but with expectations of over a 50% growth rate consider the likelihood of a continued high multiple quite strong. We believe Tandem is the highest quality of the small computer stocks and recommend maintaining positions and purchase for investors with a long term time horizon on stock price weakness.

*Smith Barney, Harris Upham & Co. Inc., usually maintains a market in the securities of this company.

Electronic News April 20, 1981

Tandem Offers Upgraded System

CUPERTINO, Calif. — Tandem Computers, Inc., upgraded its network-oriented, transaction-processing system last week, coming out with the NonStop 2 version that incorporates a new virtual memory access method, memory repackaging, revised control store and addition of an operations and service processor.

The firm said the new model offers a considerable performance improvement over its predecessor, but cautioned that it was entirely applications-dependent and that the only measure it had so far derived from beta testing.

In beta test at Telenet Communication Corp., a spokeswoman said, the system yielded about a 50 per cent improvement over the NonStop 1 in the specific applications used at that site.

Tandem priced the NonStop 2 at $144,475 for a basic configuration consisting of dual processors with 512K bytes each of memory, a tape drive and controller, and the operations and service processor. This compares with $94,975 for a NonStop 1 base system with dual processors, each with 384K bytes of memory, tape drive and controller.

Tandem, which said it has shipped six systems so far, quoted 120-day delivery ARO. Manufacturing is at Cupertino and at the firm's new facility in Reston, Va. Full production is expected by the end of this year, according to the Tandem spokeswoman.

Feature

A major feature of the new model, the firm said, was the introduction of 32-bit data access architecture. It was explained that, although the dual-

Continued on Page 25

Upgraded Transaction System Introduced by Tandem

NEW TANDEM SYSTEM: The NonStop 2 was introduced by Tandem Computers, Inc., to provide better price-performance than its original system.

Continued From Page 16

processor system continues to use a 16-bit instruction set to remain compatible with the current installed base, virtual memory is accessed through a 32-bit addressing scheme, increasing the virtual address space from the earlier 64 megabytes to one gigabyte per processor.

Related to this, the firm said, is the expansion of the I/O buffer on each processor and the maximum I/O transfer size. The firm said the buffer was increased from 64K bytes to one megabyte and the transfer size from 4K bytes to 64K bytes.

As before, the Tandem system can be expanded from two to 16 CPUs in dual-processor configuration but, with the extended virtual addressing, the maximum virtual-addressing capability is 16 gigabytes.

Tandem touted this enhancement for its ability to support the hardware and software needed for very large applications requiring hundreds of terminals; communications lines, including X.25 circuits; and large, distributed data bases.

The repackaging of real memory involves the repackaging of the boards to expand memory and to enable the firm to switch from 16K-bit to 64K-bit technology when the firm believes the price is right. While the NonStop 1 packaged 384K bytes on a board, the new model takes 512K bytes, which becomes the new minimum memory. Maximum real memory remains two megabytes per processor, as before.

In the area of control store, Tandem switched largely from ROM to RAM, implemented in 36K bytes, to enable microcode to be enhanced without interruption of user processing. Previously, adding new functions to microcode required service personnel to replace ROMs, shutting down the system during the changeover.
over.

New to the NonStop 2 is what Tandem calls the operations and service processor (OSP), which combines the operator console with diagnostic capabilities. The floppy-disk based diagnostics, which detect and report hardware faults on-line, also can be used via telephone line to provide remote diagnostic capability.

Tandem said the new system retains full compatibility with the earlier one at the application-code and network levels, so that current users will be able to retain virtually all their original investment in software and most hardware if they upgrade.

All standard code will be directly transportable to the new system, it was explained, although proprietary code written by users would not. The spokeswoman said the number of users with proprietary code is very small.

Economy Daily News April 17, 1981

"TANDEM IN TAIWAN"

SYSCOM, TANDEM's Taiwan distributor held a computer conference at Grant Hotel, Taipei, Taiwan on April 16, at 1:30 P.M. The purpose of the conference is to introduce U.S. TANDEM computer to the Taiwan market.

Approxmitely 120 guests from various walks of business attended the conference.

George Liu, the software manager from SYSCOM, opened the conference with Christopher Ericksoa, manager from TANDEM computer, G.E. peterson, mfg & production manager, and Forrest Greia, ~~Forrest Greia~~, Forest Asian representative giving presentation and demanstrations.

冷氣冷凍機具展覽會
參展廠商定廿日座談

【本報訊】由台北市電器公會主辦、本報獨家協辦的「冷氣冷凍機具展覽會」，徵展工作進展順利，並定本月廿日下午二時，在公會會議室舉行參展廠商座談會，除協調有關展出事項外，將公開依登記攤位先後之順序選定攤位，會後並由籌備委員會陪同參展廠商到現場勘察攤位位置。在分配選定攤位前，凡欲參展廠商，宜把握機會，逕往公會洽辦。此項在國內首次舉辦，規模最大之冷氣冷凍機具專業展覽會，主要目的在響應政府推行節約能源政策，積極宣導冷氣設備的高能量效率（EER比值），並使消費大眾瞭解冷氣機及中央冷凍空調系統等相關設備之性能、使用及保養方法，及協助業者招展市場。

該公會表示，公開徵展以來，辦公登記參展廠商已逾四十二家，共有一二〇個攤位，參展廠商及產品，號稱括國內外各大名廠名牌冷氣冷凍設備及相關零組件、保養設備、自動控制設備等產品。

為使此項展出順利圓滿，並促使社會各界重視使用高效率（EER值）冷氣設備，以節約能源目的，主、協辦單位，除編印特刊及專文配合宣導外，還將於展出期間，加強各種展覽活動報導。

台北市電器公會在台北市松江路一三二號十二樓，電話五二二四八八一號。

台中塗料新廠竣工
大量生產各種油墨

【台中訊】台中塗料油墨股份有限公司，投資一千五百萬元擴建之南崗工業區新廠，業已竣工，大量生產各種油墨及顏料製品，月產量達六十噸。

該公司董事長陳育松表示：南崗新廠佔地千餘坪，專門生產由合成樹脂及硝化纖維素混合之印刷油墨，全廠使用全自動密封式生產機械，從原料粉碎、過濾、混合、攪拌到加溫均採一貫作業，油墨細度只有2u，耐熱性達一百廿度。

此種印刷油墨並有下列優點，附著性特強，熱熔塗覆性不變質，色彩鮮麗，佳，耐日晒及水溶面適於高速及多色印刷。

凌群昨推介坦登電腦

凌群電腦公司昨（十六）日下午一時卅分，在圓山大飯店教師廳，舉行新代理的美國坦登（TANDEM）電腦發表會，有國內企業界人士一百二十餘人參加研討。

該研討會由凌群電腦公司總經理劉瑞復（上右）主持，坦登公司經理克里斯多福（Christopher Ericson）（上右二）、生產部經理彼得遜（G. E. Peterson）（上右三）及遠東區負責人格里英（Forrest Grein）（上右四）担任解說。（賴丹羽攝）

標籤自動上糊機
利印企業新開發

【本報訊】利印企業有限公司，新開設小型手牌標籤自動上糊機，體積小，具無段變速器，可依工作人員之需要，調整上糊速度，適合製藥、食品、化工等業貼標籤之用。

是項小型手牌標籤自動上糊機有關重要調整裝置，可依實際需要調整上糊厚度，並有逆轉演輪，能將成單張貼紙系統，不需人工，亦不會兩張重疊，同時該機無方向性，則任何形狀之標籤均可上糊，若超過十公分以上之標籤可另行訂製。

紐約世界發明博覽會
在台徵展明截止

【本報訊】亞太國際專利商標事務所代表世界專利財團公司（World-Wide Patent Ltd.）辦理第五屆紐約世界發明博覽會在台徵展事宜，至四月十八日截止。

五屆紐約發明展將於今年五月十四日起至十七日止在紐約史坦登島舉行。

凡發明人或廠商，請儘快辦理。

該公司在台北市長安東路二段一一八之四號二樓，電話五六一七七九六。

國際商銀城中分行
今慶祝開業兩週年

【本報訊】今（十七）日為中國國際商業銀行城中分行，開業二周年紀念。

眞義展示中心開幕
展出諾蒂廚具

【本報訊】眞義企業股份有限公司代理法國諾蒂（Nordic）公司廚具系列，並配合昨（十六）日展示中心開幕同時展出。

該公司表示，法國諾蒂廚房系列採用（Knock Down）單元設計，可依人體身高，空間大小整活組合，且檯面整體式設計，不會暗藏污垢，其耐高溫、高壓之門扇，能防水防潮，且耐磨抗酸鹼，歡迎參觀洽詢。

眞義公司在台北市吉林路一五〇號八樓，電話五四一七六六七號。

防銹潤滑劑
恭榮自瑞進口

【本報訊】恭榮公司由瑞士進口Ther-Bond噴霧式防銹潤滑劑及Ultra防銹保養劑，現貨供應業界。

噴霧式防銹潤滑劑，係以純金屬分子經過分解提煉而成，是防止腐蝕和氧化的特殊媒介物，可滲入小孔或金屬縫隙中，形成一層薄膜，適用於-30°C至+200°C之溫度，且不受酸鹼性物質或腐蝕性溶液影響，無毒性，可節省裝置組合時間，減低保養成本並延長機件使用壽命。適用於螺絲、輪軸、填塞物、連結器、傳動齒輪、工作檯面的潤滑及保護。

Ultra防銹保養劑，能排除溼氣，解除剎耳噪音，防止腐蝕，並能清潔電子零件。且使用後即形成一層薄膜，但不油膩，且不燃燒。摩擦係數是其他石油製品的四分之一，適於-30°C至+60°C內之溫度使用，主要供機械、金屬模具、彈簧、家電用品裝配、門鉸鏈、鎖匙孔等用。

恭榮公司在台北市吉林路三九二號二樓，電話五九三二一五六—七號。

津上齒輪研削盤
工程師來台服務

【本報訊】日本津上株式會社為加強售後服務，日前特派工程師星野靖史、小林武司前來我國為精密齒輪業者提供維護及技術服務。

據津上會社此間總代理弘華貿易公司負責人彭明江表示，津上精密齒輪研削盤採用創成研削方法，本機附有特殊周波數變換裝置，因而齒輪研削時砂輪軸與工作軸可作同期運轉，並採全自動化，精度安定，其齒形誤差可達JIS 2級至0級。現國內已獲大同齒輪、青年齒輪等多家廠商採用。

弘華公司在台北市松江路四十二號四樓E室，電話五六一九八九七號。

冷氣冷凍機具展覽會
參展廠商定廿日座談

【本報訊】由台北市電器公會主辦、本報獨家協辦的「冷氣冷凍機具展覽會」，徵展工作進展順利，並定本月廿日下午二時，在公會會議室舉行參展廠商座談會，除協調有關展出事項外，將公開依登記順位多寡之順序選定攤位，會後並由籌備委員會陪同參展廠商到現場勘察攤位位置。在分配選定攤位前，凡欲參展廠商，宜把握機會，逕往公會洽辦。此項在國內首次舉辦，規模空大之冷氣冷凍機具專業展覽會，主要目的在響應政府推行節約能源政策，積極宣導冷氣設備的高能量效率（EER比值），並使消費大衆瞭解冷氣機及中央冷凍空調系統等相關設備之性能、使用及保養方法，及協助業者拓展市場。

該公會表示，公開徵展以來，頗受登記參展廠商已逾四十二家，共有一二〇個攤位，參展廠商及產品，根據答覆內外各大名廠名牌冷氣冷凍設備及相關零組件、保養設備、自動控制設備等產品。

爲使此項展出順利圓滿，並促使社會各界重視使用高效率（EER值）冷氣設備，以節約能源目的，主、協辦單位，除編印特刊及專文配合宣導外，還將於展出期間，加强各種展覽活動報導。

台北市電器公會在台北市松江路一三一號十二樓，電話五二二四八八一號。

台中塗料新廠竣工
大量生產各種油墨

【台中訊】台中塗料油墨股份有限公司，投資一千五百萬元興建之南崗工業區新廠，業已竣工，大量生產各種油墨及副料製品，月產量達六十噸。

該公司董事長陳育松表示：南崗新廠佔地千餘坪，專門生產由合成樹脂及硝化纖維素混合之印刷油墨，全廠使用全自動密封式生產機械，從原料粉碎、過濾、混合、攪拌到加溫均採一貫作業，油墨細度只有2u，耐熱性達一百廿度。

此種印刷油墨並有下列優點，附着性特强，熱熔黏度性不變質，色彩鮮艷，耐日晒及水溶面二遠於高速及多色印刷）二三一五三八號。

迪祥引進瓦斯發熱器

凌群昨推介坦登電腦

凌群電腦公司昨（十六）日下午一時卅分，在圓山大飯店教證廳，舉行新代理的美國坦登（TANDEM）電腦發表會，有國內企業界人士一百二十餘人參加研討。

該研討會由凌群電腦公司總經理劉瑞復（上右）主持，坦登公司經理克里斯多福（Christopher Erickson）（上右二）、生產部經理彼得遜（G. E. Peterson）（上右三）及遠東區負責人格里芙（Forrest Grein）（上右四）坦任解說。（賴丹羽攝）

標籤自動上糊機
利印企業新開發

【本報訊】利印企業有限公司，新開發小幅手持標籤自動上糊機，體積小，具無段變速器，可依工作人員之需要，調整上糊速度，適合製藥、食品、化工等業貼標籤之用。

是項小幅手持標籤自動上糊機有糊量調整裝置，可依實際需要調整上糊厚度，並有逆轉旋鈕，能將皮單張貼紙取出，不需人工，亦不會兩張重疊上糊，同時該機無方向性，則任何形狀之標籤均可上糊，若超過十公分以上之標籤可另行訂製。

該公司主要產品包括：無聲間膠滾輪、軸承、軸套、耐磨導輪、導軌、導輪、膠輪軸承、複合膠板、內襯、襯墊及橡氟膠製圓抗黏處理，特殊間膠平板圓環管料等。

晶環公司在台北市和平西路三段二六一號，電話五二二四八八一號。

紐約世界發明博覽會
在台徵展明截止

【本報訊】亞太國際專利商標事務所代表世界專利財團公司（World-Wide Patent Ltd.）辦理第五屆紐約世界發明博覽會在台徵展事宜，至四月十八日截止。

五屆紐約發明展將於今年五月十四日起至十七日止在紐約史丹登島展出。

發明人或廠商，請儘快辦理。

該公司在台北市長安東路二段一八之四號二樓，電話五六一七七九六。

國際商銀城中分行
今慶祝開業兩週年

【本報訊】今（十七）日爲中國國際商業銀行城中分行，開業二周年紀念。

眞義展示中、
展出諾基

六）日展示中心開幕，該公司表示，法國元設計，可依人體設計，不會吸藏污垢，且耐磨抗皺抗皺，眞義公司在台北六七號。

防銹潤滑劑
恭榮自瑞進口

【本報訊】恭榮公司由瑞士進口"Bar"日BRTP 噴霧式防銹潤滑劑及CLTRA 防銹保養劑，現貨供應業界。

噴霧式防銹潤滑劑，係以純金屬分子經過分解提煉而成，是防止腐蝕和氧化的特殊媒介物，可滲入小孔或金屬縫隙中，形成一層薄膜，適用於-80°C至1200°C之溫度，且不受酸鹼性物質或腐蝕性溶液影響，無導性，可節省裝置組合時間，減低保養成本並能延長機件使用壽命，適用於螺絲、軸轉、填塞物、連結器、焊縫、傳動齒輪、工作檯面的潤滑及保護。

CLTRA 防銹保養劑，能排除溼氣、解除刺耳噪音、防止腐蝕，並能清潔電子零件，且使用後即形成一層薄膜，但不油膩、且不燃燒，摩擦係數是其他石油製品的四分之一，適於-30°C至240°C內之溫度使用，主要供機械、金屬模具、彈簧、家電用品裝配、門鉸、滑動等處潤滑及使用說明書。

該公司在台中縣太平鄉中山路四段二一七號，電話（〇四二）二三一五三八號。

Economy Daily News　　April 17, 1981

Tandem in Taiwan

SYSCOM, TANDEM's Taiwan distributor, held a computer conference at the Grant Hotel, Taipei, Taiwan on April 16, at 1:30 p.m. The purpose of the conference is to introduce U. S. Tandem computer to the Taiwan market.

Approximately 120 guests from various walks of business attended the conference.

George Liu, the software mamager from SYSCOM, opened the conference with Christopher Erickson, G. E. Peterson, and Forrest Greia.

Chinese translation by Grace Shyy

The newspaper for computer professionals in Asia

APRIL 27, 1981 MC (P) 15/6/80 ISSN 0129-5896 VOL. 2 NO.

Tandem establishes base in Hong Kong

By STEVE KONG in Hong Kong

TANDEM COMPUTERS' regional marketing network is shaping up well.

Tandem Computers HK and Tandem Computers International have been officially inaugurated in Hong Kong.

Mr. G.E. "Pete" Peterson, who has been temporarily seconded from the California headquarters to act as the general manager of Tandem Computers International Inc. (HK), is now busy recruiting staff for the Hong Kong operation.

He will be remaining in his present post until a new general manager is appointed. It is Tandem's policy that local people will be employed to serve the local needs, explained Mr. Peterson.

Mr. Peterson expected that the new Hong Kong general manager would be appointed within two months and the Hong Kong office would have about twelve employees by this year end.

Centre

According to Mr. Peterson, the Hong Kong subsidiary will serve as the regional marketing and engineering support centre for all Tandem operations in Asia.

The company's next branch office in this region outside Japan will be opened in Singapore some time in May. This office will be headed by Mr. Mark Ho, who is now under intensive training in California.

Size of the Singapore office will be smaller at the initial stage. Three staff is scheduled to be employed.

Mr. Peterson said that initially, software engineering would be supported by the Hong Kong office until the management thinks that the market size justifies setting up a software team in the Singapore office.

The rest of Asia will be covered by distributors. In South Korea, Korea International Products Services (KIPS) was appointed as the sole distributor for that country last September.

Tandem is now in the process of negotiating with local interests in Taiwan and the Philippines for similar distributorship arrangement, according to Mr. Peterson.

In Australia, Tandem has been represented by Melbourne-based Management Information Services (MIS) over the past two and half years.

Installations

At the moment, there are eight Tandem installations in the region. These include two in Japan, two in South Korea and four in Hong Kong.

Hong Kong's first two Tandem 16 systems were installed at First National Bank of Chicago's Hong Kong branch office and the Bank's Hong Kong-based office for international support in late July and December respectively.

The third installation was delivered to Pega, an OEM (Original Equipment Manufacturer) last December.

The latest order was placed by HAECO (Hong Kong Aircraft Engineering Co., Ltd.) and delivery of the machine is expected in early April.

Mr. Peterson predicted that there would be at least one installation each in Singapore, the Philippines, Malaysia and Taiwan by this June. There will also be another installation in Hong Kong soon, Mr. Peterson added.

No further information about the Philippines and Taiwan installations are available at this stage. However, ACW has learnt that the Tandem systems to be delivered to Singapore will be used by the branch office of the First National Bank of Chicago there.

The one to be installed in Kuala Lumpur will be employed by Motorola for management and production control applications at its KL manufacturing plant. Motorola's Tandem machine had been secured by the Company in the U.S. and will be shipped to KL.

"Inthe past, Tandem has been heavily involved with multi-national companies. These multinationals are just like a bridge. They have brought us to this part of the world," said Mr. Peterson.

"From now on, we shall continue our commitment to our multi-national users and at the same time spend more time and effort to serve the needs of local users in Asia," he said.

PICTURE above shows Tunku Mansur Yaacob, chairman of H & C (second from left), and Mr. John Quinlan, NCR Malaysia managing director (second from right) signing the agreement.

Looking on are: Mr. R. Lindesay, H & C estate department director (far left) and Mr. St. Clair George, H & C estate accounts director (far rig

Standing (from left) are: Mr. T.B. Chiam, N CIMEG manager; Mr. W.P. Chuah, NCR SI manager; Mr. Mike Kemp, H & C consultant; M K.S. Wong, NCR district manager; and Mr Harness, H & C computer manager.

H&C's M$2.5m: order

HARRISONS & CROSFIELD has signed a M$2.5 million agreement with NCR Malaysia, for the purchase of an NCR 8410 and 35 units of NCR 8140.

The NCR 8410 central computer will be installed at Harrisons & Crosfield's head office in Kuala Lumpur and the NCR 8140 units will be distributed to a number of Harrisons & Crosfield's estates in West Malaysia.

Harrisons & Crosfield commissioned consulting firm, Arthur Andersen, to assist in developing the system.

Y.M. Tunku Mansur Yaacob, chairman of Harrisons & Crosfield (Malaysia) said at the signing of the accord that the demands of modern day estate accounting has necessitated the use of computers.

"We have carried out exhaustive investigations into this field at very considerable costs both in time and money," he said.

"I can now say that these have been worthwhile, and we have got not only a very competent computer department, but we have also gained a great deal of experience."

The units installed on the estates will primarily be used checkroll, agricultural data management accounting tions. The summary data fr each estate will be consolidat by the NCR 8410 mainfram Kuala Lumpur.

Installation of the NCR 8 system will be undertaken phases, beginning in the quarter of this year while NCR 8410 computer will be stalled in Kuala Lumpur bef the year end.

After this phase is complet Harrisons & Crosfield have pl for the computerisation of ot estates under its management

John Swire & Son's MSD now dedicated to CPA

THE management services department (MSD) of John Swire & Sons (HK), one of the biggest in-house computer service bureaux in Hong Kong, has recently undergone a drastic behind-the-scene changes in its management structure.

ACW has learnt that the MSD of the Swire group has split into three specialised management offices:

The management services department (MSD), Cathay Pacific Airways; the business system department (BSD), John Swire & Sons; and the technical services department (TSD), John Swire & Sons.

Still headed by Mr. Richard Willsteed, the MSD is now solely dedicated to Cathay Pacific Airways (CPA), which for a long time has been the major user among the Swire group of companies of the services provided by the MSD.

The MSD services cater for all CPA management needs — from on-line air ticket reservation, general accounting to engineering functions.

The MSD will carry on implementing the USAS (Univac Standard Airline Reservations System) which is based on a Univac 1100/82 dual processor computer and scheduled to have its cut-over before end of this year (ACW July 14, 1980).

About two hundred staff from the original two hundred and fifty engineering team remain with the new MSD, making it the biggest among the three offices.

"With the establishment of the new MSD, the department can easily identify itself as part of CPA and thus more efficient services can be catered for," commented Mrs. Dorothy C.W. Chen, senior systems manager of the MSD.

Another major project which will be looked after by the MSD is an inventory control system to be used by CPA's engineering department and Hong Kong Aircraft Engineering Company (HAECO), which is also a Swire subsidiary.

Developed since 1973 and with roughly twenty man-years spent, the inventory system has just had its cut-over early this month. Development costs have been shared by CPA and HAECO.

HAECO, which has set up its own computer department last July, is still using services provided by the MSD. However, HAECO's ultimate aim is to establish its own in-house EDP team.

Designed to operate in an on-line data entry/enquiry and off-line information updating mode, the system is used to keep track of all items used by HAECO and CPA's engineering department, as well as such commercial items as the duty free goods on sale aboard the planes.

The inventory system is running on MSD's IBM 3031 and 3032 computers installed at Kai Tak Airport.

Mrs. Chen hinted that the management is considering a major conversion of the department's operating system, with an MPX (multiplex or multiprogramming executive system) high on the agenda.

For Indonesia Supplement See Page 11

PASS ON THIS ISSUE TO:	
DP Management	
Finance Management	
Project Supervisor	
Systems/Programming	
Operations	

a bit of a byte

An engineer in Singapore became very excited when he heard that the CNC report was out until he found that it stood for Committee for National Computerisation and not computerised numerical control.

I.P. Sharp Associates selects Singapore

I.P. SHARP ASSOCIATES, a Toronto based Canadian multinational and the world's biggest supplier of APL software and timesharing services has announced the selection of Singapore as headquarters for its Far East operations.

It will be setting up its regional office in Singapore's C.P.F. building from May 1st, while the manager of the Hong Kong office will be taking up his position in June.

Mr. K. Walter Keirstead, chairman of I.P. Sharp's Far East Group of companies told ACW that Singapore will serve as a base for expansion of its business within the Far East to countries such as Japan, Korea, Hong Kong and China.

"Our strategy will be to make use of joint ventures or agency relationships in select areas in the interest of developing the market rapidly," He said.

The company will be offering a "comprehensive educational programme which is solution oriented," Mr. Keirstead said.

It expects to start its APL courses in Singapore by the middle of June. It can cater for up to 192 applicants a year for the introductory course.

About 45 can be accommodated for the intermediate course and six for the advanced course in the first year. This is expected to be increased to 60 and 12 respectively for the second year.

I.P. Sharp Associates provides a comprehensive set of APL-based "high productivity" program products which the co pany claims can improve p grammer productivity by a fac of five to ten.

The offering includes a com ter operating system and guage processor, a data b management system, a telec munications package and ap cations systems.

These are available for in lation on IBM compatible chines or may be accessed timesharing basis.

The company has a private ternational packet switched communications network wh provides service to more than cities around the world. The c nect charge is S$2.50 per hou

The company expects a leve business of S$5-7 million wit two years. Major users will banks, insurance companies, lines and resource industries

Regional office

MSA INTERNATION INC., a major software gr has established a regional of in Singapore with a staff of s en. It has sent three Singapre to Australia for training.

Its offices are tempora housed at 3202 Shaw Tow telephone number 2925506 Roger Prior, its South East A regional manager who is base Singapore, told *ACW* that i seeking a permanent office sit

LOOK AHEAD

INFORMATICS MAKES ITS MARK	Look for an introduction from Informatics of a new software product designed to help IMS/DC users develop application programs on-line. The new Mark V product is expected late this month with a selling price of about $100,000. Menu-driven, the software carries forward the philosophy of Informatics' highly-successful Mark IV. The new product is said to be in field test currently and is to be introduced early next year to overseas customers.
NEW CHANNELS FOR TERMINALS	While the 3270-type terminal market has been Lee Data Corp.'s bread-and-butter, the firm is moving into new arenas. With annual revenues up to $6,700,000 last year, the firm has set its sights on asynchronous terminal markets so it can get non-IBM business. Also in the works at the two-year-old Minneapolis company are color and graphics capabilities for its All-in-One line of display units. The secret behind Lee Data's high-quality, high-capacity(up to 66 lines of 132 characters each) is the switch from Motorola screens to those made by another Minneapolis firm, Moniterm Corp., headed by Ward Johnson, former oem sales and field support manager at CPT Corp.
STAY WHERE YOU ARE	The high costs of relocating personnel to California from other parts of the country don't bother Interactive Systems Corp., the Santa Monica software firm. It has hired people in Boston, Gaithersburg, Md., San Francisco and Austin and let them stay where they are. Each programmer is given a block of code to work on and develop on his or her own.
RUMORS AND RAW RANDOM DATA	Dylakor should be coming out this month with a DOS version of its Dyl-280 report writer. Pricing is understood to be similar to that of the OS version:$127 a month....Burroughs is back in court because of its ill-fated B 3950, but this time the suit was filed by rival Sperry Univac. That firm charged Burroughs with violating the City of Minneapolis' bidding rules in opting for a different system than a 3950....Our prize for most extravagant advertising goes to Tandem Computers whose sleek grey Mercedes 450 SL was seen cruising Manhattan's Upper East Side recently. It had company logo license plates....Now that Xerox has signed up Hamilton/Avnet to distribute its 820 personal computer, observers are wondering if IBM will cut a similar deal for its new machine. IBM already moves its 3101 ASCII terminal through industrial distributors so a personal computer deal would be a natural.

Electronic dilemma

VDT uses are many, but so are the risks

By R.B. Plunkett Jr.
New York Daily News

TOMORROW may be the day your office goes electronic. But even if it's not tomorrow, sooner or later your typewriter, filing systems, perhaps even your calculator, pencils and paper will be obsolete.

Like 7 million American workers today, you will sit in front of a video display terminal (VDT) — a high-technology combination of a television screen and a typewriter. The keyboard has a few extra buttons that enable you to store, transmit, retrieve and edit information. The information appears on the video screen — the characters are usually bright blue or green on a dark background.

Introduced in the business world in the late 1960s, VDTs are now used to produce everything from airline tickets to insurance policies and newspapers to business letters. They boost office efficiency to such an extent — as much as a third, some claim — that their sales are expected to almost triple over the next four years as big offices and small look for increased savings.

If they don't find their way into your ofice, VDTs may end up in your home. More than 2.5 million home computers are already in use, including some in schools. They have been touted as an excellent teaching tool, terrific for balancing a checkbook, playing games and for other uses still being devised.

And VDTs, say both experts and those who use them, may also make you ill.

In the last five years, many VDT users have complained of eyestrain, blurred vision, headaches, nausea, fatigue and sore necks, backs and legs, say two federal government reports on occupational health and safety.

Some of the ailments have been explained, but enough remain a mystery that government scientists and other researchers are still trying to figure out what long-term effects these technological miracle machines will have on their users. No study has definitively proven them unsafe, so they are still being sold to eager, mostly corporate, buyers.

"There are some health problems that are showing up right now," said Michael Smith, an industrial psychologist with the National Institute for Occupational Safety and Health (NIOSH). "We have not been able yet to study the long-term effects of these machines, because they are still being introduced into business. But we do have a feeling there could be chronic effects."

Often VDTs are uncrated and positioned on the same desktop where a typewriter was the day before. When installed this way — with no change in lighting or the height of the desk and with little employee preparation — they cause a variety of health problems, experts say. Smith says the most common fall into three categories:

Ron Burda — Mercury and News

Many VDT users have complained of eyestrain, blurred vision, headaches, nausea, fatigue and sore necks, backs and legs

• Visual. The bright characters on a dark screen can overwork the lens of the eye, causing strain and fatigue. Glare from nearby windows can hurt the eyes and lead to headaches. The situation increases the risk of developing myopia, or nearsightedness.

• Muscular. Furniture designed for typewriters is usually not the right height for proper positioning of a VDT. In that case, working at the VDT puts too much pressure on he nerves in the wrists. Over a long time, that can lead to loss of dexterity in the fingers or even loss of the use of the hands.

• Job Stress. Some computer terminals are efficient enough to point out and correct the user's mistakes. They become an unsympathetic, unrelenting boss. The potential for health problems is massive, says Smith, with this kind of situation making workers three times as prone to coronary heart disease, according to one study.

VDT operators who work full time at a terminal run the greatest risk of suffering health problems, the studies indicate. So both NIOSH and several employee unions have proposed safety standards for VDT users.

They include regular eye examinations and scheduled rest breaks for users. They also call for modifying office lighting to reduce glare and furniture to make it adjustable to different heights and viewing distances. But these standards are not law, and many workers are not represented by unions, especially white-collar office employees.

Every terminal emits continuous low level radiation. Although studies have been able to pinpoint other causes for nausea and stress, the effects of this radiation are still unknown.

To create the lighted characters on the screen, a

Continued on Page 3C

San Jose Mercury 6/8/81

VDTs harmful to their users, but no one knows quite how

Continued from Page 1C

cathode ray tube (CRT) in the rear of the terminal beams a steady stream of electrons at the back of the video screen. The electrons interact at the end of the tube with chemicals called phosphors. This process produces the characters you see. It also produces several types of radiation, including X-ray, radio frequency and microwave (associated with cataracts), ultrasonic (headaches, fatigue, nausea and irritability), ultraviolet and infrared (skin cancer and cataracts).

Fear of radiation's effects has prompted several studies by federal agencies and manufacturers. In each case, the radiation emissions were found to be too low to cause any risk to employee health.

Eighteen different manufacturers' models were tested by NIOSH, the research arm of the federal Occupational Safety and Health Administration (OSHA). "We found that the VDTs generate less radiation than the average color television set," reported Wordie Parr, a NIOSH radiation specialist.

The most recent study, by the Food and Drug Administration, was released in April 1981. It reported VDT radiation levels in the radio-frequency range to be between 15 and 125 kilohertz (thousands of cycles a second) and concluded, "In this range the body absorbs so little radiation that no public exposure standards have been thought necessary."

But all of those conclusions were challenged in May in testimony before a congressional subcommittee studying the effects of VDT radiation emissions on people and whether there should be a federal study of low-level radiation.

Army Col. Philip E. Winter told the House Science and Technology's Subcommittee on Investigation and Oversight on May 12 that preliminary findings from a Department of Defense study were that long-term exposure to non-thermal (low-level) radiation could have a hazardous effect on the body.

"Apparently Western scientists have always thought the risks were only from thermal (high-level) radiation and simply concluded that the 15-to-125 kiloHertz range was safe," said Ian Marceau, the committee's science consultant. "The FDA tested (VDTs) and finding this range, simply said it didn't violate any known health standards. So no one studied this radiation range until the military did it."

Rep. Albert Gore, D-Tenn., who chairs the subcommittee, said, "I think the significance of Col. Winter's testimony is that for the first time a government scientist has acknowledged that radiation in low levels can cause damage to the body."

While the scientific evidence is inconclusive, there have been several mysterious cases of serious ailments suffered by VDT users.

In 1977, two copy editors, ages 29 and 35, who worked on VDTs at The New York Times, were diagnosed as having developed cataracts. The eye disease, usually found in those 65 or older, causes part of the eye lens to become opaque and can lead to partial or total blindness.

The Newspaper Guild of New York claimed the VDT sets were a health hazard and the issue went to arbitration. After tests, the arbitrators determined that the VDTs did not cause the cataracts. The actual cause has never been discovered. Since then, eight more cases of cataracts among young newspaper VDT users have been reported to the national Newspaper Guild.

Serious health hazards aren't limited to the newspaper business, which uses only 28,000 of the 7 million working VDTs in this country, but lacking a uniform reporting system, there are no accurate figures on how widespread serious health problems are in other occupations.

In Canada, Darlene Weiss, a former Canadian government worker, filed for worker's compensation after claiming she developed cataracts from working on a computer terminal. In May 1981, the Ontario Workmen's Compensation Board ruled against her. She is appealing.

Also in Canada and unexplained is the 1979 case of four women VDT operators in the classified advertising department of The Toronto Star who gave birth to children with birth defects. The Ontario Ministry of Labor's Special Studies Branch tested the newspaper's terminals, but found no evidence of hazardous emissions.

Despite those findings, the Communication Workers of America (CWA) and Canada Bell Co. agreed in April 1981 to allow pregnant women to refuse to work on VDTs. The agreement is not binding in the United States.

These cases only give rise to theoretical explanations.

"I think that the question of radiation has been answered by the government studies and it isn't the problem," said Dr. Leonard Solon of the New York City Department of Health's Division of Radiation. "The real question is whether protracted viewing of a lighted screen is healthy for anyone. And that includes people with eye problems and pregnant women."

But Dr. Milton Zaret, an ophthalmologist and radiation specialist, strongly disagrees. He claims that long-term exposure to even low-level radiation can damage the human body.

"The VDT may have less radiation than a television, but how many people watch television every day for eight hours at a distance of about a foot?" said Dr. Zaret, an associate professor at New York University-Bellevue Medical Center in New York City. He studied radiation for the U.S. Air Force and the Defense Department.

"Radiation is absorbed by the eye. So the question is, what happens when a person is subject to low-level radiation for a long period of time?" he asked. "I have contended for years that it causes cataracts. It may simply take longer for people to develop cataracts and the amount of time can vary for each individual. That would explain why there isn't an epidemic of cataracts from VDTs right now."

Zaret examined Darlene Weiss and the two New York Times copy editors and reported the eye damage had "characteristics of radiant-energy cataracts that were acquired over time." He says the cataracts have a radiation "signature." They develop on the lens — like a blister — instead of inside the lens like most cataracts.

Zaret also complains about most researchers' methods, saying VDTs often malfunction when first hooked up. "No one has tested to see if these malfunctions give the operator a good blast of radiation," he complained.

If radiation proves to be an unfounded fear, then what is causing the numerous health complaints from VDT operators — real or imagined? Health experts say it could stem from something known as "ergonomics" — the effects of a complete change in the working environment on the workers' ability (or inability) to adapt.

"When you bring 21st century equipment into a 1981 office, workers may complain of injuries because of fear of the machines or just the annoyance of having to relearn their jobs," says Anthony LaBua, formerly an environmental design expert with IBM and now a private consultant. "The real hazard comes when the VDTs are not installed properly."

The Fairchild Processing Co. hired LaBua to redesign its Connecticut offices after employee complaints and says most problems have since disappeared.

Several probes are under way concerning health hazards and VDTs. NIOSH is conducting a study at The Baltimore Sun (which had two reports of cataracts) on eye fatigue, headaches and overall health among VDT and non-VDT workers. The CWA has launched a similar study on a group of its workers in Wisconsin.

Largest is a joint study into several health aspects of operating VDTs by the Newspaper Guild of New York and New York's Mount Sinai School of Medicine. That probe will monitor the effects of VDTs on 3,000 workers.

But, meanwhile, the sale of VDTs continues unabated, with some of the country's biggest companies staking their futures on the electronic office. And no one yet knows what happens to the people who work on them.

Ways to reduce electronic strain

New York Daily News

WORKING on a VDT does not automatically mean you will experience headaches, eye problems, sore arms or legs. Many users never suffer any health problems. Scientists theorize each worker may be affected differently.

While the VDT's effects are still being debated, there are ways to reduce the potential for problems. If your office goes electronic, you should:

- Have your eyes examined. Do this before you begin working at the VDT, and then once a year. Whether eye problems are caused by radiation or by simply by the strain of focusing on the screen, ophthalmologist Milton M. Zaret and NIOSH experts say eye examinations can be the most effective way to uncover and prevent sight problems. "The eye is the most fragile and sensitive tissue exposed on the body," says Dr. Zaret.
- Take rest breaks. Although the screen's lighted characters appear steady, they actually flicker. This may be a main cause of eye strain and blurry vision. NIOSH recommends that you take a 15-minute break from the VDT every two hours.
- Screen out office glare. Lighting in the average office should be cut in half, recommends Anthony LaBua, a private design consultant. VDT sets should never be placed near or facing a large window. If they are, NIOSH recommends reducing window light with heavy drapes or blinds. Glare can also be reduced by installing hoods or glare shields on the VDT screen.
- Make sure your set-up is flexible. You should be able to adjust the viewing distance to the screen, height of your keyboard, screen brightness and the chair you use, says NIOSH. "You should be allowed to work with your arms horizontal, knees bent at right angles and feet flat on the floor," says LaBua.

The N.Y. Committee on Occupational Safety and Health, a non-government group, has a pamphlet called "Health Protection for Operators of VDTs" at 32 Union Square, Room 404, New York, N.Y. 10003. The price is $1 for individuals and $3 for corporations.

Working Women, a 10,000-member national association of office workers, has issued a 50-page report, "Warning: Health Hazards for Office Workers." Send $4 plus 80 cents for postage to Working Women, 1224 Huron Road, Cleveland, Ohio 44115.

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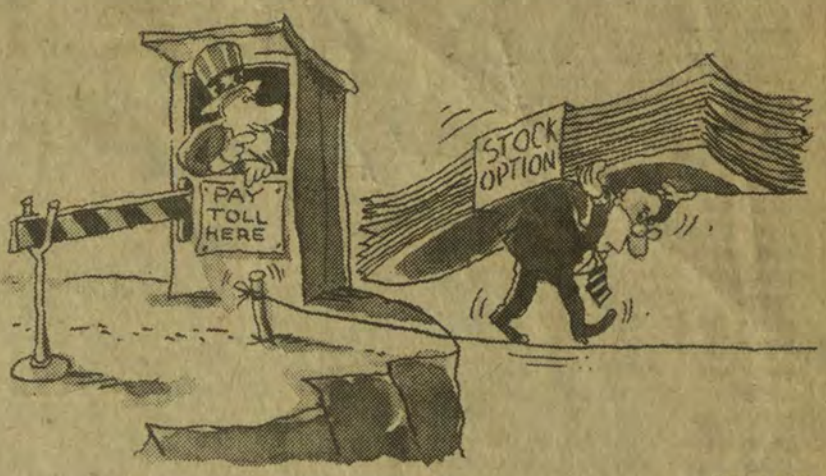
Revival for Stock Options?

The Tax Act of 1976 did options in, but steps are underway to restore their former advantages.

By KENNETH B. NOBLE



Nicolae Asciu

THE stock option, long a favored form of remuneration among the nation's top corporate executives, may be restored to its throne.

The Senate Finance Committee last week voted to repeal an especially onerous provision enacted in the Tax Reform Act of 1976. That law wiped out the special tax advantages that had made "qualified" stock options such a boon to the executive pocketbook.

Until then, provided a stock option plan met certain restrictions, an executive could be awarded a stock option, exercise the option and buy the shares — which could have grown immensely in value — and not pay any tax on that benefit until eventually selling the holding. In addition, when the executive did sell, the gain could qualify for lower capital gains rates.

Under the 1976 Reform Act, which did not affect options previously granted, an executive who exercises an option and buys stock is immediately subject to a tax on any "profit" reaped in acquiring the shares at below-market prices. That tax is levied at ordinary income rates. In short, if an executive buys the company's shares at $25 when they sell publicly at $40, the $15 is considered taxable pay.

If passed by Congress, the return to the more lenient rules could mean considerable savings for executives. The legislative outlook is uncertain, but already several companies have new stock option plans waiting in the wings. These include, according to Peter Chingos of Peat, Marwick, Mitchell & Company, such companies as Mobil Oil, Pennzoil, and Standard Oil of Indiana.

The stock option flowered in the 1950's as a relatively painless way for companies to provide incentives to executives. "A lot of executives became millionaires with these options," said Louis J. Brindisi, senior vice president at Booz, Allen & Hamilton Inc. Particular winners were those who had signed on early with young and growing companies.

The collapse of the market in the 1970's, static corporate growth, rising interest rates, and tighter curbs eventually cooled the stock option euphoria. The body blow came in the 1976 Tax Reform law, which effectively eliminated the favorable tax treatment of options.

"That change was the beginning of the death-knell of options," said Richard Geiger, corporation manager of compensation for Baxter Travenol Laboratories Inc.

"It just isn't fair to tax a person for a benefit that he hasn't realized the cash on," complained Randall Bolten, manager of financial analysis for Tandem Computers, a California-based manufacturer of computer systems.

IN the worst case, according to Randy B. Blaustein, tax manager with the New York accounting firm of Siegel & Mendlowitz, an employee could exercise an option, purchase the stock, pay taxes on it, and then find that while he held the shares, the stock drops.

"He had paid taxes on money he had never received and probably was never going to receive," Mr. Blaustein said. The employee could deduct losses, of course, when the shares were sold, but "the tax loss may not be great enough to have made the transaction economical," Mr. Blaustein said.

Furthermore, when employees exercise options, they typically borrow the money to do so. "With interest rates climbing to extremely high levels, financing severely reduces the profits that could be made on the options," Mr. Geiger said. "Most companies find they have piles of options that have been granted but never exercised."

The Senate committee approved last week the creation of a new category of stock options called "incentive stock options," which offer employees two big advantages over the current law: a potentially lower tax rate and a return to the pre-1976 Act timing.

The bargain spread under an "incentive" option is taxable as a long-term capital gain, at a 28 percent top rate, if the shares are held a year. By contrast, the ordinary income rates that apply under current law run as high as 50 percent. Thus, the savings could be as high as 22 percentage points.

Most important, in contrast to present law, the tax would not be imposed until the shares were sold.

Tax lobbyists say they expect the incentive option to be approved by the full Senate without major changes. In the House, although the Democrats have a majority, a companion bill has been introduced and several of its sponsors are members of key tax writing committees. Chances are President Reagan would sign such a bill.

Repeal has been most aggressively urged by lobbyists for smaller companies that expect to grow rapidly, particularly in high-technology specialities.

"High-growth companies need to attract and retain experienced management, and the most effective and efficient way for these firms to do this is to give their managers a stake in the company's future," said John M. Albertine, president of the American Business Conference, a coalition of medium-sized high-growth companies. "Under the current law they can't do that,"

Mr. Bolten of Tandem Computers, stressed that stock options are no longer considered rewards limited to the uppermost corporate chiefs. "We have given options to every employee in the company," he said.

The growth of Tandem in recent years illustrates why stock options are particularly attractive. Currently 80 percent of Tandem's more than 2,000 employees hold options. In 1979, for example, the company granted to all employees the option to purchase 100 shares at $36 a share. The stock subsequently split, providing employees the right to purchse 200 shares at $18. At today's value of about $90, the option is worth more than $14,000,

Under current tax rules, though, employees who exercise their stock option would have that $14,000 as additional income, regardless of whether they sold their shares. The incentive option rules would not tax that gain until the shares are sold. And if the shares are held for at least a year, lower capital gains rates would apply.

Proponents argue that qualified stock options would actually raise revenue for the Treasury. Indeed, the Congressional Joint Committee on Taxation estimates that restoring qualified stock options would reduce tax revenues "by less than $2.5 million" a year through 1983 and then increase net revenues by $15 million in 1984 and $30 million in 1985 as the capital gains started feeding through.

Mr. Brindisi of Booz, Allen warns however that stock option plans may not be for everyone. "Just switching to a stock option because of the tax legislation will not guarantee executives will gain unless their companies are stragetically managed — companies that have demonstrated high earnings growth rate with high returns at the same time." ■

Taking the time to choose without preconceived notions, a team found the computer system to best serve its needs.

BENCHMARKING FOR THE BEST

by Malcolm A. Gleser, Judith Bayard, and David D. Lang

For four years the U.S. Public Health Service has been developing a medical information system for the nine hospitals and 26 ambulatory care clinics which make up the Bureau of Medical Services; a prototype system has been running on a DEC-10 in a timesharing environment. Written in FORTRAN, with several assembly language subroutines, the system emulates a transaction processing environment on a machine not originally designed for that purpose.

Based on experience with the prototype, we decided to convert our software to a fully supported database management system (DBMS) before branching out to the other hospitals and clinics. During the inevitable major software conversion, we decided to take the time to choose, without preconceived notions, a computer system that would best serve our needs.

We first specified the functional requirements: both those that would determine the amount of equipment needed to support the operational system and those that would determine the difficulty of software development and maintenance.

We based the functional requirements of the operational system on our experiences with the prototype we found we needed:

1. Twenty-four hours a day, seven days a week on-line access to a common database by 72 terminals initially and by over 400 terminals after five years of operation;

2. User interactions via crt terminals employing the formatted screen, block mode transmit approach;

3. Forty different user-initiated transactions executing at the rate of .2 per second during the first year, increasing to over 200 transactions at the rate of 4.5 per second after five years;

4. A DMBS managed database, the largest dataset of which would contain approximately 1 million records after one year, 10 million records after five years, and over 100 million records after seven years;

5. Typical transactions requiring access to three datasets and using 12 disk accesses but involving relatively minor processing; and

6. Rapid response times; the exact requirements varied by transaction type, but overall 90% of all transactions were to be completed in under four seconds.

Our functional needs were:

1. A well-supported DMBS that would allow adding or changing data elements within a dataset without affecting transactions not using the new or altered elements; adding new datasets to the database without affecting transactions that did not use the new datasets; and powerful, easy-to-use ad hoc report generation;

2. Database reorganizations required by scheme alterations that would be handled automatically by the DBMS;

3. Altering or adding a transaction that would not affect any other transaction, and would not cause database inaccessibility;

4. Application software that could be written as though it would be used by only a single user, the system providing the ability for the code to be used by multiple users simultaneously.

CHOOSING THE BEST SYSTEM

We selected the system best suited to our application by making comparisons of total system life cost in dollars. This was done by determining the exact equipment configuration for each competing system which would be needed to support our application over a defined system life, and by assigning a monetary value to desired features of the software development process. To do this, we developed two benchmarks. The first simulated our operational system with estimates of our operational loads at yearly intervals over a five-year system life. The second benchmark determined the software development characteristics of the competing systems.

The operational benchmark was a detailed functional specification of a transaction processing task meant to stimulate our operational load. We wrote no programs, provided no code; those were the tasks of the competing vendors.

The functional spec was the definition of a conceptual database and transactions that would store, retrieve, and update data in the database. Each competing vendor was instructed to use these specs to create a transaction processing system on their computer. We required that the data be maintained on a well-supported DBMS and that the transactions be programmed in a high-level language of the vendor's choosing. We supplied over 1 million data records to load the database, and we provided a scenario of transaction activity, simulating users entering transactions as in the projected operational environment. The vendors were required to use the transaction scenario to choose the necessary hardware configuration. That, in turn, produced the costs.

Eleven datasets were defined as somewhat simplified versions of their operational counterparts. In general, data items were eliminated if they played no role in the access paths to the data records. For example, details of a patient's address might be simplified or eliminated, since no transaction was defined to retrieve patients with certain addresses. On the other hand, a patient's last name and maiden name were included in the dataset, since at least one transaction required the retrieval of all patients with a specified name, either last name or maiden name. Vendors were allowed to organize their databases in any manner they chose. Furthermore, they could choose a hierarchical, network, or relational model to optimize the efficiency of their approach.

Previous experience indicated that our application would be disk-I/O activity of our application, without concern for the simulation of cpu activity. While we wanted the benchmark to be realistic, we wanted to keep its scope reasonable so that vendors could afford to compete in the procurement.

We needed to define a small number of different transactions that would access the database with the same characteristics as the 200 different transactions of the operational system. This was accomplished by studying the prototype system and grouping transactions with similar database access characteris-

The system best suited to the application was selected by making comparisons of total system life cost in dollars.

tics. Groups of two or more transaction would be represented by a single transaction which was assigned the workload, in numbers of invocations per hour, or the whole group. Low-volume transactions were simply eliminated. Eventually we were able to narrow down the benchmark to the definition of 11 datasets and 22 transactions.

DATA ACCESS FEATURES

A data access path determines the circumstances under which the DMBS may efficiently retrieve one or a sequence of records from the database. We wanted a DBMS that would support a variety of efficient paths to data. Therefore, in designing the benchmark special care was given to specify transactions that would operate most efficiently if the DBMS could support access paths to data we felt would be needed to implement our operational system. Systems that provided the most efficient data access methods would be able to complete the benchmark with lower hardware costs than those with less efficient methods. We were particularly concerned that the DBMS be able to full support direct (random) record access and index sequential access.

We defined full support of the direct access feature as a record that could be identified by its record number and retrieved in a single disk access regardless of its location in the dataset. Further, the DBMS had to be able to recognize and support linkage between datasets using the direct access identifier. Support for this feature had to extend to the data maintenance and report generation software.

Index sequential access refers to the ability to access records as if they were physically ordered according to a prespecified key consisting of data items in the records. The DBMS must be able to access any arbitrary record from the dataset in at most a few disk reads, given its key value. We felt that full support of index sequential access should:

1. Provide the ability to define multiple access keys per dataset;

2. Allow an index key to be composed of multiple data elements in the record; ideally the data elements could be located in any positions in the record, i.e., be "noncontiguous," and could be individually and independently defined to be treated as either ascending or descending in sort order;

3. Allow retrieval of the access key itself (if stored separately from the record) without necessitating a read of the data record to which the key applies (this is the functional equivalent of automatically maintaining a subset of data items from a dataset in a different sort order than the parent file, totally under DBMS control); and

4. Allow index sequential access to a subset of records within a dataset.

Each of the 22 benchmark transactions was designed to exercise one or more of the above access properties. Although individual transactions could be done most efficiently on systems providing the desired access paths, the benchmark could run on systems not possessing all features. For example, we tested the "noncontiguous key" feature by specifying two transactions that required access to a given dataset, but accessed records using a different ordering of the same data items within the record (e.g., patient number, date, and drug name).

Systems that required all key items to be stored contiguously either could do one transaction efficiently and the other inefficiently or could store data redundantly in the record so that two contiguous keys could be defined. In both cases, the penalty for not having the feature was measurable in terms of either added storage costs or added hardware costs of accomplishing more disk accesses in a given amount of time.

Each transaction had an associated mandatory response time. The response time requirements were set independently of the transaction's resource requirement. Table I lists the benchmark transaction, the type of transaction (update or retrieval), our estimate of the average number of dataset and disk accesses for each, and the response time requirements. We required that 90% of the executions of a transaction be completed within its specified response time. Some transactions, such as 60 and 61, had relatively high resource requirements yet relatively short response time requirements. Transactions 40 and 45 had no response time requirements. We wanted vendors to run these at very low priorities so as to use system resources only when no other transactions were active. We reasoned that systems best able to adjust and to balance transaction priorities would be able to meet response time requirements using less hardware than systems that were less flexible.

TABLE I

BENCHMARK TRANSACTIONS

TRAN. NO.	TRANSACTION NAME	TRANS TYPE	DATASETS ACCESSED	EXPECTED I/Os	REQ. RESP TIME-SEC
30	Patient reg.	update	3	10	5
31	Alter reg.	"	3	15	5
32	Admission	"	4	10	5
33	Find reg. by no.	retrieval	2	4	3
34	Find by name	"	2	15	5
35	Bed census	"	2	20	5
40	Create schedule	update	2	100	—
41	Free MD appoint.	retrieval	2	6	5
42	Make apoint.	update	3	10	5
43	Find pt. appoint.	retrieval	3	8	5
44	See schedule	"	3	12	5
45	Delete appoint.	update	1	1,000	—
50	Make visit	"	4	8	3
51	Retrieve visits	retrieval	3	10	5
52	Clinical event	update	4	8	5
53	Retrieve problems	retrieval	4	8	5
54	Lab retrieval	"	4	8	5
60	Prescribe	update	4	20	4
61	Med profile	retrieval	4	25	4
62	Med ingreds.	"	2	8	5
63	Med products	"	2	8	5
64	Problem profile	"	4	7	5

DATABASE USAGE PATTERNS

We developed four separate benchmark scenarios to simulate our expected usage patterns one, two, three, and four years after selecting the new computing system. Each scenario simulated the anticipated number of terminal users and their transaction rates during one hour of prime time operation. The year one scenario simulated 72 terminals entering transactions at a rate of .2 transactions per second. Year two, three, and four simulated, respectively, 176, 192, and 400 terminals entering transactions at the rate of 1, 2, and 4.5 transactions per second. Year five was assumed to have identical operational requirements as year four.

To simulate 72 to 400 people using the system simultaneously, the vendors were required to initiate the transaction scenario from an independent computer. Each transaction had an exact start time when it was to be launched from the external computer, an

The functional spec was the definition of a conceptual database and transactions that would store, retrieve, and update data in the database.

response time was determined as the length of time from the specified start time until the result was returned from the benchmark computer. We also required crt terminals to be connected to the benchmark computer for independent response time verification. Each computing vendor was required to run each benchmark scenario within the required response times to determine the configuration of equipment required for each year of the project. This provided a method of determining the five-year system's life costs of the operational system, and was also an excellent functional test of the scalability of the various approaches.

With such a large database to maintain, disk storage is an important contributor to the operational cost of the selected system. Without some form of data compression, the 50 million records expected over the next five years would occupy about 4 billion bytes of storage, not counting the storage necessary for alternate access paths to the data. However, the data contained a high proportion of null fields, blanks, and zeros. We expected that a DBMS that used an effective data compression technique could reduce storage costs by 50% or more over the system's life.

In the benchmark, we estimated the number of data records of each dataset we would accumulate over the next five years. Vendors measured the storage they used for the benchmark data and extrapolated to our expected file sizes. The costs of the disk drives required to store the extrapolated database were included in the operational cost comparison between systems.

The comparison of the system's developmental features was accomplished with a similar functional approach. Based on our estimate of the total cost of program development, we assigned a dollar value to each of the desirable development requirements. We then specified those "development problems" for each competitor to solve. The first involved adding new data items to one of the benchmark datasets and making any resultant modifications necessary to maintain the existing transactions. The second involved programming and installing a new transaction using the existing database. The third problem involved creating four reports from the benchmark database using their report generation software.

All competitors were told in advance the nature of the development problems, but they were not given the specifics until site verification of the benchmark. At this time, they were given the problems one at a time. Each problem was evaluated according to prespecified criteria relating to the ease of solution. In essence, we measured the ability of experts on each system to solve the same development problem and we could then evaluate how we felt each solution would impact our own development cost, if we selected their system.

TABLE II

PROPOSED SYSTEMS

MAKE	MODEL	PROCESSORS	DBMS	TP MONITOR
Burroughs	B-6800	single	DMS-II	GEMCOS
Burroughs	B-7700	dual	DMS-II	GEMCOS
Univac	1180	single	DMS-1100	TIP
Tandem	T-16	fifteen	ENCOMPASS	PATHWAY
IBM	370/168	single	ADABAS	COM-PLETE

TABLE III

YEAR FOUR BENCHMARK RESPONSE TIME SUMMARY

(In seconds)

Number of transactions of the year four benchmark which finished in less than the indicated number of seconds for each vendor. The last column is the number of transactions which took longer than their respective required response times.

EQUIPMENT	1	2	3	4	5 required
Burroughs (B-6800)	2,008 13%	9,499 63%	12,752 85%	14,080 94%	14,643 97%	700 5%
Univac	5,221 35%	10,757 72%	13,214 88%	14,104 94%	14,514 97%	692 5%
Tandem	5,320 35%	12,739 85%	13,996 93%	14,408 96%	14,582 97%	518 3%

CHOOSING THE VENDOR

The objective of our procurement was to obtain the service of a timesharing computer vendor to supply the computing equipment and a large national telecommunications network. While we are not going to discuss here the evaluation of the telecommunications network or the costs due to the management of the computer facility, it is important to understand that the competing vendors on our procurement were large service bureaus, not hardware manufacturers.

The RFP was sent to over 90 potential vendors. As the cost of the requested services was estimated to be more than $5 million over five years, many vendors were interested. However, only five offerors, using four different brands of hardware, submitted acceptable proposals. Two proposed Burroughs computers; the others proposed Univac, Tandem, and IBM computers.

The computer hardware, DBMS, and transaction processing monitor used in each approach are listed in Table II. The number of processors refers to the number of cpus used to run the year four benchmark, except for the IBM entry, which was only successful in running the year three benchmark. In the case of the Burroughts B-7700 system, the two processors used to do the benchmark were substantially in excess of what was required, as the vendor was proposing we share the system with other users. For that reason, it is difficult to compare the B-7700 with configurations that were finely tuned to exactly do the benchmark. Since another Burroughs system was proposed, we will drop the B-7700 from further discussion.

The vendors' response times for all transactions of the year one benchmark are listed in Table III. The IBM entries are omitted because the vendor was unable to meet the required response times on an IBM 370/168 using version three of ADABAS. Under the ground rules of our procurement, the vendor was allowed to compete because it was willing to guarantee a fixed price to do our job regardless of how much hardware it eventually took to do it. Its experience with the benchmark convinced it that using the yet-to-be-released version four of ADABAS and a larger IBM or Amdahl computer, it could successfully complete the benchmark. However, for purposes of this presentation, the IBM 370/168 using version three of ADABAS was unable to complete the benchmark with the required response times. The other three systems met and exceeded the response time requirements for every transaction.

With such a large database to maintain, disk storage was an important contributor to the operational cost of the selected system.

The approximate manufacturer's list prices of the Burroughs, Univac, and Tandem systems, configured to accomplish the year four benchmark, and the IBM system, configured to accomplish the year three benchmark (excluding the costs of disk drives) were as follows:

Burroughs (6800)	$850,000
Univac	$3 million
Tandem	$1.1 million
IBM	$3.3 million

Note that these prices were not taken from the bidder's proposals, as its prices involved many extraneous factors, such as telecommunications, operations, and facility overhead. These are strictly the manufacturers' quoted prices for the hardware components of the four systems and are presented only for rough comparison. Some or all of these prices may be discountable by the manufacturers under a variety of circumstances.

SYSTEM FEATURES COMPARED

The above price comparison is based on the equipment configuration needed to support our heaviest benchmark load. This level of processing would not be required until after four years of operation. For a typical application, using in-house processing, the true costs of the system would be significantly affected by the scalability of the hardware. Systems that allowed the purchaser to start small and add components as the processing load increased would cost less on an actuarial basis over the life of the project. Over the range of processing loads which we tested with our benchmark, the Tandem system was the most scalable.

Tandem systems start with two processors and allow addition of processors up to a total of 16. On Tandem hardware, the year one benchmark ran on a four-processor system. The yearly cost of the system is approximately proportional to the number of processors used, significantly reducing the average yearly cost of the Tandem solution as compared to other equipment.

The Burroughs large computer systems are also scalable, being able to adjust throughout by over a factor of 10. However, the Burroughs B-6800 system used for the year four benchmark is the smallest of Burroughs' large computers and, therefore, was not scalable downwards for the early years of our application.

The Univac and IBM systems are scalable over wide ranges of processing power. For these systems, major upgrades in throughput are accomplished by conversion to a more powerful processor, as opposed to the Tandem approach of adding increments of the same processor. The Univac vendor did not propose using smaller Univac systems early in the project because of its concern about the disruption caused by a major hardware upgrade. The IBM vendor proposed an upgrade from an IBM 370-168 to an Amdahl 470/V7 during the third year of the project, a two to three fold increase in computing power. (However, it was not clearly established that the Amdahl system would actually meet the benchmark requirements.).

TABLE IV
VENDORS' DISK REQUIREMENTS

HARDWARE	DBMS	STORAGE (Mbytes)	NUMBER OF SPINDLES
Burroughs	DMS-II	6,800	39
Burroughs	DMS-II	4,900	28
Univac	DMS-1100	5,000	24
Tandem	ENCOMPASS	5,500	24
IBM	ADABAS	2,400	10

The vendors' disk requirements to store our expected database are shown in Table IV.

ADABAS provided the most effective data comparison of all of the DBMSs compared. Although DMS-II provides a reasonable data compression technique, the two Burroughs vendors derived widely varying database storage estimates, which were not significantly smaller than ENCOMPASS or DMS-1100 which didn't employ data compression. DMS-1100 can employ a user-written compression scheme, but this was not done in the benchmark. ENCOMPASS's data compression technique was not useful for our database application.

HOW A DBMS WORKS

The database management software is important for both the operational and the developmental efficiency of the system. In approaching the system selection we had several biases about the features a DBMS should have and how it should work. However, in attempting an objective functional evaluation, we tried to compare how easily and efficiently systems could do our job, rather than to demand prespecified features. For example, as discussed above, the data compression feature was tested functionally by comparing systems according to the cost of storing our projected database, giving a realistic appraisal of the value of that feature.

The database access path features were tested directly by the benchmark. Systems that possessed all features were at an advantage in performing the benchmark with a minimum amount of equipment. Of the desired access features, Burroughs DMS-II possess all features; Univac DMS-1100 and ADABAS lacked only automatic subset inversion; while Tandem's ENCOMPASS lacked subset inversion, ascending and descending elements in the same key, and the ability to specify noncontiguous data elements as a key.

We evaluated the ease of schema change by asking each vendor to add a new variable to a particular dataset and to modify all transactions so that the benchmark would run correctly. We were interested in whether the DBMS could manage the database conversion without any user-written software, whether transactions not using the dataset would require change or recompilation; whether transactions using the affected dataset were protected from errors due to use of an out-of-date schema; and our overall assessment of the ease and speed of the conversion effort.

ADABAS was the outstanding system for ease of schema change, because adding a field to the end of an ADABAS record doesn't require dumping and reloading the database. Since all ADABAS records are of variable lengths with null data omitted, adding a new field in the schema adds a logically new "null" data item to each record without physically changing the database.

DMS-II and ENCOMPASS tied for second place on the schema change problem. On DMS-1100, the dataset specified to be changed was one which the vendor had defined as hierarchically owned by another dataset. Change to one affected the other, and this affected transactions which did not directly require access to the altered dataset. All of the DBMSs had effective subschema capabilities so programs that did not use a new or altered dataset did not require recompilation.

We tested the desired feature of transaction independence by requiring each vendor to add a new transaction to the benchmark system. We wanted to see if this could be done without affecting other transactions on the system, i.e., if the new transaction could be programmed, tested, and installed without interfering with already existing transactions. Also, we wanted to see if each transaction was programmed as if only one terminal would use it, leaving the multithreading up to the operating system software.

Adding new transactions was easily accomplished on all of the systems. All allowed the programs to be written as if they would be used by only one terminal. The vendors of the IBM and Burroughs systems

Using in-house processing, the true costs of the system would be significantly affected by the scalability of the hardware.

chose to implement the benchmark as one large program containing all transactions. This necessitated recompiling the whole application and stopping all processing every time a transaction was altered or added. This was a less desirable approach from a developmental prospective, but was not dictated by either manufacturer's system architecture.

We evaluated the report generation capability of the DBMSs by requiring each vendor to produce four "unknown" reports from the database during our benchmark evaluation visit. The reports chosen to test the generality and flexibility of the report generation capability were typical of those commonly requested of a medical information system. They exercised features we thought would be important in report generation software, including the ability to access data from several unrelated datasets for a single report, the ability to define working subsets of the database for report generation; a built-in flexible sort capability; flexible formatting capability with powerful edit features; a number of built-in functions such as total, subtotal, mean, range, count, etc.; and the ability to assign parameters so that a report could serve a variety of requirements. We assigned each of these attributes a value between 0 and 5 to derive overall scores for comparing systems.

Tandem's ENFORM was by far the best report-generating software as seen by our technical evaluation team. Burroughs' REPORTER II and Software AG's NATURAL were relatively equal, but did not rate as high as ENFORM. Univac's OLP rated substantially lower than the rest. ENFORM had all of the power, flexibility, and ease of use frequently ascribed to relational database systems. It was the only system evaluated that generated all four of the requested reports exactly as specified, using mostly one-statement programs.

The winner was Martin Marietta Data Systems (MMDS). Although MMDS operates several large IBM, CDC, and Prime computer systems, it chose to bid Tandem equipment on this procurement after an in-house competitive analysis. Computer hardware was only one of many factors that determined the final price evaluation; telecommunications, operations support, and profit margin also contributed heavily.

The functional benchmark is an excellent tool for evaluating the many interacting components that make up a good transaction processing system. There is no mathematical method for determining whether a given computer can do the job. An exhaustive comparison of desired features leaves unanswered the question of what each feature is worth. Availability of a particular feature may be far more important on one system than on another. A functionally specified benchmark can put these features into perspective, establishing an approximate cost of each approach to solving your problem.

Furthermore, no amount of handwaving, charts, or figures can compare to seeing a simulation of your application run successfully, according to specification, to give confidence that a system can do the job.

To get the broadest possible participation in a procurement involving substantial investment by the vendors, it is important to make the competition fair and objective. It cost each vendor over $100,000 to compete in out procurement. Yet they were willing, in fact, enthusiastic about competing in a procurement with a concise and impartial evaluation plan which specified exacly what was required and how every offeror would be evaluated. Each vendor knew that if its solution could do the specified job most cost-effectively, it would win the business. Each was betting on its technical ability and the quality of its systems, rather than its salesmanship. It was clear that many vendors would not have participated if they had thought we would have selected our "favorite" vendor regardless of the outcome of the benchmark.

Although we compared only those transaction processing systems which competed in our selection process, we feel that this list includes the major transaction processing systems for our site application. Our request for proposals was sent to over 90 major service bureau companies. None of these vendors were constrained to a particular hardware or software approach. Each had the option of determining what it though to be the best technical solution to our application.

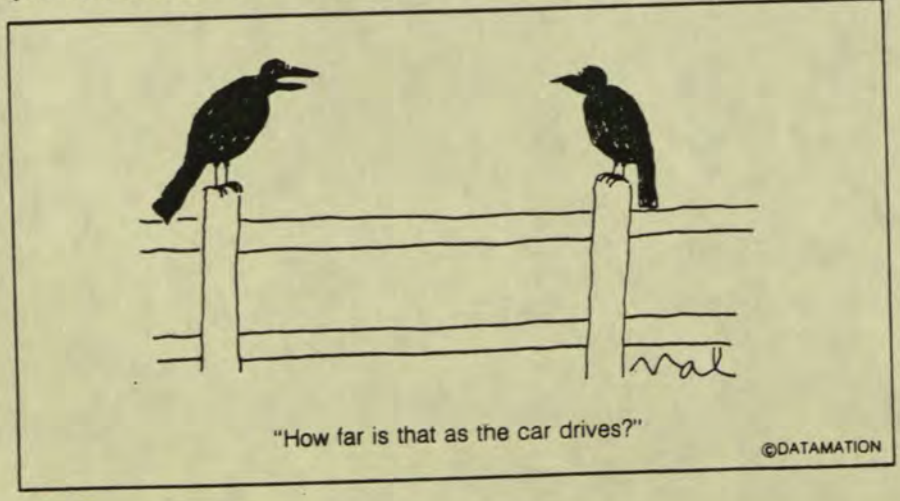
Indeed, the winning vendor proposed a system with which it had no previous experience because its analysis indicated it to be the most cost-effective. With a multimillion dollar contract at stake, it is unlikely dors would have overlooked a major competitive alternative.

Our heaviest benchmark load involved the processing of 15,000 transactions in one hour, necessitating an average of 12 disk accesses per transaction, against a test database consisting of over 1 million records, with the requirement that over 90% of the transactions be completed in less than four seconds. At this load, the Burroughs and Tandem systems were able to do the transaction processing benchmark at less than half the cost of the Univac and IBM systems. ❋

Malcolm A. Gleser is head of the Department of Health Services Research at the U.S. Public Health Service Hospital, Seattle, and the director of the Public Health Automated Medical Information System project (PHAMIS). Dr. Gleser has been involved in the use of computers for medical applications for 20 years.

Judith Bayard is project officer for the PHAMIS project at the U.S Public Health Service Hospital in Seattle. She was the technical liaison to vendors during the recent PHAMIS TSP procurement. Before settling in Seattle to work at the hospital, Ms. Bayard worked as a programmer with IBM, the Banque de Paris et des Pays Bas in Paris, the University of Bordeaux, Cornell Univ., and Texas Instruments.

David. D. Lang is a systems analyst involved in telecommunications and design, and specification of teleprocessing resources for the development and national deployment of PHAMIS. Prior to his work with the hospital in Seattle, Lang worked with the NASA manned Spacecraft Center on the Gemini, Apollo, and Space Shuttle programs, where he helped develop flight dynamics models and specifications, and handled the procurement and programming of real-time computing systems.



"How far is that as the car drives?"

CARTOON BY MALCOLM HANCOCK

COMPUTERWO

THE NEWSWEEKLY FOR THE COMPUTER C

Weekly Newspaper Second-class postage paid at Framingham, Mass., and additional mailing offices 1981

V 6 April 20, 1981

NEWSPAPER

Tandem Adds Nonstop II

By Jeffry Beeler
CW West Coast Bureau

CUPERTINO, Calif. — Tandem Computers, Inc. last week extended its hardware architecture with the introduction of its second major product — a transaction-processing system that reportedly improves the company's network expandability and is compatible with Tandem's existing software and peripherals.

Although not strictly a 32-bit system, the firm's latest offering — designated Nonstop II — incorporates a 32-bit data access architecture that provides users with a virtual addressing space of 1G byte per processor and 16G bytes per system, a company spokesman said.

This extended addressing capability gives the Nonstop II up to 16-fold greater I/O transfer and buffer space,

(Continued on Page 8)

Product Spotlight

Net Processors Filling Key Roles

By Brad Schultz
CW Staff

The communications processor arena is likely to be especially active this year. What IBM does with its communications processor offerings will suggest how far the largest DP supplier is willing to go in allowing its products to communicate cost-effectively with products from other vendors.

The plurality of installed communications processors are IBM 3704s and 3705s, but a number of vendors offer data network users plug-compatible equivalent models, some of which offer capabilities IBM does not.

Makers of 370X-compatible processors have not hesitated to meet growing user demand for the protocols of open systems interconnection, while IBM continues to demur on domestic support for X.25, the most famous of such protocols.

Users did not express much disappointment with 3704s and 3705s in a

Rivals 4341-2, VAX

Tandem Corp Prime Supermini Most I

By Tim Scannell
CW Staff

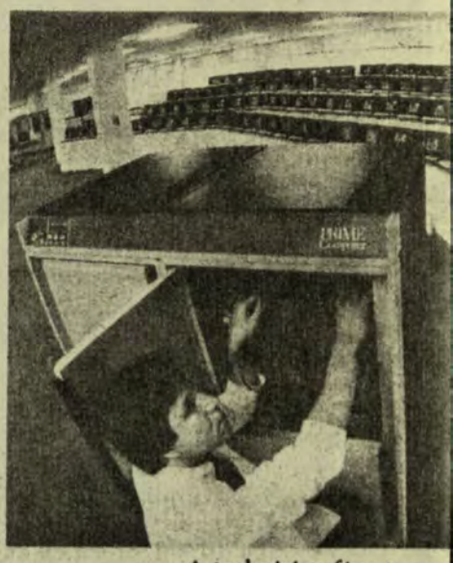
NATICK, Mass. — Prime Computer, Inc. last week furthered its supermini push onto mainframe turf by introducing a 32-bit computer system said to rival the performance of IBM's 4341-2 and to provide from 60% to 90% more processing power than Digital Equipment Corp.'s VAX-11/780.

At the same time, the company phased out two of its mid-range processors and beefed up the processing capabilities of its present systems by as much as 70%.

The Prime 850, the newest member of the 50 series family, is reportedly the first multifunctional virtual memory minicomputer to incorporate a multiple instruction stream processing architecture. It is also reportedly the first computer to use 1M-byte memory boards that are made up of 64K-byte random-access memory chips.

Although the system is competitively aimed at computers in the VAX-11/780 range, its performance is rated by the company to be in the 4341-2 and Decsystem-2060 mainframe class.

The 850 has from 2M- to 8M bytes of main memory and a 512M-byte



A technician fine tunes

virtual address space per user. The system also features a 32M-byte user program address space and can simultaneously support 128 terminals and active user processes, a spokesman said.

Basically, the machine's multistreaming structure allows it to process more user programs per unit of time without impacting machine cycle, increasing disk transfer speeds or adding to the system's instruction set, the spokesman stated. Architec-

ACLU Slams Reagan's Data

By Bill Laberis
CW Staff

WASHINGTON, D.C. — The American Civil Liberties Union (ACLU) has assailed a Reagan administration plan to ferret out welfare fraud by creating a computerized national data bank that would list the identities of some 25 million Americans receiving public assistance.

Charging that the data bank would constitute a "gross violation of existing federal laws designed to protect the privacy rights of all individuals," ACLU Natonal Director John Shattuck said his group will lobby for the system's defeat and will probably initiate court action if the proposal passes an upcoming congressional test.

The proposed National Recipier Information System, unveiled

'Columbia': Glitches and

By Tim Scannell
CW Staff

KENNEDY SPACE CENTER, Fla. — Troubled by a balky on-board computer that scrubbed its initially planned launch, the space shuttle Co-

oved to have twice the perfor-
nce as its predecessor when pitted
a program-for-program show-
wn.
unning "computer-intensive" Co-
l programs, both machines took
out 11 seconds to run a single com-
ter program. However, when a
ond program was added to each
mputer and run simultaneously,
850 clocked in at about 11.5 sec-
ds and the 750 finished in about 22
onds. The gap widened even fur-
r when 10 programs were run on
h system at the same time. The
ltistreaming 850 finished its run
around 56 seconds, while the 750
mbered" across the finish line
rly a minute and 49 seconds later.
rime raced each machine around
computer track to demonstrate
850's ability to perform in such
h-throughput areas as computer-

provements to the 150, 250 and 550 systems. The 150-II and 250-II now have 70% more performance and can handle 32 — or twice as many — terminals as the previous 150 and 250 models, at a cost increase of about 5% to 10% more, the spokesman pointed out.

The 550-II now has four times as much cache memory as its previous systems shadow — 8K- instead of 2K bytes — and twice as much memory. In addition, the system has decimal floating-point arithmetic and character string operations in hardware, rather than microcode, and has 35% greater performance than its predecessor.

this summer and is typically priced at about $525,000 for a system with 4M bytes of memory, a 300M-byte disk drive, a tape drive, 600 line/min printer, networking hardware and software, 20 terminals and necessary software. The 150-II and 250-II cost about $86,000 for systems with 1M-byte of main memory, while a 550-II sells for about $190,000 for a typical system, and the boosted 750 is priced at $320,000.

Deliveries for these enhanced systems are scheduled for the second quarter of 1981, the spokesman said.

Prime is located at Prime Park, Natick, Mass. 01760.

Tandem Adds Nonstop II With Extended Architecture

(Continued from Page 1)

eight times more physical memory and several times more X.25 virtual communications circuitry than Tandem's existing systems line, the Nonstop I.

More specifically, Nonstop II accommodates I/O transfer blocks as long as 64K bytes, physical memory as large as 16M bytes and "several hundred" X.25 virtual circuits, the spokesman said. Nonstop I, by contrast, supports an I/O transfer space of up to 4K bytes, a maximum physical memory of 2M bytes and 40 to 50 virtual circuits per processor.

Because of its increased number of virtual communications circuits, Nonstop II accepts up to 32 I/O controllers and 256 I/O peripherals per CPU pair. The system's I/O channels operate at up to 5M byte/sec.

By extending its hardware architecture and addressability, Tandem is reportedly enabling users to create much larger communications networks and data bases than would otherwise be possible with the firm's existing Nonstop product line. This increased hardware expansion capability will soon prove crucial for many of the company's customers, whose Nonstop I resources are rapidly being exhausted by their steadily growing demand for on-line applications, the spokesman said.

Although it costs 12% to 20% more than a typical Nonstop I configuration, Nonstop II provides an average of 50% better price/performance than the original Tandem system, the source added.

Like the older Nonstop I, Tandem's latest systems line is optimized for on-line, transaction-processing applications requiring uninterrupted CPU availability as well as hundreds of terminals, communications lines and large, geographically distributed data bases.

As for their other common technological traits, both the Nonstop I and II expand from a minimum of two processors to a maximum of 16 and can operate in a communications network consisting of up to 255 nodes and a total of 4,080 CPUs.

In addition, the two systems are hardware-, software- and network-compatible with each other. A current Nonstop I user can upgrade to a Nonstop II without having to rewrite application programs or discard existing peripherals and controllers, the spokesman said.

Built around a 22-bit, 100-nsec processor, the Nonstop II is equipped with an enhanced, 400-nsec memory subsystem. At present, Tandem is limiting its maximum main memory expansion to only 2M bytes. But the company's 32-bit data access architecture can accommodate up to 16M bytes per processor, and as higher density storage chips become cost-effective, users will be able to expand beyond the current 2M-byte limit in 512K-byte increments, the spokesman explained.

Although Tandem will continue to manufacture and support Nonstop I, the company is offering an exchange agreement that gives users a financial incentive to upgrade from their existing hardware to a Nonstop II system. Under the agreement, customers can return their original equipment and, in exchange, receive credits that can be applied toward the purchase of a system upgrade.

A minimum Nonstop II configuration consisting of dual 512K-byte processors, an OSP and a tape system with controllers costs $144,475 and has a 120-day delivery lead time. Tandem can be reached at 19333 Vallco Parkway, Cupertino, Calif. 95014.

LOUTH (right) . . . "There's a price to pay for peace of mind." With him is David Thornley, Tandem UK sales manager.

Tandem rides into life assurance

by Maggie McLening

A PRESTIGIOUS contract with Equity and Law, a leading life assurance company, has been snatched from Honeywell by Tandem Computers. The £1.3m deal is the first major international sale for Tandem in the insurance field. Four processors have been installed so far, at a cost of £400,000, with the remaining four destined for mid-1982.

A 3-4,000 Mbyte database that can hold 620,000 insurance contracts will form the basis of the new interactive system, which will utilise Tandem's NonStop II system, launched in April.

Honeywell was the disappointed competitor, more so because Equity and Law has been running its batch systems on four Level 6s until now.

John Louth, UK managing director of Tandem, attributes his company's success to the flexibility of the system, and to increased user demand for reliability.

He commented, "There is a price to pay for peace of mind, and more and more manufacturers are building in fail-safe devices."

Tandem's NonStop system is fault tolerant. By using mirrored databases and multiple paths it is able to redistribute the workload to functioning processors when components fail, without operator intervention.

Computer Weekly
Oct. 29, 1981

FYI

Electronics firms reminded of the good old days

Ah, the good old days.

That's probably what many Silicon Valley executives were thinking about when their firms were honored at a banquet for being the fastest-growing companies in the Bay Area from 1977-1980.

Business has slowed dramatically for many electronics firms in the past year. But that didn't dull the glow of the past at a ceremony in San Francisco sponsored by the Sales and Marketing Executives' Association.

Of the 35 fastest-growing industrial companies as measured by sales, Silicon Valley electronics firms captured 22 spots.

What's more, high technology companies seized the top four positions.

They are, in order, Apple Computer Inc. of Cupertino (11,358 percent growth), Tandem Computers Inc. of Cupertino (1,317 percent), Triad Systems Corp. of Sunnyvale (677 percent) and Rolm Corp. of Santa Clara (516 percent).

Technical Equities Corp., a San Jose company that owns and manages a diversified group of firms, was the fifth-fastest growing industrial corporation with a 490 percent sales increase.

It was a different story in the rankings of financial corporations, where San Francisco firms dominate the field.

Boothe Financial Corp. topped the list with a 249 percent growth in assets from 1977 to 1980.

While Wells Fargo & Co. ranked 12th in percentage rate of growth, the firm showed the largest gain of California companies. — *Bruce Entin*

ComputerWorld Oct 26, 1981

SPECIALREPORT

Broker Information Terminal System Termed

By George Fulmore
Special to CW

SAN FRANCISCO — In the competitive securities industry, the flow of information over the past decade has accelerated at an alarming rate. And all signs point to a continued acceleration. Brokers are concerned with more issues and the trend is to move further and further away from the emphasis on traditional stocks and bonds to an emphasis on diversified investment services, including tax shelters and various options strategies.

In short, because of the vast amounts of information required at a moment's notice, the securities industry is ripe for a computerized information inquiry system. And in San Francisco, the Sutro Group, a diversified financial services organization with 14 branch offices in California and Nevada and nearly 200 brokers, described its Broker Information Terminal System (Bits) as the securities industry's "system of the future."

Bits Goes On-Line

Designed, developed and now maintained and operated for Sutro by Computer Systems Design, Inc., also a San Francisco-based firm, Bits went on-line in February 1979, giving Sutro managers and brokers direct access — via desktop video display terminals — to a broad range of marketing and customer account information.

At Sutro, Bits is implemented on terminals provided by Quotron System, Inc. The result is that information such as current prices of stocks on the various exchanges, the Dow Jones averages and business news summaries are available from the same terminals that provide Bits information, such as the available purchasing power, current positions (holdings of stocks and bonds) and recent transactions for any customer account.

Other valuable information available from the Bits data base includes listings of a broker's customers who hold positions in specific securities, bulletins from the firm's product line departments or its research department, Standard & Poor's stock reports for any of approximately 3,600 listed securities and even a glossary of securities-related terms.

Broker Productivity Studied

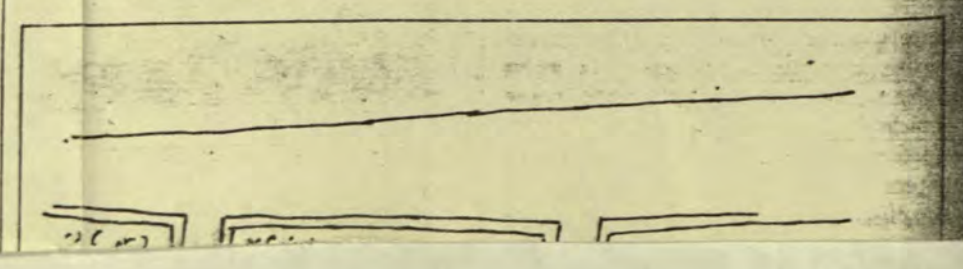
What all these inquiry functions and others add up to is improved customer service plus increased broker productivity, according to Sutro's director of planning, George H. Baldwin, who recalls the impetus to develop Bits.

"In 1977 Sutro asked our accounting firm to do a study of broker productivity," he said. "What they did was basically a time and motion study, and they discovered that the reason brokers were not more productive was that they spent a lot of time walking around, away from their desks, not talking on the phone.

"What they found brokers to be doing was walking around getting information. Based on this study, we concluded that we could achieve a substantial increase in broker productivity by bringing the information that the broker needed to the broker's workstation."

It has been two years since Bits was implemented and Baldwin reports: "We think that the underlying assumptions that we made when we created the system are more valid now than ever. This is an information-intensive business and it is going to become an even more information-intensive business. Right now our product line is so complicated that a broker can't possibly memorize everything that we can offer his client."

Integrating Bits into his daily routine — as a definite factor in his productivity as a securities broker — is



'System of the Future' by Securities Firm

Randy V. Rosso, a Sutro vice-president. Having been at Sutro for nearly 23 years, Rosso has been in the securities industry long enough to remember the days when his job required literally "living on the phone with the margin clerks [in order to get up-to-date customer account information]." Today, however, all the customer account information he needs is as close as his Bits terminal.

Using Bits Functions

A typical day for Rosso today begins with his logging on the Bits system and receiving a list of the "Front Page News," or a list of titles for the 40 bulletins that most recently have been entered to the system's data base by one of Sutro's product-line managers or its research department.

After displaying and reading through any of these that are new to him, he then uses the Rank function to rank the usable buying power and available cash as of that day for his customers. Next, he uses the Customer Information (Cust) function to check that all previous day trades by his customers are listed as completed transactions. "If I don't find something in the customer's record of transactions that should be there, I find out why," he said.

Throughout the day, Rosso makes use of other functions, such as the commission calculator that calculates and displays commissions on a single- or multiple-execution order or the options yield calculator that calculates and displays the approximate yields from proposed options strategies.

But in addition to the various Cust functions, it is Standard and Poor's Automated Research (Spar) function that Rosso finds most valuable, especially when he gets a call from a customer who wants information on an issue about which Rosso knows few details. In such a case, he quickly brings the Spar series of displays for that issue to his screen, scanning through them to collect the information that he needs to advise the customer.

"Prior to the time Bits has been around it was a lot [illegible] to get something like that done and took a lot more 'leg' work," he said.

"Bits saves me a tremendous amount of time and that is what productivity is all about. It also makes a broker look damn smart to a client, because all his account information and just about any information about an issue is literally at his fingertips. A client can ask you just about any question he wants, and 'bing, bing, bing,' you have the answer for him."

Tandem/16 Hardware

Computer Systems Design (CSD) senior technical consultant, Bob Fyles, was involved in the early phases of Bits development, including the installation of the Tandem/16 computer system as the system to develop and support Bits.

The current hardware configuration includes three CPUs, which have 960-, 868- and 480K bytes of memory, respectively. There are six Tandem 200M-byte disk drives and two tape drives and the system supports approximately 400 terminals.

"Among the major factors that we were looking for when we selected the Tandem," Fyles said,"were the reliability of the hardware, the ability to upgrade the system in a modular fashion and the feature of 'fault tolerant' Tandem Nonstop processing. We wanted a system that was online transaction-oriented and was fast.

"Our response time for a Bits inquiry is less than two seconds now on a system that performs thousands of transactions per week plus supports a variety of systems other than Bits. And the Nonstop feature of Tandem is all they say it is. We have had a history of excellent reliability."

But along with all the success of the system, director of planning Baldwin pointed out an irony: "We're so far ahead of everybody else that some of our own people don't know what they're sitting on," he said.

"Where we have achieved the greatest results is with brokers who come from other brokerage firms. They think it is the greatest thing since sliced bread. We know that several million dollars worth of production has come into this firm because of the Bits system.

"The next thing that we want Bits to provide is a highly sophisticated order-entry system that will eliminate all the problems the firm has now with its semiautomated system," Baldwin added.

"That's being developed right now. After that we will be able to provide our biggest customers with terminals in their homes where they can dial up Sutro through an acoustical coupler, get their own margin information and enter their own trades. That will happen within three years."

Fulmore is a technical writer with Computer Systems Design, Inc.

Wall Street Journal NOV. 3, 1981

...rials, transportation and utility ...od indicated:

...nange	%	x-High	x-Low	Shares Sold
4.27	+ 1.67	872.53	855.97	5,659,300
9.60	+ 2.35	854.83	826.96	5,300,800
4.66	— 0.56	842.47	826.58	4,504,600
0.77	— 0.09	847.89	832.29	5,199,400
3.19	+ 0.85	383.10	375.33	1,129,600
5.38	+ 1.45	376.59	366.90	1,256,400
4.38	— 1.17	376.39	368.36	1,089,900
4.25	+ 1.15	379.98	370.42	1,462,600
1.24	+ 1.16	108.72	106.85	1,120,600
2.02	+ 1.93	107.27	104.57	1,236,400
0.03	+ 0.03	105.66	103.79	981,900
0.19	+ 0.48	105.51	103.71	1,033,700
9.50	+ 2.22	347.90	1.25	7,909,500

during the afternoon to finish at 866.82, up 14.27 points. The transportation and utility indicators also continued to rise.

Underscoring the wide advance were the New York Stock Exchange breadth figures. Almost 1,300 stocks advanced, about four times the losers.

"In the past when the Fed cut the discount rate the market usually has done well for a couple of weeks, except for brief periods of profit taking," said Harry W. Laubscher, analyst at Paine Webber, Mitchell Hutchins. "We are advising clients to lock in yields on interest rate-related issues." The rally is technical and based on the decline in some short-term interest rates, asserted Dudley A. Eppel, senior vice president at Donaldson Lufkin & Jenrette. He noted the "fluff" in the takeover issues and also some buying in insurance, interest-sensitive and forest-product stocks.

Abreast of the Market

"The Dow Jones industrial-type stocks and other big name issues were playing catch-up with the broad list" contended Alfred E. Goldman, vice president of A. G. Edwards & Sons Inc., St. Louis. "Enjoy it, but don't take too long a lunch hour. We still see too little cash on the sidelines to call this the start of a new bull market."

Robert Farrell, vice president, market analysis, at Merrill Lynch, Pierce, Fenner & Smith Inc., said: "We still believe the technical picture warrants continued caution." He added: "We have never seen a bottom so widely identified and documented. With so many becoming informed technicians, we suspect that this bottom isn't the final bottom in this down cycle and that fundamental factors, such as earnings and dividend growth, ultimately will be more important than technical factors."

Big Board volume, including turnover of 20,060,000 shares the first hour, expanded to 65,100,000 shares from 59,570,000 Friday and was the highest since 66,403,420 shares were traded last March 24. Trades of 10,000 shares or more, a measure of institutional activity, spurted to 1,108 from 975 the prior session and the third highest ever; the record total was 1,365 last Jan. 7 and the second highest was 1,231 on March 5, 1980.

Mobil Slipped

Marathon Oil, which didn't open until late in the day, soared 22½ to 90 in active trading; on Friday, Mobil began a plan to acquire Marathon by offering $85 a share for 67% of the stock. Mobil slipped ⅛ to 25⅝. Cities Service, a subject of takeover speculation, also was active and climbed 2 to 50¼.

Other gainers in the group included Getty, up 3 to 66¼; Standard Oil (Ohio), 2⅝ to 46; Indiana Standard, 2½ to 53; Standard Oil of California, 1 to 43¾; Sun, 1¾ to 41; Kerr-McGee, 4¼ to 78¾ and Amerada-Hess, 2⅛ to 27.

Host International jumped 3½ to 20¾; it agreed in principle to be acquired by privately held DFS Group Ltd. of Hong Kong. General Steel Industries gained 1¾ to 18; Walco National has bid $19 a share for 750,000 of General Steel's common shares.

General Motors was active and climbed 2 to 38½; it was announced after the close that directors left its quarterly dividend at 60 cents a share. There had been concern that the dividend might be cut.

Upjohn advanced 1¾ to 50¾; the government approved Upjohn's new anti-anxiety drug. Halliburton, which reported higher third quarter net, gained 2⅜ to 59⅜. Foxboro, which also announced a third quarter earnings boost, rose 1⅞ to 50⅜.

Among blue chips, International Business Machines was active and rose 1⅛ to 53. American Brands gained 1¼ to 39; Eastman Kodak, 1⅝ to 67⅛; General Electric, 1⅜ to 55⅝, and United Technologies, 1⅝ to 47.

Sterling Drug advanced 1⅛ to 23¼; a 213,200-share block, handled by Donaldson Lufkin & Jenrette, moved at 23¼.

Connecticut General Corp. jumped 2½ to 57; a 210,000-share block, handled by Merrill Lynch-White Weld, traded at 56.

Amex Index Spurted

The American Stock Exchange index spurted 8.29, its biggest gain in more than a month, to 320.31; winners led about three to one. Turnover rose to 7,350,000 shares, from 4,610,000 Friday.

Houston Oil Trust, the volume leader, ebbed ⅞ to 18¼ on trading of more than 1.6 million shares. Goldman, Sachs & Co. handled a 1,197,200-share block at 18¼.

Pacific Realty soared 5¾ to 35¼; APC Investments is offering to buy 454,000 shares for $37 each. Stepan Chemical rose 1 to 38¾; it boosted its payout and declared a stock dividend. Bic Pen, which reported lower earnings, fell 1⅝ to 10⅛.

In over-the-counter trading, the Nasdaq composite index rose 2.01 to 197.25 on volume of 31,978,400 shares, up from Friday's 27,164,700. Advancing issues outnumbered decliners 1,008 to 285.

Tandem Computers, an active issue, rose 1¼ to 33¾, bid; it reported higher profit. Keuffel & Esser tumbled 5¾ to 23¼, bid; James River has called off merger talks.

and actively traded OTC issues.

TRADING ACTIVITY

Volume of advancing stocks on N.Y.S.E., 51,871,600 shares; volume of declining stocks, 9,248,700. On American S.E., volume of advancing stocks, 4,200,600; volume of declining stocks, 2,612,500. Nasdaq volume of advancing stocks, 14,794,500; volume of declining stocks, 3,360,400.

Mobil's Bid for Marathon Oil Raises Questions Over the Reliability of Asset Values as a Guide

By George Anders

Among the ways to assess oil-industry takeover targets, looking at the companies' asset values per share is turning out to be a convenient, but all-too-often inaccurate guide.

Mobil's effort to take over Mar[illegible]n Oil provides a clear example. Est[illegible] of barrel a day on refineries is all very good," adds Merrill Lynch's Mr. Shimmerlik. "But some of those refineries may never make any money, and companies may even have a hard time getting rid of them."

Most asset-value calculations assume that companies' oil and gas reserves are

Net income .27 .27
9 months:
Revenues 440,305,000 410,251,000
Net income .. 16,145,000 15,017,000
Avg shares .. 15,567,340 15,488,934
Shr earns:
Net income 1.04 .97

FLORIDA CAPITAL CORP. (A)

Quar Sept 30: 1981 1980
aRevenues ... $1,898,000 $2,103,000
Inco cnt op .. 248,000 215,000
Loss dis op 178,000
Net income .. 248,000 37,000
Avg shares .. 477,298 606,444
Shr earns:
Inco cnt op .52 .35
Net income .52 .06
9 months:
aRevenues ... 5,791,000 6,245,000
Inco cnt op .. 716,000 594,000
Loss dis op 178,000
Net income .. 716,000 416,000
Avg shares .. 456,152 618,215
Shr earns:
Inco cnt op 1.57 .96
Net income 1.57 .67
a-From continuing operations.

FOXBORO CO. (N)

Quar Sept 30: 1981 1980
Sales $147,929,000 $130,385,000
Net income .. 7,864,000 7,549,000
Shr earns:
Net income .95 .91
9 months:
Sales 424,884,000 365,714,000
Net income .. 21,239,000 20,311,000
Shr earns:
Net income 2.56 2.45

GENERAL BINDING CORP. (O)

Quar Sept 30: 1981 1980
Sales $37,203,000 $33,908,000
Net income .. a1,405,000 2,002,000
Shr earns:
Net income .28 .40
9 months:
Sales 112,206,000 103,655,000
Net income .. b5,196,000 c6,003,000
Shr earns:
Net income 1.04 1.20
a-Includes a $250,000 loss from phase out of floor-model folder business. b-Includes $250,000 loss from phase out, offset by a $198,000 gain on sale of land. c-Includes gain of $950,000 from sale of Pho-Tronics unit and a $750,000 loss for losses anticipated in disposition of certain foreign assets.

GENERAL HOUSEWARES CORP. (A)

Quar Sept 30: 1981 1980
Sales $22,432,000 $18,272,000
Net income .. 1,389,000 1,118,000
Shr earns:
Net income .64 .52
Shr earns (fully diluted):
Net income .59 .48
9 months:
Sales 55,553,000 46,369,000
Net income .. 2,714,000 2,045,000
Shr earns:
Net income 1.25 .95
Shr earns (fully diluted):
Net income 1.15 .88

GF BUSINESS EQUIP (N)

Quar Sept 30: 1981 1980
Sales $41,817,000 $38,642,000
Net income .. 92,000 463,000
Shr earns:
Net income .03 .18
9 months:
Sales 128,886,000 129,014,000
Net income .. 261,000 1,055,000
Shr earns:
Net income .09 .41

GOLDEN NUGGET INC. (N)

Quar Sept 30: 1981 a1980
Revenues $80,352,000 $13,314,000
Net income .. 11,479,000 d561,000
Shr earns:
Net income 1.38 ....
9 months:
Revenues 209,097,000 41,202,000
Net income .. 25,998,000 1,306,000
Avg shares .. 8,390,028 6,708,312
Shr earns:
Net income 3.14 .19
a-Restated to reflect acquisition of Leisure Time Tours Inc. in December 1980 on a pooling-of-interests basis. d-Loss.

GOV'T EMPLOYEES LIFE (O)

Quar Sept 30: 1981 1980
Income $2,105,833 $2,134,539
Cap loss 49,115 4,855
Net income .. 2,056,718 2,129,684
Shr earns:
Income ..... .47 .48
Net income .46 .48
9 months:
Income 6,054,799 6,183,049
Cap loss 44,067 c16,585
Net income 6,010,732 6,199,634
Shr earns

Net income 14,982,000 16,342,000
Avg shares .. 9,644,000 8,834,000
Shr earns:
Net income 1.66 1.85

JEFFERSON NATIONAL LIFE (O)

Quar Sept 30: 1981 a1980
Inco cnt op .. $1,105,000 $918,000
Loss dis op .. 83,000 490,000
Income 1,022,000 428,000
Cap gain 100,000 28,000
Net income .. 1,122,000 456,000
Shr earns:
Inco cnt op .84 .70
Income ..... .78 .32
Net income .85 .35
9 months:
Inco cnt op .. 3,494,000 3,714,000
Loss dis op .. 712,000 852,000
Income 2,782,000 2,862,000
Cap gain 55,000 298,000
Net income .. 2,837,000 3,160,000
Shr earns:
Inco cnt op 2.65 2.83
Income 2.11 2.18
Net income 2.15 2.41
a-Restated to reflect discontinued operations.

JEFFERSON-PILOT CORP. (N)

Quar Sept 30: 1981 1980
Income $24,665,000 $22,497,000
Cap loss 389,000 a1,507,000
Net income .. 24,276,000 24,004,000
Shr earns:
Income 1.15 1.03
Net income 1.12 1.10
9 months:
Income 74,216,000 67,434,000
Cap gain 4,005,000 2,636,000
Net income .. 78,221,000 70,070,000
Shr earns:
Income 3.41 3.08
Net income 3.59 3.20
a-Gains.

JOHNSON CONTROLS INC. (N)

Year Sept 30: a1981 1980
Sales $1,128,386,000 $964,854,000
Inc cnt op 48,132,000 34,021,000
Loss dis op 328,000
Net inco 48,132,000 33,693,000
Avg shrs 14,044,181 13,995,548
Shr earns:
Inco cnt op 3.43 2.43
Net inco 3.43 2.41
Quarter:
Sales 325,561,000 270,494,000
Net inco 15,163,000 11,157,000
Shr earns:
Net inco 1.08 .80
a-Reflects an accounting change for modification in valuing domestic battery inventories.

KEMPER CORP. (O)

Quar Sept 30: 1981 1980
Income $22,901,000 $19,170,000
Cap gain 2,330,000 d2,405,000
Net income .. 25,231,000 16,765,000
Avg shares .. 13,181,000 12,727,000
Shr earns (primary):
Income 1.74 1.51
Net income 1.91 1.31
9 months:
Income 62,194,000 62,142,000
Cap gain 11,820,000 5,167,000
Net income .. 74,014,000 67,309,000
Avg shares .. 13,077,000 12,574,000
Shr earns (primary):
Income 4.75 4.94
Net income 5.65 5.35
d-Loss.

KROY INDUSTRIES (O)

Quar Sept 30: 1981 1980
Sales $12,633,885 $8,743,330
Net income .. 2,064,104 1,479,223
Shr earns:
Net income .34 a.25
6 months:
Sales 23,883,696 17,706,689
Net income .. 3,335,319 2,944,854
Shr earns:
Net income .55 a.49
a-Adjusted for a two-for-one stock dividend in August 1981.

LANCASTER COLONY CORP. (O)

Quar Sept. 30: 1981 a1980
Sales $87,168,000 $74,956,000
Net income .. 3,587,000 2,181,000
Avg shares .. 5,088,506 4,927,510
Shr earns:
Net income .70 .44
a-Restated to reflect an acquisition on a pooling-of-interests basis.

LIONEL CORP. (N)

Quar Sept 30: 1981 a1980
bRevenues ... $61,253,285 $46,177,380
Loss cnt op .. 3,642,824 1,524,121
Loss dis op .. 225,845 56,645
Net loss 3,868,669 1,580,766
9 months:
bRevenues ... 166,920,716 129,195,992
Loss cnt op .. 11,574,876 4,452,583
Loss dis op .. 379,078 c16,472
Net loss 11,953,954 4,436,111
Avg shares .. 7,061,254 e5,981,816
a-Restated to reflect discontinued operations. b-From continuing operations. c-Income. e-Adjusted to reflect a 5% stock dividend paid in June 1981.

LUMEX INC. (A)

Quar Sept 30: 1981 1980
Sales $7,645,000 $6,222,000
Net income .. 415,000 387,000
Avg shares .. 1,827,122 1,279,124

Shr earns:
Net inco 2.82 2.20
a-Restated.

PACO PHARMACEUTICAL (O)

Year Aug 29: 1981 1980
Sales $27,540,276 $24,044,075
Net income .. 1,904,968 1,111,924
Shr earns:
Net income 1.25 .74

PEOPLES ENERGY CO. (O)

Year Sept 30: 1981 1980
Revs $3,403,234,000 $3,016,237,000
Net inco a156,957,000 137,564,000
Avg shrs 29,043,148 27,472,165
Shr earns:
Net inco 5.40 5.01
Quarter:
Revs 639,389,000 516,399,000
Net inco a3,305,000 5,948,000
Shr earns:
Net inco .10 .15
a-Reflects provision for reorganization and related costs which reduced net by $4,500,000.

PLACER DEVELOPMENT LTD. (A)

9 mo Sept 30: 1981 1980
Income $31,100,000 $66,400,000
Extrd cred 8,100,000
Net income .. 31,100,000 74,500,000
Shr earns:
Income ..... .87 1.87
Net income .87 2.10
Amounts in Canadian dollars.

PLANNING RESEARCH CORP. (N)

Quar Sept 30: 1981 1980
Revenues $79,087,000 $75,851,000
Net income .. 1,862,000 1,468,000
Shr earns (com & com equiv):
Net income .27 .22

Shr earns (primary):
Net income .51 .34
Shr earns (fully diluted):
Net income .50 .34
39 weeks:
Sales 148,284,000 157,913,000
Net income .. 2,960,000 2,819,000
Shr earns (primary):
Net income 1.33 1.27
Shr earns (fully diluted):
Net income 1.31 1.26

SWANK INC. (N)

Quar Sept 30: 1981 1980
Sales $37,068,000 $38,887,000
Net income .. 2,336,000 2,703,000
Avg shares .. 3,377,448 a3,359,266
Shr earns:
Net income .69 a.80
9 months:
Sales 83,421,000 86,191,000
Net income .. 2,524,000 4,400,000
Shr earns:
Net income .75 a1.31
a-Adjusted for a 10% stock dividend in January 1981.

TANDEM COMPUTERS INC. (O)

Year Sept 30: 1981 1980
Revenues $208,397,000 $108,989,000
Net income .. 26,549,000 10,687,000
Avg shares .. 37,025,246 a30,241,116
Shr earns:
Net income .72 a.35
Quarter:
Revenues 64,506,000 34,092,000
Net income .. 8,219,000 3,339,000
Avg shares .. 39,137,562 a31,848,378
Shr earns:
Net income .21 a.10
a-Adjusted for a three-for-one stock split pain in June 1981.

Shr earns (fully diluted):
Income 2.25 a2.27
Net income 2.51 a2.49
a-Adjusted to reflect a 50% stock dividend paid in April 1981.

WISCONSIN POWER & LIGHT (N)

Quar Sept 30: 1981 1980
Revenues $167,666,000 $93,791,000
Net income .. 12,185,000 9,517,000
Shr earns:
Net income .94 .72
12 months:
Revenues 439,406,000 392,608,000
Net income .. 39,908,000 34,503,000
Shr earns:
Net income 3.00 2.60

WTC INC. (A)

Quar Sept 30: 1981 a1980
Revenues $31,516,000 $29,127,000
Loss cnt op .. 152,000 228,000
Loss dis op 373,000
Net loss 152,000 601,000
9 months:
Revenues 91,751,000 83,573,000
Loss cnt op .. 1,104,000 c368,000
Loss dis op 2,259,000
Net loss 1,104,000 1,891,000
Shares 2,327,608 2,107,915
Shr earns:
Loss cnt op c.17
a-Restated. c-Income.

ZONDERVAN CORP. (O)

Quar Sept 30: 1981 1980
Sales $16,960,357 $14,381,269
Net income .. 495,523 404,114
Shr earns:
Net income .28 .24
9 months:
Sales 47,667,350 35,853,517
Net income .. 1,171,608 1,004,289
Shr earns:
Net income .68 .60

Flow General Expects Sizable Earnings Rise In Year Ending June 30

By a WALL STREET JOURNAL *Staff Reporter*

McLEAN, Va. — Flow General Inc.'s rapid sales and earnings growth don't show signs of abating and will lead to significantly higher earnings for the fiscal year ending June 30, said Joseph E. Hall, president and chief executive officer.

In fiscal 1981 sales climbed 45% to $112 million and profit rose 111% to $8 million, or $1.07 a share. And Flow General's earnings should climb a further 61% in fiscal 1982, according to Alex. Brown & Sons analyst Robert Benezra. Mr. Hall doesn't quarrel with that forecast, which calls for $12.9 million, or $1.50 a share, in profit, on sales of $150 million. The per-share gains are lower because of increased shares outstanding from recent stock offerings and a three-for-two stock split.

For its fiscal 1982 first quarter, ended Sept. 30, Flow General posted earnings of $2.5 million, or 30 cents a share, and 80% rise from the year-earlier $1.4 million, though only a 36% rise per share, from 22 cents. Sales rose 34% to $30.25 million from $22.7 million.

Wall Street has lately been unimpressed with Flow General's seemingly impressive record, however. Its stock has been trading at only about half its springtime high of $45.375.

The first quarter figures were greeted with skepticism, the company says, because much of the earnings gain was due to interest income. Flow General had pretax interest income of $821,000 for the period, compared with interest expense of $166,000 a year earlier, according to chief financial officer Rodney W. Cook. Without that swing, earnings gains would have been much more modest.

"Growth in operating income isn't what we would have liked," Mr. Hall said in an interview, adding, "But there's been no deterioration in the basic business."

Flow General's biomedical division is the growing part but is finding its possible targets "very pricey," according to Mr. Hall.

Flow General's considerable European exposure had much to do with its lackluster operating results. About one-third of its sales come from there, and currency exchange losses, together with a sagging economy, hurt. Mr. Hall says currency translations cost the company as much as $2 million in first quarter sales.

Europe is particularly important to Flow General's biomedical division, the segment that has been the driving force behind the company's growth.

From fiscal 1979 to 1981 the division's sales nearly tripled to $57.4 million and it accounts for two-thirds of corporate profit. About two-thirds of its sales are in Europe and the economy, as well as the exchange rate, is a current problem.

Alex. Brown's Mr. Benezra still sees a near-50% sales growth in fiscal 1982, to $85 million. Much of that is being fueled by laboratory instruments, most notably a fiber-optics unit that rapidly measures chemical contents of as many as 96 substances at once. It is being increasingly used by clinical and research laboratories to test blood and other body fluids.

By contrast, the product that has drawn the most attention to the company, interferon, plays a much less important role, at least for the present. Interferon, an antiviral protein that may be an anticancer agent, accounted for less than $3 million in sales last year. Most of that came from a National Cancer Institute contract.

Stockholder Meeting Briefs

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CARPENTER TECHNOLOGY CORP. said it expects 1982 sales and earnings to improve. In fiscal 1981, ended June 30, net income was $44.7 million, or $5.20 a share, on sales of $570.7 million. Paul R. Roedel, president and chief executive officer, said Carpenter is undertaking a $400 million program to expand production capability 50%

TANDEM NEWS

TANDEM COMPUTERS INCORPORATED • 19333 VALLCO PARKWAY • CUPERTINO, CA 95014 • (408) 725-6000

Release Date: December 7, 1981

Contact: Pat Becker
(408) 725-6000

TANDEM COMPUTERS PLANS NEW CALIFORNIA R & D FACILITY

CUPERTINO, CA -- Tandem Computers Incorporated (OTC) today announced it has completed arrangements for the construction of a 140,000 square foot building in Cupertino, CA.

The facility, scheduled for occupancy in December 1982, will house 400 employees involved in product development, new product marketing and manufacturing operations for the Cupertino, California-based manufacturer of NonStop(tm) computer systems.

The structure brings the total building space in Santa Clara County, CA, occupied by Tandem to over 1,240,000 square feet, representing 16 locations. The facility will be leased form Grosvenor California Ltd.

Tandem recently announced its sixth consecutive year of record operating results with revenues of $208,397,000, up 91% from fiscal 1980.

-- MORE --

Architects for the new building are V.C. Wong and Associates, Santa Clara, CA. Construction managers are Rudolph & Sletten, Inc., Mountain View, CA.

Tandem Computers Incorporated designs, develops and manufactures multiple processor computer systems that minimize the risk of system failure or data loss. It is the originator of NonStop systems, the first commercially available computer systems designed to continue to operate despite module failures. In addition to its domestic sales, service and manufacturing facilities, Tandem maintains a network of subsidiaries and distributors located in many major commercial centers throughout the world.

# # #

Peninsula Times Tribune Dec. 10, 1981

Times Tribune photo

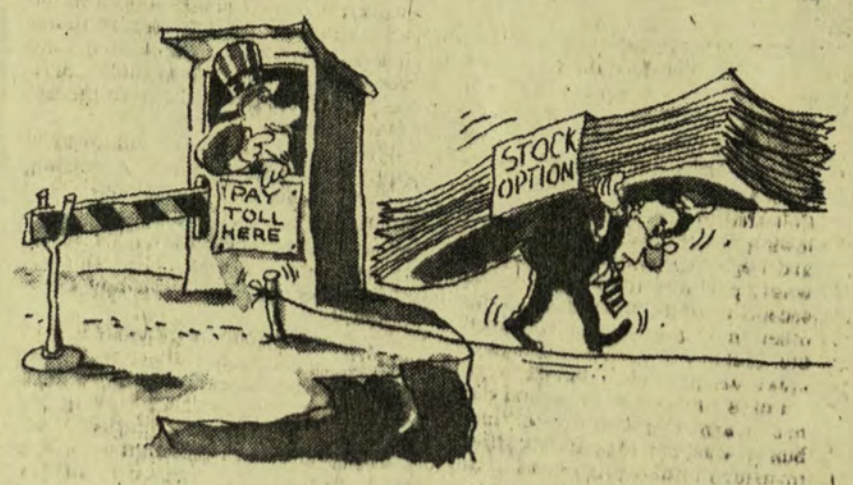
300 trees for charity
Nancy O'Conner accepts a gift from Tandem Computers employee Slim Owen on behalf of Santa Clara County Activities. The Cupertino firm supplied more than one-third of 300 trees given to 45 county charities.

E NEW YORK TIMES, SUNDAY, JUNE 28, 1981

Revival for Stock Options?

The Tax Act of 1976 did options in, but steps are underway to restore their former advantages.

By KENNETH B. NOBLE



Nicolas Aceto

THE stock option, long a favored form of remuneration among the nation's top corporate executives, may be restored to its throne.

The Senate Finance Committee last week voted to repeal an especially onerous provision enacted in the Tax Reform Act of 1976. That law wiped out the special tax advantages that had made "qualified" stock options such a boon to the executive pocketbook.

Until then, provided a stock option plan met certain restrictions, an executive could be awarded a stock option, exercise the option and buy the shares — which could have grown immensely in value — and not pay any tax that benefit until eventually selling the holding. In addition, when the executive did sell, the gain could qualify for lower capital gains rates.

Under the 1976 Reform Act, which did not affect options previously granted, an executive who exercises an option and buys stock is immediately subject to a tax on any "profit" reaped in acquiring the shares at below-market prices. That tax is levied at ordinary income rates. In short, if an executive buys the company's shares at $25 when they sell publicly at $40, the $15 is considered taxable pay.

If passed by Congress, the return to the more lenient rules could mean considerable savings for executives. The legislative outlook is uncertain, but already several companies have new stock option plans waiting in the wings. These include, according to Peter Chingos of Peat, Marwick, Mitchell & Company, such companies as Mobil Oil, Pennzoil, and Standard Oil of Indiana.

The stock option flowered in the 1950's as a relatively painless way for companies to provide incentives to executives. "A lot of executives became millionaires with these options," said Louis J. Brindisi, senior vice president at Booz, Allen & Hamilton Inc. Particular winners were those who had signed on early with young and growing companies.

The collapse of the market in the 1970's, static corporate growth, rising interest rates, and tighter curbs eventually cooled the stock option euphoria. The body blow came in the 1976 Tax Reform law, which effectively eliminated the favorable tax treatment of options.

"That change was the beginning of the death-knell of options," said Richard Geiger, corporation manager of compensation for Baxter Travenol Laboratories Inc.

"It just isn't fair to tax a person for a benefit that he hasn't realized the cash on," complained Randall Bolten, manager of financial analysis for Tandem Computers, a California-based manufacturer of computer systems.

IN the worst case, according to Randy B. Blaustein, tax manager with the New York accounting firm of Siegel & Mendlowitz, an employee could exercise an option, purchase the stock, pay taxes on it, and then find that while he held the shares, the stock drops.

"He had paid taxes on money he had never received and probably was never going to receive," Mr. Blaustein said. The employee could deduct losses, of course, when the shares were sold, but "the tax loss may not be great enough to have made the transaction economical," Mr. Blaustein said.

Furthermore, when employees exercise options, they typically borrow the money to do so. "With interest rates climbing to extremely high levels, financing severely reduces the profits that could be made on the options," Mr. Geiger said. "Most companies find they have piles of options that have been granted but never exercised."

The Senate committee approved last week the creation of a new category of stock options called "incentive stock options," which offer employees two big advantages over the current law: a potentially lower tax rate and a return to the pre-1976 Act timing.

The bargain spread under an "incentive" option is taxable as a long-term capital gain, at a 28 percent top rate, if the shares are held a year. By contrast, the ordinary income rates that apply under current law run as high as 50 percent. Thus, the savings could be as high as 22 percentage points.

Most important, in contrast to present law, the tax would not be imposed until the shares were sold.

Tax lobbyists say they expect the incentive option to be approved by the full Senate without major changes. In the House, although the Democrats have a majority, a companion bill has been introduced and several of its sponsors are members of key tax writing committees. Chances are, President Reagan would sign such a bill.

Repeal has been most aggressively urged by lobbyists for smaller companies that expect to grow rapidly, particularly in high-technology specialities.

"High-growth companies need to attract and retain experienced management, and the most effective and efficient way for these firms to do this is to give their managers a stake in the company's future," said John M. Albertine, president of the American Business Conference, a coalition of medium-sized high-growth companies. "Under the current law they can't do that."

Mr. Bolten of Tandem Computers, stressed that stock options are no longer considered rewards limited to the uppermost corporate chiefs. "We have given options to every employee in the company," he said.

The growth of Tandem in recent years illustrates why stock options are particularly attractive. Currently 80 percent of Tandem's more than 2,000 employees hold options. In 1979, for example, the company granted to all employees the option to purchase 100 shares at $36 a share. The stock subsequently split, providing employees the right to purchse 200 shares at $18. At today's value of about $90, the option is worth more than $14,000.

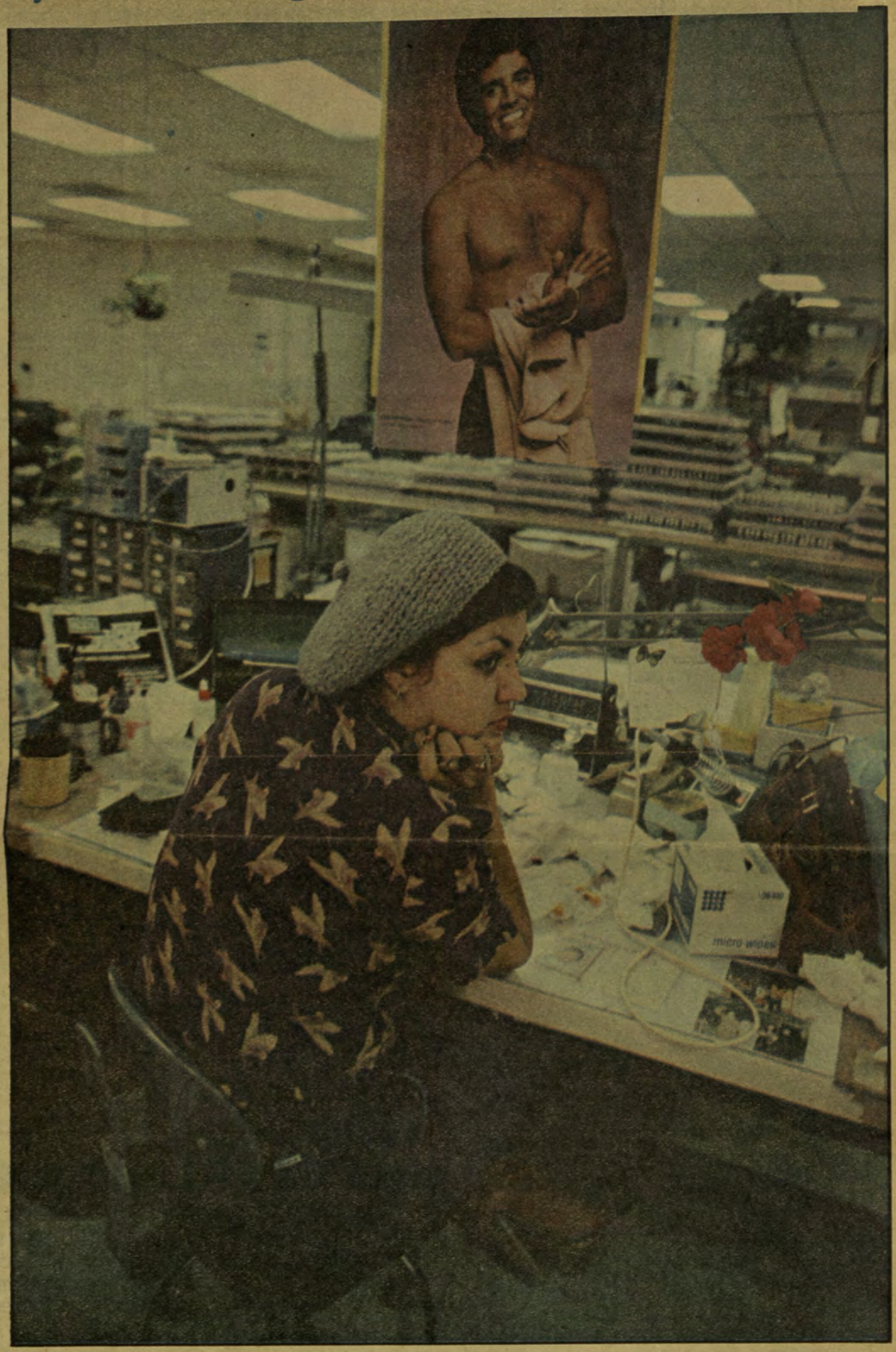
Under current tax rules, though, employees who exercise their stock option would have that $14,000 as additional income, regardless of whether they sold their shares. The incentive option rules would not tax that gain until the shares are sold. And if the shares are held for at least a year, lower capital gains rates would apply.

Proponents argue that qualified stock options would actually raise revenue for the Treasury. Indeed, the Congressional Joint Committee on Taxation estimates that restoring qualified stock options would reduce tax revenues "by less than $2.5 million" a year through 1983 and then increase net revenues by $15 million in 1984 and $30 million in 1985 as the capital gains started feeding through.

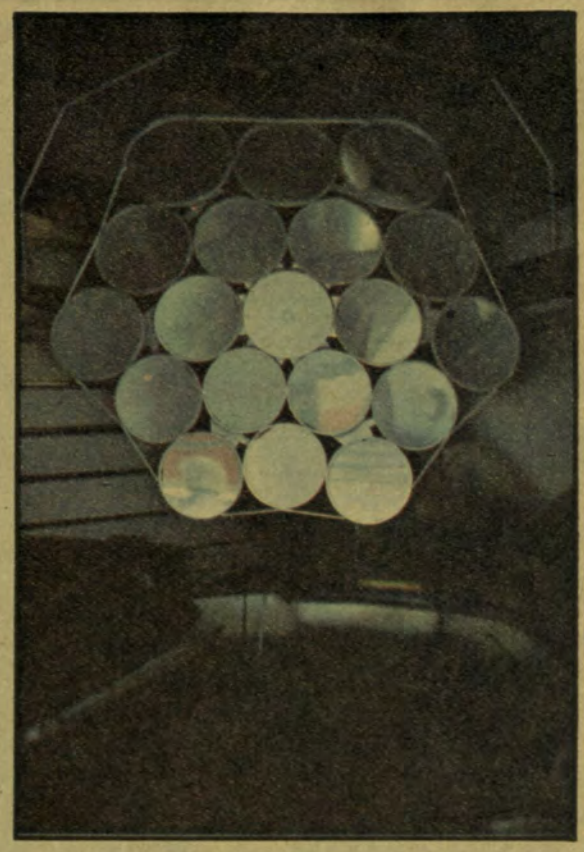
Mr. Brindisi of Booz, Allen warns however that stock option plans may not be for everyone. "Just switching to a stock option because of the tax legislation will not guarantee executives will gain unless their companies are stragetically managed — companies that have demonstrated high earnings growth rate with high returns at the same time." ■

INSIDE SILICON VALLEY: A SPECIAL REPORT

These silicon wafers are at the heart of a billion-dollar industry that has changed Santa Clara Valley forever



WHEN MOST OF US THINK of assembly-line work, we conjure up images of grime, deafening noise and exhausting manual labor. But in Silicon Valley, many workers have a clean environment in which to assemble computer chips. Employees at some companies add a personal touch to their work areas by hanging posters and baby pictures. At Tandem Computers, one assembly-line worker has a macho Erik Estrada poster for a workmate. Other industry workers toil in environments that require safety precautions. Wearing protective goggles, a plastic cap and a worksuit, one lab worker sees yellow all day in the photo-engraving room at Precision Monolithics. At Memorex Corp., one researcher takes three-dimensional pictures in the holography lab. The purple V-shaped steel form, with colorful connecting tubes, looks more like an art exhibit than an assembly-line work station at Hewlett-Packard



THE WORLD HEADQUARTERS FOR ELECTRONICS AND CHIP manufacturing, Silicon Valley stretches 25 miles from Menlo Park to Los Gatos, touching 10 cities. Beginning with raw silicon--Earth's second-most-common natural element, after oxygen--the local electronics industry makes computer chips for products used around the world

FUN-AND-GAMES IS AN ESSENTIAL PART OF *the Silicon Valley scene, where many electronics firms provide their employees with leisure-time amenities like athletic facilities and weekly parties. Every Friday evening, Tandem Computers sponsors a beer bust, where attire is apparently informal. At Atari, employees have carte-blanche privileges to the computer game room. A whirlpool spa is part of the $1-million athletic facility at Rolm Corp. of Sunnyvale, where employees can play almost any sport, from racquetball to horseshoes. The Decathlon Club in Santa Clara is a sports-dining-drinking resort where industry chatter can be heard the loudest*

 continued from page 8

A Lockheed technician has a "talking" computer for a co-worker. The young woman inspects silicon chips that are used in missile-guidance systems, and audibly talks to the computer via a headset. If she inputs erroneous information, the computer admonishes her on a display terminal. In a very real sense, the computer checks on the checker

on the city's east side. During the day, when slivers of silicon were etched with a landscape of intelligence and stuffed into computers, calculators, disc memories and video games, Sunnyvale was a capital city of the technological world. At night, the pattern reversed itself, and with the setting sun, the tidal surge of humanity poured out of the manicured industrial parks.

This cycle of ebb and flood had not been lost on the members of the Sunnyvale Historical Society. Though most of these greying children of the city's agrarian past had never even seen the inside of an electronics plant, the effects of the technological revolution had not passed them by. They had seen the orchards bulldozed, watched as the value of their homes skyrocketed, been trapped in overheated rush-hour grid locks, and were present when Sunnyvale's quaint old downtown was razed for a climatically controlled shopping mall.

The Historical Society members watched as the Porsches and Mercedes and other totems of the *nouveau riche* flashed past their city on nearby freeways; they observed the construction of million-dollar mansions. What they witnessed gave the members hope. What better time, they reasoned, could there be for a new museum, a million-dollar edifice commensurate with the city's new wealth and importance?

So the society, with the city council's blessing, mounted a campaign to build a museum in the likeness of the house of Sunnyvale's pioneering landowner, Martin Murphy Jr. In keeping with Silicon Valley style, the society hired a fund-raising consulting firm to poll both the average citizens and the city's powerbrokers for their thoughts on the project.

The results of the survey were shocking, but, when pondered, not altogether unexpected: It seemed that most of the people of Sunnyvale did not give a damn that Martin Murphy and his family were among the first American settlers to cross the Sierra, or that they were among the rescuers of the Donner Party, or that, before it was covered with Silicon Valley veneer, Santa Clara County boasted some of the richest farmland in the world.

Being among the city's oldest established citizens, the Historical Society members thought they understood the needs of their community. But the survey told them that they had carefully preserved a past about which few of their neighbors cared. For the vast majority of Sunnyvale's population, history was that misty, ill-defined transistor era before the invention of the semiconductor. To them, the great historical question was not why Martin Murphy left Missouri in 1847 for California, but why Dr. Robert Noyce left Fairchild in 1968 to found Intel.

For them, the city had no past. It was a boom town, with only a provisional present of endless work weeks, obsessed play, strained marriages and crushing mortgage payments which, they hoped, would inevitably lead to the Big Strike; to that golden future of realized stock options, 450 SELs, a gold card at the Decathlon Club and the tennis-courted mansion in the Monte Sereno hills.

Seen from the perspective of, say, a Gary, Ind., or a Dayton, Ohio, Silicon Valley must be an amazing sight: A latter-day Elysium in which the perfection of the climate and topography is matched by a similar order and perfection in its people's lives; where a population of tanned, healthy young people is inventing the future and getting rich in the process.

As the snow falls and the unemployment rate climbs in Northern and Midwestern cities, the Valley must take on the outlines of a dream, a sanctuary from the vagaries of economy and meteorology, age and infirmity. Compared to the aging brickyards of New England industry, everything is as shiny as a new penny in Silicon Valley; instead of factory shutdowns and worker layoffs, Silicon Valley can't find enough people to meet its needs.

There is no doubt that, for many immigrants to Silicon Valley, our local economy and lifestyle embody a dream miraculously come true. For some, this success manifests itself in the trappings of wealth—the flashy car, the big house in the western hills, the powerful job title—all achieved while they are still young enough to fully enjoy them.

continued

MICHAEL S. MALONE holds a master's degree in business from Santa Clara University, and is enrolled in Stanford University's Graduate Program in the Philosophy of Science. He has co-authored several investigative stories on Silicon Valley for the Mercury News, and currently contributes to a number of computer-industry magazines.

Tandem Now Shipping NonStop II, Claims 50% Better Performance

By Paul E. Schindler Jr.

Tandem Computers Inc. has begun shipping NonStop II, the second transaction processing computer model the firm has introduced in its six-year history. It has 50 percent better performance at a 20 percent higher price tag than the first model, Tandem said.

President James G. Treybig said NonStop II was actually the firm's fourth processor, but that the second and third were not given new names. He said the new machine offers the best price/performance of any system aimed at the on-line transaction processing market.

Beta site tests showed a 50 percent increase in throughput with the NonStop II, according to David R. Mackie, vice president for headquarters marketing operations. A base system with two processors and 512K bytes of main memory sells for $144,475.

Six NonStop II systems have already been shipped, and the firm is quoting delivery 120 days after receipt of order.

The NonStop II is aimed at "very large applications, or systems with large numbers of terminals," Mackie said, and will supplement the NonStop I but not replace it.

Customers with neither very large networks or large numbers of terminals may not want to pay the premium for the NonStop II, said Robert C. Marshall, senior vice president and chief operating officer.

He said Tandem intends to fulfill its contractual obligations to continue to support the NonStop I for five years after it is dropped as a product, but hastened to add, "It is nowhere near being dropped.

Mackie estimated that 30 to 50 percent of Tandem's present user base would upgrade to the NonStop II during the next several years.

ISN/Max Hirshfeld

James Treybig boasts of price/performance on the NonStop II.

The new system, he said, is a recognition of the growing size of customer data bases and networks. Whereas (depending on the application) an average NonStop I could handle only 50 terminals at most, a similar NonStop II could handle several hundred.

The maximum memory size on the NonStop I was 2 Mbytes; the NonStop II is designed for 16 Mbytes of main memory, once 64K RAM chips are available.

In order to be able to address the full main memory and virtual memory, the NonStop II has 32-bit addressing capability, although it will continue to use a 16-bit instruction set, company officials said.

Also new on the NonStop II is an operations and service processor, which will reduce downtime for service by providing one-location access to all system components. The new service processor will also make remote diagnostics easier to perform, Mackie said.

The instruction set is in loadable control store, meaning that new or changed instructions can be implemented simply by distribution of magnetic tapes that contain them.

The new and old systems are compatible at the object-code and network levels, company officials said.

Asked what IBM computer would be comparable to a six-processor Tandem model costing about $1 million, one company official said it would operate at about 4.5 MIPS (million instructions per second).

He likened that to an IBM 3033N, which he said costs about $2.5 million. Then, he added, "it is not fair to compare them on a MIPS basis, because in transaction processing benchmarks, our computers consistently outperform competitive machines that are not specifically designed for the transaction processing environment."

Two-thirds of Tandem's sales are to end users (it has 350 customers).

INFORMATION SYSTEMS NEWS 4-20-81

ComputerWeekly

COMPUTER WEEKLY, April 23, 1981

Barclays offshoot to upgrade with Tandem

LOUTH . . . failures will remain transparent to the user.

AMONG the first customers for an expanded transaction processing system announced worldwide by US company Tandem Computers last week will be Mercantile Credit, the finance house subsidiary of Barclays Bank.

Barclays and Mercantile are current users of NonStop, the multiple processor system which ensures a very high degree of user availability by duplicating processors, input/output facilities, memory and peripherals. Mercantile is likely to move to NonStop II, as the bigger system is called, to support over 200 interactive terminals.

Tandem, which is five years old and claims to be the fastest growing publicly quoted computer company in the US, says the NonStop II system is expandable up to 16 processors addressing a maximum 16,000 megabytes of virtual memory.

A 32-bit data access architecture, and a separate processor to monitor the system and advise on failures have been introduced. But UK managing director John Louth emphasises that, as with the original NonStop, failures are transparent to the user because double the absolute minimum processor capacity acceptable is always supplied.

Processors are independent, with their own I/O channels, power supplies and memory. Data is read from one but written on to two disc systems, for example, so that each mirrors the other. "Spare" processor capacity is typically taken up with interruptable applications, while printers and other peripherals are duplicated.

According to regional customer engineering manager Noel Johnston, a theoretical analysis has shown system failure is likely to occur once every 56 years.

Applications flexibility for the future is provided by a loadable control store for adding instructions to microcode as part of normal software update and with "minimal" interruption, says Tandem, and the system is compatible with the original NonStop.

Speaking at the company's California head office, vice-president David Mackie said: "This means that our users . . . will be able to retain virtually all their original investment in software and most hardware if they choose to upgrade to the NonStop II."

Turnover for the whole company rose to $108 million last year, an increase of almost 100% on the year before. Louth expects revenue to double again this year.

A McGRAW-HILL PUBLICATION

Electronics®

Electronics newsletter

Second generation of fault-tolerant computers unveiled

Tandem Computers Inc. of Cupertino, Calif., introduced its second generation of fault-tolerant interactive computer systems last week, four years after the introduction of its first generation. Dubbed the NonStop II system, it comes in practical configurations containing 2 to 16 processors. With peripherals, the cost ranges from $500,000 up to $4 million. The new system has a 16-bit data path like its predecessor, but it maps up to 23 bits per processor, or 16 megabytes, whereas its predecessor mapped to 20 bits, or 2 megabytes. In addition, **the NonStop II can address up to 1 gigabyte of virtual memory per processor,** which is unlikely to be exceeded by any application program. Input/output-channel memory is increased from 4-K bytes to 64-K bytes and the number of virtual circuits that can be established by the new system has also been increased from less than 50 terminals to 255. NonStop II is software-compatible with previous systems, but it uses loadable control storage rather than programmable read-only memory to hold the instruction set. The new system also provides for remote diagnostics and operation via a page-mode–oriented operations and service processor. Present NonStop systems are field-upgradable to the NonStop II.

BusinessWeek

May 4, 1981

Briefs

The leading supplier of time-sharing computer services, General Electric Information Services Co., is expanding into the custom software business. The GE Rockville (Md.) subsidiary will build this new business around Lambda Technology Inc., a New York software company that it acquired Apr. 9 for $13 million in stock—plus up to $13 million more in stock, depending on how well Lambda performs over the next four years. GE previously provided software only to customers on its time-sharing network.

Personal Software Inc., which markets the popular VisiCalc program that simplifies the building of numeric models, is adding more software products aimed at professionals who use a personal computer as a management aid. The Sunnyvale (Calif.) company's new VisiTrend program performs trend analysis, and the results can be graphed using the new VisiPlot program. The company has also announced VisiDex to help managers set up an electronic filing system.

Tandem Computers Inc. is moving into the market for larger computer systems. On Apr. 14, the company announced the NonStop II, its first superminicomputer that can process 32-bits of information at once. The new processor packs eight times more memory capacity and permits users to hook up several hundred terminals to one computer instead of just 40 or 50. Tandem's multiple-computer systems are designed for such businesses as banks and airlines, which cannot tolerate system failures.

The latest entry in the burgeoning satellite communications market is Radiation Systems Inc. The Sterling (Va.) company has set up SatCom Technologies Inc. to manufacture and sell ground stations to such businesses as cable television operators, broadcasters, and communications companies. The premiere product is a 15-ft. multiple-beam antenna, selling for $27,000, that was originally designed and built for ComSat General Corp. It can pick up signals simultaneously from up to 10 satellites.

Bits & Bytes

Bruce Entin

San Jose Mercury, Wednesday, April 15, 1981

WHEN astronauts Robert Crippen and John Young landed the space shuttle Columbia Tuesday, they got help from Silicon Valley's Hewlett-Packard.

Both astronauts were using HP-41C hand-held calculators to balance the reusable spacecraft as it reentered the earth's atmosphere.

By punching buttons on the calculator, the pilots computed how much fuel had to be burned in each gas tank so that the descent of the craft would not be lopsided.

The HP-41C is the same programmable calculator that anyone can buy in retail stores for about $250, but chances are that buyers would not put it through the wringer like NASA did to make sure it was airworthy.

NASA dropped it, shook it and gave it stress tests that make the old Timex watch commercials look tame.

After all was said and done, the H-P calculator still worked.

But the same could not be said for IBM computers and some programming done by another high-technology firm.

Shortly before the Columbia was set to blast off last week, a computer software foul-up forced a delay.

Chances are pretty good that if NASA had been using Tandem Computer's mainframes, the launch would have gone ahead without a hitch, according to James G. Treybig, Tandem's president.

Treybig was careful not to knock his competitors or try to diagnose the problems encountered at Cape Canaveral.

He did speculate, however, that his Tandem computers would have identified the hang-up and continued to work while technicians repaired the damage.

□

Speaking of Tandem, the Cupertino firm Tuesday unveiled its new version of the popular non-stop computer, which is guaranteed to work as long as it's plugged in.

The new computer is said to be able to handle four times as many remote computer terminals as the older model and, with a price tag of $144,000, is 53 percent more expensive than last year's model.

So far, Tandem has sold six of the systems, which are viewed by some electronics buffs as a sure-fire sequel to a box-office smash.

Commenting on the new product, Rich Matlack of Dataquest said it puts Tandem in a good position to deal with competitors rumored to be lurking on the Silicon Valley horizon.

□

MIS WEEK April 22, 1981

INFORMATION SYSTEMS

Tandem Has NonStop II For EFT-Type Functions

CUPERTINO, Calif. — Tandem Computers Inc. last week unveiled its "NonStop II" computer system, a processor designed for multi-user, on-line transaction applications that represents the second generation of the firm's architecture aiming for continuous system operation and data integrity.

The basic NonStop II configuration is priced at $144,475, the firm said. This set-up includes dual processors, each with 512 Kilobytes of memory, a magnetic tape drive and controller, and an operations and service processor (OSP) that detects and reports on-line faults. The systems are currently in production and transit, the firm said, and deliveries are set at 120 days after recepit of order.

Designed for applications with up to hundreds of interactive user terminals communicating with a large database over long distances — such as electronic funds transfer — the new system is software-compatible with previous NonStop systems.

Through modular expansion of up to 16 processors, it can have eight times the current memory capacity, as each processor is capable of addressing 16 megabytes of physical memory.

Also, Tandem has designed a new 32-bit data-access architecture that places up to one gigabyte of storage per processor under control of the operating system.

The firm said that the early fault-isolation and error-detection capabilities of the OSP have dropped the costs of memory-module maintenance by 64 percent. The OSP includes a modem that supports a remote diagnosis and system operation.

David R. Mackie, vice president of headquarters marketing operations said the new address architecture permits the transfer of greater amounts of data to and from disks, terminals, communications lines, and other peripherals through a 16-fold increase in each processor's input/output (I/O vuffer space and in the maximum I/O transfer size.

Tandem said that current users of NonStop systems will be able to upgrade their systems to NonStop II configurations and retain their software, peripherals and most of their hardware. The firm will continue to manufacture and support existing systems.

Tandem Computers Inc. is located at 19333 Vallco Parkway, Cupertino, Calif., 95014.

THE WALL STREET JOURNAL.

Wednesday, April 15, 1981

Tandem Computers Introduces a System

By a WALL STREET JOURNAL Staff Reporter

CUPERTINO, Calif.—Tandem Computers Inc. introduced a multiprocessor computer system called Nonstop II, designed for large, on-line processing applications.

Designed to work within networks and to handle two to 16 processors, Nonstop II in its basic configuration is priced at $144,475. This includes two processors with 512,000 bytes of memory per processor, a magnetic tape drive and controller and an operations and service processor.

How to store ½m pages of the *FT*

BY ALAN CANE

TRADITIONALLY, holders of the middle ground, minicomputer manufacturers are looking to the top and the bottom end of the computer power spectrum for new triumphs.

Yesterday, Tandem, a U.S. company which has carved out a high reputation for itself in a remarkably short time with systems which it claims never stop running, announced a new, very powerful system for the large user.

A fully expanded version of the NonStop II, as it is called, can support up to 16bn bytes of virtual memory (which should be enough to store around 500,000 pages of the *Financial Times*).

The full system, with up to 16 processors linked together could allow several thousand terminals to operate simultaneously. Prices for the NonStop II start at about £200,000.

Meanwhile, Digital Equipment (DEC), the U.S. company which pioneered the minicomputer and which has already launched its own offering at the top end of the market, the VAX, last month announced one of the cheapest machines in its range, the PDP11/24 costing from £6,300.

The new machine, says DEC, is a general purpose mini with four times the memory expansion of the PDP11/34A at up to 30 per cent less cost. In other words, the new machine represents the inexorable trend towards more computing power at lower prices.

Tandem has never made a virtue of low costs. Its success is based on a guarantee that its machines will never leave its users in the lurch through breakdown.

Of course, Tandem machines break down like any other computers but all the essential components—the processors, stores and data paths are all duplicated; hence Tandem.

It is a formula which has led to spectacular growth. The company's turnover increased by 130 per cent in 1979 and then by 95 per cent last year to total US$108m.

Tandem has some 320 customers in the U.S. and 21 in the UK including some prestigious Government sites such as GCHQ Cheltenham.

Mr. John Louth, managing director of Tandem UK, emphasised that the new system is fully compatible with the existing NonStop machinery.

He said that the chief advantages in the new system lay in the very large applications and communications capability, and in its serviceability.

There is an independent processor provided in a separate console with each system which acts as the system policeman. Information about the health of the entire system is relayed and displayed by this processor. The operator can use the console to diagnose hardware and software problems.

New instructions can be added to the system's instruction set through a loadable control store, without lengthy interruption of normal working.

Tandem is on 01-841 7381, DEC on 0734 583555.

Financial Times Wednesday April 15 1981

Upgraded Transaction System Introduced by Tandem

CUPERTINO, Calif. — Tandem Computers, Inc., upgraded its network-oriented, transaction-processing system last week, coming out with the NonStop 2 version that incorporates a new virtual memory access method, memory repackaging, revised control store and addition of an operations and service processor.

The firm said the new model offers a considerable performance improvement over its predecessor, but cautioned that it was entirely applications-dependent and that the only measure it had so far derived from beta testing.

In beta test at Telenet Communication Corp., a spokeswoman said, the system yielded about a 50 per cent improvement over the NonStop 1 in the specific applications used at that site.

Tandem priced the NonStop 2 at $144,475 for a basic configuration consisting of dual processors with 512K bytes each of memory, a tape drive and controller, and the operations and service processor. This compares with $94,975 for a NonStop 1 base system with dual processors, each with 384K bytes of memory, tape drive and controller.

Tandem, which said it has shipped six systems so far, quoted 120-day delivery ARO. Manufacturing is at Cupertino and at the firm's new facility in Reston, Va. Full production is expected by the end of this year, according to the Tandem spokeswoman.

Feature

A major feature of the new model, the firm said, was the introduction of 32-bit data access architecture. It was explained that, although the dual-processor system continues to use a 16-bit instruction set to remain compatible with the current installed base, virtual memory is accessed through a 32-bit addressing scheme, increasing the virtual address space from the earlier 64 megabytes to one gigabyte per processor.

Related to this, the firm said, is the expansion of the I/O buffer on each processor and the maximum I/O transfer size. The firm said the buffer was increased from 64K bytes to one megabyte and the transfer size from 4K bytes to 64K bytes.

As before, the Tandem system can be expanded from two to 16 CPUs in dual-processor configuration but, with the extended virtual addressing, the maximum virtual-addressing capability is 16 gigabytes.

Tandem touted this enhancement for its ability to support the hardware and software needed for very large applications requiring hundreds of terminals; communications lines, including X.25 circuits; and large, distributed data bases.

The repackaging of real memory involves the repackaging of the boards to expand memory and to enable the firm to switch from 16K-bit to 64K-bit technology when the firm believes the price is right. While the NonStop 1 packaged 384K bytes on a board, the new model takes 512K bytes, which becomes the new minimum memory. Maximum real memory remains two megabytes per processor, as before.

In the area of control store, Tandem switched largely from ROM to RAM, implemented in 36K bytes, to enable microcode to be enhanced without interruption of user processing. Previously, adding new functions to microcode required service personnel to replace ROMs, shutting down the system during the changeover.
over.

New to the NonStop 2 is what Tandem calls the operations and service processor (OSP), which combines the operator console with diagnostic capabilities. The floppy-disk based diagnostics, which detect and report hardware faults on-line, also can be used via telephone line to provide remote diagnostic capability.

Tandem said the new system retains full compatibility with the earlier one at the application-code and network levels, so that current users will be able to retain virtually all their original investment in software and most hardware if they upgrade.

All standard code will be directly transportable to the new system, it was explained, although proprietary code written by users would not. The spokeswoman said the number of users with proprietary code is very small.

NEW TANDEM SYSTEM: The NonStop 2 was introduced by Tandem Computers, Inc., to provide better price-performance than its original system.

ELECTRONIC NEWS 4-20-81

DATAQUEST INCORPORATED
A Subsidiary of A.C. Nielsen Co.
RESEARCH NEWSLETTER

SCIS Code: Tandem Computers Inc.

THE NONSTOP II
TANDEM'S FIRST MAJOR PRODUCT FOR THE EIGHTIES

SUMMARY

On April 14, 1981, Tandem Computers Incorporated announced the Tandem NonStop II, its second computer system. According to David R. Mackie, vice president of Tandem's Headquarters Marketing Operations, the NonStop II is intended to "carry Tandem forward into the eighties," and toward its stated goal of achieving revenues of $1 billion by the close of fiscal 1985.

The NonStop II provides all the features of the original fault-tolerant NonStop system plus the following new features and enhancements:

- A new 32-bit data access architecture, which is the key to implementing the system's extended addressing capability. Each processor can address up to 16 Mbytes of physical memory without architectural changes as denser memory devices become cost effective. The maximum main memory size is currently 2 Mbytes per processor. Virtual memory addressing capability is now one billion bytes per processor.

- Software compatibility with current NonStop systems at the object code level.

- Enhanced input/output capability that will significantly improve the terminal throughput and the number of terminals and communications circuits available.

- Processor microcode resident in 32 Kbytes of loadable control storage, which allows the processor's instruction set to be easily modified.

- A new Operations and Service Processor (OSP) that provides both local and remote detailed system status information and diagnostic facilities to assist in reducing repair times.

- An exchange program that allows current customers to upgrade their systems by returning their original NonStop systems to Tandem for credit against the list price of a NonStop II.

19055 Pruneridge Ave. / Cupertino, CA 95014 / (408) 725-1200 / TWX (910) 338-7695 / DATAQUEST CPTO

FEATURES

32-Bit Data Access Architecture

A major feature of NonStop II is an extended 32-bit addressing mode that allows access to the system's entire virtual memory space. A fully configured 16-processor NonStop II system can address up to 16 billion bytes of virtual memory (one billion bytes per processor), giving users "access to almost unlimited data space," according to Mr. Mackie. The extended address ability provides hardware and software support for very large applications with hundreds of terminals, communications lines (including X.25 virtual circuits), and large, distributed data bases.

Each NonStop II processor currently has a main memory capacity of 512 Kbytes to 2 Mbytes, expandable in increments of 512 Kbytes. However, each processor is capable of addressing up to 16 Mbytes of physical memory. As denser memory devices become cost effective, the current maximum memory of the processor can be increased without architectural changes. This strategy recognizes potential user needs for larger memories in the future and should allow Tandem to meet these needs in a cost-effective manner that is advantageous to its customers.

Software Compatibility

NonStop II is fully compatible with the original Tandem NonStop 16 system at both application code and network levels. "Our users . . . will be able to retain virtually all their original investment in software and most hardware if they choose to upgrade to the NonStop II system to take advantage of its new capabilities," stated Mr. Mackie. Futhermore, NonStop II systems can be used in a common data communications network with the current NonStop systems without software modification. However, NonStop II processors cannot be combined with older NonStop processors in a single system.

Enhanced Input/Output Capability

According to James G. Treybig, Tandem's president, the NonStop II is a direct response to the needs of the Company's customers with large, on-line transaction processing needs. The 32-bit data access architecture can support very large I/O intensive applications needed by organizations having critical business operations on-line. The NonStop II expanded architecture provides more capability in the amount of data that can be transferred to and from disks, terminals, and other peripherals, as there is a 16-fold increase in both I/O buffer space available per processor and in the maximum I/O transfer size. Each processor can now support 1 Mbyte of I/O buffer space. I/O channel speed can reach up to 5 Mbytes/second in a burst mode.

Loadable Control Storage

The processor microcode resides in 32-Kbytes of loadable control storage. The loadable control store allows the processor's instruction set to be modified for new features or performance enhancements as part of Tandem's standard software update procedure.

Operations and Service Processor

Tandem estimates that during an assumed seven-year life of a system purchased in 1982-83, service will cost a user about three times the original price of the hardware; i.e., for every $100 spent on hardware, $288 will be spent on hardware repair and maintenance. To keep these costs from overwhelming the user, Tandem has introduced the Operations and Service Processor (OSP) designed to lower service costs through early fault detection and isolation, and through reducing mean time to repair. Each NonStop II system is supplied with an OSP, which functions both as an operator terminal and as a system diagnostic and maintenance tool that communicates with the Diagnostic Data Transceiver (DDT) that is included in each NonStop II processor module. The operator can thus diagnose software and hardware problems through the operator console. The OSP includes a built-in modem and can be connected to a remote terminal or another OSP, allowing an operator or Tandem service personnel to diagnose, and perhaps correct, problems from a remote site. Furthermore, a remote terminal connected to the OSP can be used as the operator's console, allowing users at the remote terminal to load and run an unattended system. However, initial connection to the OSP modem must be done at the system site.

Exchange Program

Current Tandem users wishing to migrate to the NonStop II may participate in an exchange program that permits them to upgrade their systems as their application needs expand. This plan provides for on-site upgrade of the customer's NonStop system to a NonStop II system, with the customer's original equipment being returned to Tandem for credit against the list price of the upgrade. The returned equipment will be refurbished and resold by Tandem.

Under a similar program, customers can purchase the original NonStop system for application development and subsequently migrate to a NonStop II system as applications come on-line and the application support features of the NonStop II system are needed.

Tandem will continue to manufacture and support the original NonStop system.

PRICING AND DELIVERY

A basic NonStop II configuration consisting of two 512-Kbyte processors, a magnetic tape drive and controller, and an OSP, is priced at $144,475. A basic configuration of the original NonStop system with two 384-Kbyte processors, a magnetic tape drive and controller, and an operator console sells for $94,975. A medium-sized system with six 2-Mbyte processors, four 300-Mbyte disk drives, a magnetic tape drive and controller, an OSP, and software consisting of the Guardian operating system, database management, COBOL, Network/Expand, and access method for 6520 terminals, is priced at $750,000. A roughly similar configuration of the original NonStop system sells for about $700,000. In general, NonStop II systems are priced 15 to 20 percent higher than their earlier counterparts. However, because of the increased memory and the addition of the OSP, the two systems

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Tandem establishes base in Hong Kong

By STEVE KONG in Hong Kong

TANDEM COMPUTERS' regional marketing network is shaping up well.

Tandem Computers HK and Tandem Computers International have been officially inaugurated in Hong Kong.

Mr. G.E. "Pete" Peterson, who has been temporarily seconded from the California headquarters to act as the general manager of Tandem Computers International Inc. (HK), is now busy recruiting staff for the Hong Kong operation.

He will be remaining in his present post until a new general manager is appointed. It is Tandem's policy that local people will be employed to serve the local needs, explained Mr. Peterson.

Mr. Peterson expected that the new Hong Kong general manager would be appointed within two months and the Hong Kong office would have about twelve employees by this year end.

Centre

According to Mr. Peterson, the Hong Kong subsidiary will serve as the regional marketing and engineering support centre for all Tandem operations in Asia.

The company's next branch office in this region outside Japan will be opened in Singapore some time in May. This office will be headed by Mr. Mark Ho, who is now under intensive training in California.

Size of the Singapore office will be smaller at the initial stage. Three staff is scheduled to be employed.

Mr. Peterson said that initially, software engineering would be supported by the Hong Kong office until the management thinks that the market size justifies setting up a software team in the Singapore office.

The rest of Asia will be covered by distributors. In South Korea, Korea International Products Services (KIPS) was appointed as the sole distributor for that country last September.

Tandem is now in the process of negotiating with local interests in Taiwan and the Philippines for similar distributorship arrangement, according to Mr. Peterson.

In Australia, Tandem has been represented by Melbourne-based Management Information Services (MIS) over the past two and half years.

Installations

At the moment, there are eight Tandem installations in the region. These include two in Japan, two in South Korea and four in Hong Kong.

Hong Kong's first two Tandem 16 systems were installed at First National Bank of Chicago's Hong Kong branch office and the Bank's Hong Kong-based office for international support in late July and December respectively.

The third installation was delivered to Pega, an OEM (Original Equipment Manufacturer) last December.

The latest order was placed by HAECO (Hong Kong Aircraft Engineering Co., Ltd.) and delivery of the machine is expected in early April.

Mr. Peterson predicted that there would be at least one installation each in Singapore, the Philippines, Malaysia and Taiwan by this June. There will also be another installation in Hong Kong soon, Mr. Peterson added.

No further information about the Philippines and Taiwan installations are available at this stage. However, ACW has learnt that the Tandem systems to be delivered to Singapore will be used by the branch office of the First National Bank of Chicago there.

The one to be installed in Kuala Lumpur will be employed by Motorola for management and production control applications at its KL manufacturing plant. Motorola's Tandem machine had been secured by the Company in the U.S. and will be shipped to KL.

"Inthe past, Tandem has been heavily involved with multi-national companies. These multi-nationals are just like a bridge. They have brought us to this part of the world," said Mr. Peterson.

"From now on, we shall continue our commitment to our multi-national users and at the same time spend more time and effort to serve the needs of local users in Asia," he said.

Tandem Computers figures it has the machines to take it to $1 billion, so it works at preparing its people for problems of bigness.

Beyond the better mousetrap

Tandem President James Treybig sharing corporate culture with employees
Seminars and stock options for all on the way to $1 billion sales.

By Kathleen K. Wiegner

IN TOM WOLFE'S book *The Right Stuff*, he reveals the key to training the first astronauts. The astronauts, writes Wolfe, were taken through simulations of space orbit so many times that when they actually made it into space the trip was as familiar as driving to work. Any problems had to be so familiar that they would seem routine.

Like astronauts, the senior and middle managers of little Tandem Computers Inc. are being put through a training course in expectation of the time—set for internal purposes in 1985—when $109 million (sales) Tandem becomes a $1 billion company. In two-day seminars they run through courses on hiring, delegating responsibility, new markets, new-product development and Tandem's basic corporate philosophy. When the great day arrives, the problems and differences that come with bigness should seem old hat.

"We use $1 billion not as a sales forecast but to think about the problems that come when you get that big," says James Treybig, 40, Tandem's president. "We need to anticipate growth so people can recognize the problems that come with growth." Eventually all of Tandem's 1,890 employees will take that training in anticipating growth.

Planning for $1 billion in sales is neither arrogant nor farfetched. The Cupertino, Calif.-based minicomputer company has one of the hottest track records in a hot industry. Since going public in 1977, Tandem's revenues have soared from $8 million to $109 million; earnings have risen from $325,000 to $11 million. For the first six months of this fiscal year—which ends Sept. 30—revenues surged to $88 million, from $45.7 million in the first half of fiscal 1980, and net income equaled the $11 million Tandem made in all of last year. In order to reach $1 billion by 1985, revenues must grow at a compound annual rate of 50%.

Treybig, a lean Texan with a bachelor's degree in electrical engineering and an M.B.A. from Stanford, worked for more than five years as a marketing manager at Hewlett-Packard before he started Tandem with three other H-P employees in 1974. He also spent over a year as a limited partner at Kleiner, Perkins, Caufield & Byers, the San Francisco venture-capital firm, working on his business strategy and his plan for a better mousetrap.

The mousetrap that Treybig and two computer engineers came up with was a way of linking two or more central processing units together, so that if there was a failure anywhere in the system, work would automatically shift to another part of the system while the faulty parts were fixed. The computer could keep running. The Tandem NonStop system—Treybig says he got the idea from Hewlett-Packard customers who were looking for such capability—was an instant hit with banks, hospitals, distribution outfits, government agencies, even racetracks where betting is computerized. "If you run a business with a computer, whether you're a big bank or a travel agency, your computer can't be down," explains Treybig. "Every customer we talk to says *his* is the worst problem."

Because Tandem's computers can be linked together without any software changes, a bank or hospital can start with two processors—which sell for around $200,000—and eventually add on 14 more of the boxes. This system in turn can be hooked up with other systems anywhere in the world. First Chicago Corp. currently uses 31 Tandem computers in a worldwide network to manage everything from currency transactions to its automated tellers.

Having established his niche, Treybig so far has shown that he has a good grip on financing Tandem's explosive growth. The company has almost no long-term debt, earned a tidy 21% on equity last year, and uses its $99 million in cash balances to produce interest income amounting to 25% of this year's first-half pretax earnings.

When he needs capital to finance the next phase of Tandem's expansion, Treybig can go again to the equity market, as he has done three times since going public. He avoids debt, he says, because "when you're selling

against larger companies like IBM or Data General you have to look safe financially to your customer."

And also because he can get equity money dirt cheap and without dilution while Tandem sells at around 48 times this year's anticipated earnings of $26 million, or $2.15 a share. At the recent price of $103 a share—for a company that earned $1.06 a share last year—investors are buying the vision of the multibillion-dollar company Tandem may become.

Is that vision realistic? The prospects at least are bright. "Tandem has several more years of well above 50% annual growth based on its existing customers [most of them large companies] adding new equipment," says Michael De Santis, a partner at San Francisco's investment banking firm Robertson Colman Stephens & Woodman. Nationwide banking and the acceleration of electronic funds transfer are trends that will send Tandem's financial customers scurrying back for more computers.

But most reassuring of all is that Treybig's Tandem is developing corporate muscle tone now, in the heady growth days, that should serve it well when the going gets tougher.

Tandem buys most of its components and such peripherals as terminals and printers from outside companies, and one set of circuit boards essentially fits all systems, so it gets the cost advantages of volume manufacturing. In addition, only 30% of the subassembly of these circuit boards is done by company employees—the remainder is farmed out to subcontractors. This arrangement keeps Tandem's labor costs down, reduces the need for high-priced new capacity and also precludes future layoffs in slow periods.

Laying off and rehiring people is frowned upon in the electronics business. First, it's expensive. But it also erodes the spirit of joint effort that companies such as Tandem strive to instill in their employees. At Tandem, all 1,890 employees get stock options. Every Friday afternoon Tandem holds "beer bashes" on the company's patio, where suppliers, managers and assembly workers swap information and complaints. In that balmy strip of northern California known as Silicon Valley, where skilled people are hard to find and often harder to hold on to, Tandem's tennis courts and flexible work hours are not merely examples of "laid-back" California, but practical industrial relations tactics.

Life at Tandem is anything but relaxed. Worker productivity is twice the average for the computer industry, which is as a whole devoutly entrepreneurial and fiercely competitive. Treybig's paradox is that Tandem must grow big or be swallowed up by a larger competitor; yet, to grow, it must keep the kind of people who often function best in small, free-wheeling organizations.

Treybig is under no illusion that IBM, Data General, Digital Equipment or Hewlett-Packard won't someday offer different—possibly better—solutions to the problems that his NonStop system now solves. Tandem will need other ideas for new products and new markets. And such ideas come from motivated people, not machines. With the seminars, the benefits, the emphasis on corporate culture, Treybig is doing more than training or rewarding people—he's involving them. Tom Watson, who built IBM, would understand that very well. ■

TANDEM

On Wednesday, July 15, 1981, the New Jersey Office celebrated the completion of their new facility with a gala Grand Opening Party.

There were many local Tandemites in attendance as well as some of our friends from the Divisional Office and Cupertino. I can whole-heartedly say that we presented a fine example to friends, family, customers and prospects of what a true Tandem Party is all about.

Guests were served a myriad selection of hot and cold hors d'oeuvres ranging from miniature Quiche to Chicken Tempora. A buffet followed, highlighted by a variety of French Crepes and Oriental Side Dishes. Two bars, strategically located provided the evening with refreshments.

The evening was set in a beautiful, relaxed atmosphere which the open office environment features. Larry Schuster seemed a little disappointed in the "openness" of the surroundings because, as he put it, "The halls were too wide, the waitresses could get by much too easily."

It was a very enjoyable evening for all and the general feeling was expressed by Bill Emond "I thought it was the best open house I've ever been to. I enjoyed the opportunity to meet the customers and potential employees."

"When are we having our next open house?" asked George Peltz, "We ought to have the next one when my office is completed." And for Andy Demartini, he had such a great time he was speechless.

We would like to extend an open invitation to come and see our new offices, and to show a little Jersey hospitality.

Article by: Jean Wachter - NJ Office

COMPUTERS

The push for fail-safe systems

Eastern Air Lines Inc. stands to lose as much as $20,000 a minute in lost ticket bookings if its computerized reservations system breaks down. Merrill Lynch, Pierce, Fenner & Smith Inc. could drop $50,000 on just one wheat futures order during a 20-minute computer outage. Businesses all over the country are becoming more vulnerable than ever to a loss of computer power. "Computer failures show up in the company's profit and loss statement," laments Frank M. Heinzmann, Eastern's vice-president of computer and communications systems.

Not too long ago, the only way for a company to make sure that such costly breakdowns did not happen was to buy two complete computer systems—one to handle the work and the other as a backup in case the first system failed. Eastern, for example, needs three computers to run its reservations but has three more of the giant systems standing by in case of a breakdown.

Tandem Computers Inc. was the first manufacturer to offer a system that eliminated the need for a user to buy two separate computers to ensure that the system would always be operating. The Cupertino (Calif.) company found a ready market: It has doubled its sales each year since it shipped its first Non-Stop computer in 1975. The Tandem system teams up two or more computers that share the work load and take over for each other in case one unit fails. The demand for such reliable computers is growing so fast that Tandem expects its revenues to soar from $109 million in 1980 to $1 billion by 1985. "A great majority of users are recognizing that continuous availability of computers is something they are willing to pay for," says Michael P. De Santis, a computer industry analyst at San Francisco's Robertson, Colman, Stephens & Woodman.

August System's Willoughby and Can't Fail model: The market is "just waiting to be tapped."

Encouraged by Tandem's spectacular success and by the declining cost of computer hardware, several startup companies are incorporating subsystem redundancy in the design of their new computers to make them more reliable. "The underlying need is there just waiting to be tapped," says David W. Willoughby, president of August Systems Inc., a company that in August began to ship its own Can't Fail computer. "Over time," comments Richard J. Matlack, a vice-president at Dataquest Inc., a Cupertino market research company, "everyone is going to want [these reliability] features."

Built-in spare parts. Not to be left behind in this rapidly changing marketplace, an increasing number of established computer makers are adding backup parts to their machines.

Sperry Corp.'s Univac Div., for example, has put duplicate circuitry into the crucial arithmetic section that is the brain of its year-old 1100/60 computer. This and other features will give Sperry customers "greater on-the-air time in the future," according to Vincent M. Donovan, who is vice-president of customer and marketing support. Similarly, Prime Computer Inc. is redesigning its computer systems to include built-in spare parts for all vital functions. "If a chip goes down," explains Thomas A. Jordan, a product manager, "there's another chip right next to it to take over its function."

For the new computer startup companies such as August Systems, it is easier to build redundancy into their machines because they do not have to make their computers compatible with existing product lines. As a result, they can take greater advantage of new technology that allows them to combine two entire computers in one machine. August System's new computer, for instance, is really three computers in one system, yet the Salem (Ore.) company estimates that its starting price of $50,000 is only 40% higher than the price of a comparably powered minicomputer system containing just one computer. And Stratus Computer Inc., which was founded in 1980, plans to roll out a so-called super minicomputer next year that features a dual-computer design.

The demand for such computers is expected to continue to soar as more companies automate their offices and factories. "As you get highly paid white-collar professionals [depending on] a system, the cost of [the computer] being down is very high," explains John P. Morgridge, marketing vice-president at Stratus. And as computers take on more of the load in running oil refineries and power plants, the cost of a breakdown could become even greater. A computer

Information processing / CONTINUED

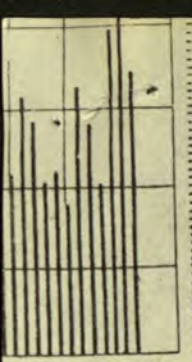
failure in such instances "could cause an oil spill or another Three Mile Island," says August System's Willoughby.

Despite the potential for costly delays or even disaster from a computer breakdown, not all manufacturers are convinced that redundancy is necessary. "It is not terribly price-effective," argues Seymour Kraut, vice-president and general manager of field engineering at Honeywell Information Systems Inc. Instead, he says, "the premium is on design and building it right the first time."

To accomplish this, Honeywell is replacing defect-prone wiring in its latest line of computers with printed circuit boards and more complex integrated circuits that include more of the connections on the chips. Similarly, Amdahl Corp. has cut the number of circuit boards from 55 in its 470 computer to 12 in its new and more powerful 580 series.

Chief selling point. As the reliability of all computers increases, customers are beginning to demand higher performance from the peripheral storage devices, terminals, and communications links that are vital to reliable operations, especially when the data processing is being done by a remotely located computer. American Express Co., for example, has more than 45,000 credit authorization terminals attached to its computers; if the communication lines fail, the system becomes useless. To make sure such problems do not happen, Amex is currently installing equipment that automatically reroutes calls around any out-of-service lines. Rockwell International Corp. now spends $100,000 a year to lease duplicate communications lines between many of its Southern California offices. This investment, says Lawrence E. Manly, vice-president of operations, "has a payback if the main line fails only once a year." For this reason, "reliability will be a major part of the [communications customer's] purchase decision," says William J. Moody, a general manager of industry sales for the Long Lines Dept. of American Telephone & Telegraph Co.

As computer makers proliferate, reliability will increasingly become the industry's chief selling point. Hewlett-Packard Co. and Wang Laboratories Inc. already sell computers that are guaranteed to work 99% and 98% of the time, respectively. Predicts Prime's Jordan: "That approach will [soon] be inevitable across the industry." ■



tation and utility stocks

	x-High	x-Low	Shares Sold
.22	873.19	859.87	5,143,200
.67	872.53	855.97	5,659,300
.35	854.83	826.96	5,300,800
.56	842.47	826.58	4,504,600
.70	383.10	375.93	993,900
.85	383.10	375.33	1,129,600
.45	376.59	366.90	1,256,400
.17	376.39	368.36	1,089,900
.14	109.17	107.27	1,490,100
.16	108.72	106.85	1,120,600
.93	107.27	104.57	1,236,400
.03	105.66	103.79	981,900
.36	348.27	342.44	7,627,200
.32	347.90	341.25	7,909,500
.99	341.61	331.64	7,793,600
.66	338.17	331.59	6,576,400

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November 3, 1981

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quotations supplied by the Na- of Securities Dealers through NAS- ed quotations system. Table in- an original offering price of at nd total initial market value of $5 Current prices don't include retail n or commission. Volume repre- changed hands during the dav.

	Initial Offer Price	Vol. In 100s	4 pm Closing Bid	Asked	Chg.
s	$11	358	16½	16¾	+ ¾
ps	$13.50	71	13¼	13½	...
	$9.50	118	14¼	14½	+ ¼
	$13	296	16⅝	16⅞	+ ¼
	$10	252	14	14¾	+ ¼
	$8	164	8	8¼	...
	$5	841	7½	7¾	+ ⅛
le	$8.50	27	8¾	9⅛	...
	$11	252	11¼	11½	– ⅛
	$7.50	26	7¾	8¼	...
	$11.50	973	12¼	12⅜	...
	$9.50	590	10½	10⅝	+ ¼
	$8	32	7¾	8¼	...
	$7.50	233	7½	7¾	...
	$10	17	10	10½	...
	$13	268	16¼	16½	+ ¼

Mobil, an active issue, eased ⅛ to 25¼.

Cities Service, the subject of takeover speculation, rose ¾ to 51. Other oil gainers included Sun, up 1¼ to 42¼; and Superior, 1 to 37⅛. Indiana Standard, which in-issue, rose 1⅛ to 31, bid. Florida National Banks, which agreed to merge into Chemical New York Corp., gained 1¾ to 26, bid. Graphic Scanning was an active gainer for the second day, rising 1⅜ to 22⅝, bid.

Minicomputer Makers Draw Note of Caution From Analysts Due to Slowing Order Growth

By George Anders

While a round of weak profit reports has pushed stocks of mainframe computer makers near their 52-week lows, their counterparts in the minicomputer field have parlayed brighter earnings into continued stock gains.

But some analysts are starting to sound a cautious note about minicomputer makers, chiefly because of slowing order growth. Marc Schulman, an analyst at First Boston Corp., recently trimmed his per-share profit estimate for **Digital Equipment Corp.** by 15 cents for the rest of fiscal 1982, ending June 30, despite first quarter earnings that, he said, "were above our expectations."

The culprits, he said, include slow sales in Europe, deteriorating capital spending in the U.S. and cancellations in the commercial original-equipment sector. He currently forecasts fiscal 1982 earnings of $7.85 a share, still up from fiscal 1981's $6.70. Yesterday, DEC common was unchanged at 102, having traded in a range of 113¼ to 80¼ in the past year.

Heard on the Street

Mr. Schulman notes that a chunk of DEC's fiscal first quarter earnings came from interest on its $671.5 million cash position, and says these earnings would be hurt by a drop in interest rates. DEC's orders grew during the quarter by 20% to 25%, Mr. Schulman estimates, and he expects "a further narrowing" of that growth.

Viewing other minicomputer makers, such as **Wang Labs, Prime Computer, Data General** and **Datapoint**, Mr. Schulman expects they, too, will show "an economy-induced further deterioration of order trends." To date, he says, order slowdowns have been traced only to the strength of the dollar, high interest rates and product or marketing problems.

Howard Geiger, an analyst at Merrill Lynch, Pierce, Fenner & Smith Inc., has been neutral since January about DEC's short-term prospects, though he rates the company a long-term buy. "I'm looking for an opportunity to jump all over the stock and upgrade its rating," he says, but is holding off until the trading price nears 90.

Mr. Geiger adds that DEC has carved out "an incredibly strong fundamental position" at the expense of its rivals. DEC introduced a 32-bit, superminicomputer in 1977, he says, while Data General didn't enter that fast-growing field until late in 1980.

Furthermore, he says, Digital has "a higher percentage of large companies among its customer base, a luxury that others, such as Data General, don't enjoy." Mr. Geiger is neutral short-term about Wang and Datapoint as well, though he rates **Tandem Computer** OK-to-buy and Prime Computer a buy, contending that the market "overreacted" when Prime shares tumbled after a management shuffle.

Other minicomputer makers are faring less well, with "the marginal supplier being squeezed," according to John McManus, an analyst at Shearson/American Express Inc. **Honeywell** said this week that it is laying off 400 workers at a minicomputer plant in Massachusetts, though Mr. McManus said that's "more symptomatic of Honeywell's particular problems than of the industry's.

"They've been selling to the wrong base," he contends, saturating existing buyers of large Honeywell computers. "I'm not saying that orders aren't slowing for Data General, Hewlett-Packard and DEC as well," he says, "but they aren't laying off people." Honeywell, he notes, gathers most of its earnings outside minicomputers.

DEC still has strong support among some analysts, including Jay Stevens of Oppenheimer & Co., who expects it to show 50% growth this year in orders for its "real strength," the more powerful, 32-bit minicomputers that sell for $200,000 to $500,000.

He notes that its lead time for shipments has shrunk from nine months late last year to four months currently, but says that signs of an order slowdown are "just part of the market. I don't think it's anything special about DEC."

First Boston's Mr. Schulman is projecting a slight decline in operating margin, or profit as a percentage of sales. He says that though the company still predicts a nominal improvement, it doesn't any longer argue with forecasts of a decline. An increased willingness to make price concessions, he says, is holding down margins.

Merrill Lynch's Mr. Geiger says that while DEC's fiscal first quarter operating profit matched his expectations, revenue was off slightly, "and with shipments below targets, we're probably going to see revenue moving away more from the company's estimates in the next few quarters." DEC's order rate has been slowing since December 1980, he says, with its orders-to-shipments ratio "barely even" at present.

Among factors helping DEC stock, he suggests, are tentative signs that institutional investors are moving their holdings out of large main-frame companies and into smaller concerns, such as DEC. He notes that institutional ownership of DEC shares has passed 75%.

$1,624,000 | 158,483,000
14,982,000 | 16,342,000
9,044,000 | 8,834,000

1.66 | 1.85

ATIONAL LIFE (O)

1981	a1980
$1,105,000	$918,000
83,000	490,000
1,022,000	428,000
100,000	28,000
1,122,000	456,000
.84	.70
.78	.32
.85	.35
3,494,000	3,714,000
712,000	852,000
2,782,000	2,862,000
55,000	298,000
2,837,000	3,160,000
2.65	2.83
2.11	2.18
2.15	2.41

to reflect discontinued

PILOT CORP. (N)

30: 1981	1980
$24,665,000	$22,497,000
389,000	a1,507,000
24,276,000	24,004,000
1.15	1.03
1.12	1.10
74,216,000	67,434,000
4,005,000	2,636,000
78,221,000	70,070,000
3.41	3.08
3.59	3.20

ONTROLS INC. (N)

t 30: a1981	1980
,128,386,000	$964,854,000
48,132,000	34,021,000
....	328,000
48,132,000	33,693,000
14,044,181	13,995,548
3.43	2.43
3.43	2.41
325,561,000	270,494,000
15,163,000	11,157,000
1.08	.80

:ts an accounting change ation in valuing domestic entories.

CORP. (O)

ept 30: 1981	1980
$22,901,000	$19,170,000
2,330,000	d2,405,000
25,231,000	16,765,000
13,181,000	12,727,000
(primary):	
1.74	1.51
ome 1.91	1.31
hs:	
62,194,000	62,142,000
11,820,000	5,167,000
74,014,000	67,309,000
13,077,000	12,574,000
(primary):	
4.75	4.94
ome 5.65	5.35

DUSTRIES (O)

Sept 30: 1981	1980
$12,633,885	$8,743,330
me .. 2,064,104	1,479,223
s:	
come .34	a.25
gths:	
23,883,696	17,706,689
me .. 3,335,319	2,944,854
s:	
come .55	a.49

justed for a two-for-one stock in August 1981.

$1,500,000 from sale of an interest in a building.

PACIFIC POWER & LT (N)

Quar Sept 30: 1981	1980
Revenues $323,358,000	a$230,074,000
Net inco 30,809,000	23,984,000
Shares 50,421,000	45,641,000
Shr earns:	
Net inco .46	.40
12 months:	
Revenues 1,207,902,000	a933,199,000
Net inco 162,187,000	115,032,000
Shr earns:	
Net inco 2.82	2.20

a-Restated.

PACO PHARMACEUTICAL (O)

Year Aug 29: 1981	1980
Sales $27,540,276	$24,044,075
Net income .. 1,904,968	1,111,924
Shr earns:	
Net income 1.25	.74

PEOPLES ENERGY CO. (O)

Year Sept 30: 1981	1980
Revs $3,403,234,000	$3,016,237,000
Net inco a156,957,000	137,564,000
Avg shrs 29,043,148	27,472,165
Shr earns:	
Net inco 5.40	5.01
Quarter:	
Revs 639,389,000	516,399,000
Net inco a3,305,000	5,948,000
Shr earns:	
Net inco .10	.15

a-Reflects provision for reorganization and related costs which reduced net by $4,500,000.

PLANNING RESEARCH CORP. (N)

Quar Sept 30: 1981	1980
Revenues $79,087,000	$75,851,000
Net income .. 1,862,000	1,468,000
Shr earns (com & com equiv):	
Net income .27	.22

13 wk Oct 2: 1981	1980
Sales $49,229,000	$49,434,000
Net income 1,116,000	761,000
Shr earns (primary):	
Net income .51	.34
Shr earns (fully diluted):	
Net income .50	.34
39 weeks:	
Sales 148,284,000	157,913,000
Net income 2,960,000	2,819,000
Shr earns (primary):	
Net income 1.33	1.27
Shr earns (fully diluted):	
Net income 1.31	1.26

SWANK INC. (N)

Quar Sept 30: 1981	1980
Sales $37,068,000	$38,887,000
Net income .. 2,336,000	2,703,000
Avg shares .. 3,377,448	a3,359,266
Shr earns:	
Net income .69	a.80
9 months:	
Sales 83,421,000	86,191,000
Net income .. 2,524,000	4,400,000
Shr earns:	
Net income .75	a1.31

a-Adjusted for a 10% stock dividend in January 1981.

TANDEM COMPUTERS INC. (O)

Year Sept 30: 1981	1980
Revenues $208,397,000	$108,989,000
Net income .. 26,549,000	10,687,000
Avg shares .. 37,025,246	a30,241,116
Shr earns:	
Net income .72	a.35
Quarter:	
Revenues 64,506,000	34,092,000
Net income .. 8,219,000	3,339,000
Avg shares .. 39,137,562	a31,848,378
Shr earns:	
Net income .21	a.10

a-Adjusted for a three-for-one stock split pain in June 1981.

Net income 2.51 | a2.69

a-Adjusted to reflect a 50% stock dividend paid in April 1981.

WISCONSIN POWER & LIGHT (N)

Quar Sept 30: 1981	1980
Revenues $107,666,000	$93,791,000
Net income .. 12,185,000	9,517,000
Shr earns:	
Net income .94	.72
12 months:	
Revenues 439,406,000	392,608,000
Net income .. 39,908,000	34,503,000
Shr earns:	
Net income 3.00	2.60

WTC INC. (A)

Quar Sept 30: 1981	a1980
Revenues $31,516,000	$29,127,000
Loss cnt op .. 152,000	228,000
Loss dis op	373,000
Net loss 152,000	601,000
9 months:	
Revenues 91,751,000	83,573,000
Loss cnt op .. 1,104,000	c368,000
Loss dis op	2,259,000
Net loss 1,104,000	1,891,000
Shares 2,327,608	2,107,915
Shr earns:	
Loss cnt op	c.17

a-Restated. c-Income.

ZONDERVAN CORP. (O)

Quar Sept 30: 1981	1980
Sales $16,960,357	$14,381,269
Net income .. 495,523	404,114
Shr earns:	
Net income .28	.24
9 months:	
Sales 47,667,350	35,853,517
Net income .. 1,171,608	1,004,289
Shr earns:	
Net income .68	.60

EF Hutton

Gene Ferraro
Account Executive

EF Hutton

EF Hutton & Company Inc
3 Girard Plaza Suite 1300
Phila PA 19102
Telephone (215) 972-1825/26

INVESTMENT SUMMARY 973

September 18, 1981

Tandem Computers Inc. (TNDM—29 Bid) *Gordon Casey*

Tandem Computers has achieved impressive business growth with an outstanding set of well differentiated products. We expect the company to be a major participant in the convergence of communications and data processing in the mid-1980s. We recommend purchase of the shares based upon the company's outstanding long-term outlook. We estimate earnings of $0.70 per share in the current fiscal year (September) and a strong gain to $1.00 per share in fiscal 1982. The company earned $0.35 in fiscal 1980. Over the period 1981 to 1986, we expect earnings growth to average 37% annually.

The information processing arena is currently undergoing dramatic changes. The once separate spheres of data processing, office products and communications are converging rapidly. Emphasis is shifting from individual hardware products to overall systems and the many subtle factors involved in their installation and implementation. This changing emphasis is expected to dramatically reshape the data processing marketplace bringing to the fore companies that can respond to the evolving opportunities. Tandem Computers is well positioned with outstanding products and an effective communication networking strategy. We expect Tandem to participate strongly in this rapid evolution.

G.S. Grumman/Cowen
Institutional Services

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Technical Publishing
a company of
The Dun & Bradstreet Corporation

1981/82 Mini/Microcomputer Conference

September 20–23, 1981

Pine Isle
Buford, Georgia

PROFILE OF THE U.S. SURVEY POPULATION

MANUFACTURER/ MODEL		QUANTITY REPORTED
NORTHERN TELECOM (SYCOR)		244
300 Series	*48*	
400 Series	*173*	
Other/Unspecified	*23*	
PERKIN-ELMER		544
50-55	*10*	
70/74	*35*	
Series 16	*28*	
5/16	*4*	
6/16	*39*	
7/16	*101*	
8/16	*14*	
7/32	*71*	
8/32	*66*	
3220 Unspecified	*55*	
3230	*9*	
3240	*18*	
Other/Unspecified	*94*	
PERTEC		70
PRIME COMPUTER		387
Prime 100/200	*32*	
Prime 250	*5*	
Prime 300	*15*	
Prime 350	*10*	
Prime 400	*65*	
Prime 450	*20*	
Prime 500	*15*	
Prime 550	*68*	
Prime 550-2	*5*	
Prime 650	*11*	
Prime 750	*102*	
Information Series	*16*	
Other/Unspecified	*23*	
RAYTHEON		143
RDS 500	*54*	
700 Series	*7*	
PTS Series	*62*	
Other/Unspecified	*20*	
ROLM		16
SEL		134
32 Series	*117*	
80 Series	*10*	
Other/Unspecified	*7*	

MANUFACTURER/ MODEL		QUANTITY REPORTED
TANDEM		130
NonStop I	*104*	
NonStop II	*11*	
Unspecified	*15*	
TEKTRONIX		81
TEXAS INSTRUMENTS		1,629
960 Series	*38*	
980 Series	*53*	
990	*429*	
990/1-2	*79*	
990/3	*2*	
990/4	*74*	
990/5	*6*	
990/6	*3*	
990/8	*15*	
990/10-12	*199*	
990/20	*16*	
990/30	*20*	
DS 990	*640*	
DXS	*7*	
700 Series	*13*	
Other/Unspecified	*35*	
3M (Linolex)		101
UNIVAC/VARIAN		244
BC/7	*38*	
1900/Cade	*25*	
9000 Series	*5*	
UTS Series	*16*	
520 Series	*2*	
620 Series	*14*	
V/71,72,73	*7*	
V/76	*9*	
V/77-200,-400	*4*	
V/77-600,-800	*26*	
V/77, Unspecified	*55*	
System 80	*5*	
Other/Unspecified	*38*	
WANG		561
2200 S.T., T	*169*	
2200 VP, SVP	*34*	
2200 LVP	*11*	
2200 MVP	*75*	
P Series	*8*	
VS	*105*	
OIS-5,25,30	*11*	
OIS-125,130	*5*	

SAME AS IN 1980 SURVEY
HARDWARE RELIABILITY THE TOP
FACTOR IN CHOICE OF SUPPLIER

MOST IMPORTANT SELECTION FACTOR

1978 SURVEY: PRICE

1979 SURVEY: VENDOR REPUTATION

1980 SURVEY: HARDWARE RELIABILITY

1981 SURVEY: HARDWARE RELIABILITY

- Vendor Reputation cited as second most important selection factor in 1980 and 1981 surveys.

FIRST-RANKED FACTOR FOR SELECTION OF VENDOR, 1981 VERSUS 1980

PRINCIPAL SUPPLIER	MOST CITED SELECTION FACTOR	
	1980 SURVEY	1981 SURVEY
Basic Four	Hardware Reliability	Hardware Reliability
Burroughs	Price	Price
Computer Automation	Hardware Reliability	Price
Data General	Price	Price
Datapoint	Price	System Modularity/Expandability
DEC	Vendor Reputation	Hardware Reliability
Four Phase	Hardware Reliability	Price
General Automation	Price	System Compatibility
Harris	Price	System Modularity/Expandability
Hewlett-Packard	Hardware Reliability	Hardware Reliability
Honeywell	Hardware Reliability	Hardware Reliability
IBM	Vendor Reputation	Vendor Reputation
Microdata	OP System Software	OP System Software
Modcomp	CPU Performance	CPU Performance
NCR	Field Maintenance	Vendor Reputation
Northern Telecom (Sycor)	Field Maintenance	Price
Perkin-Elmer	Price	Price
Prime	OP System Software	Price
Tandem	Hardware Reliability	Hardware Reliability
Texas Instruments	Price	Price
Univac	Field Maintenance	Vendor Reputation & System Compatibility*
Varian	Price	CPU Performance & System Compatibility*
Wang	Price	OP System Software
All Suppliers	Hardware Reliability	Hardware Reliability

*Ranked equally

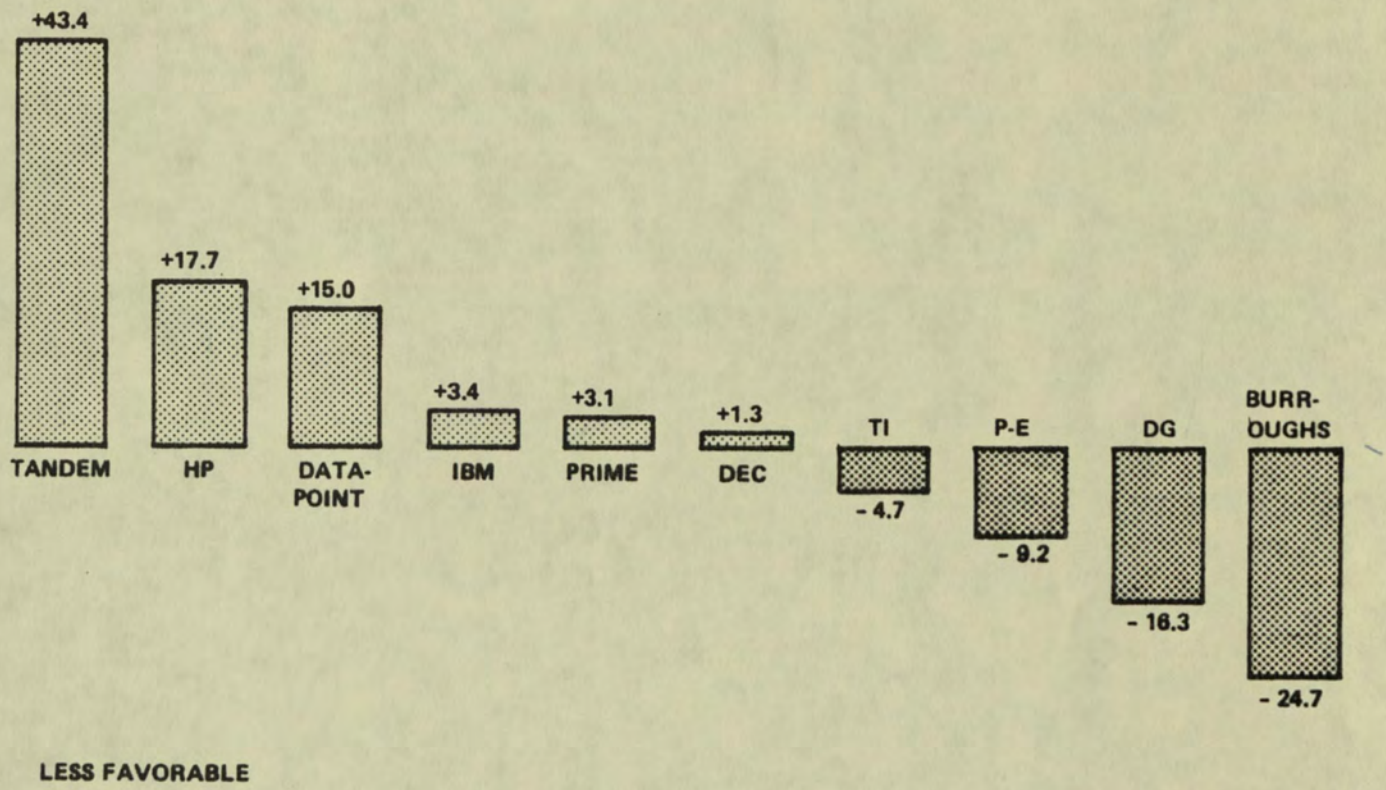
PERCENT OF SITES PLANNING/CONSIDERING VENDOR SWITCH, DISTRIBUTED BY CURRENT PRINCIPAL SUPPLIER

MANUFACTURER	1980 SURVEY	1981 SURVEY
Basic Four	16.9	32.7
Burroughs	29.6	27.0
Computer Automation	23.1	31.8
Data General	18.2	22.0
Datapoint	9.4	15.2
DEC	12.8	13.2
Four Phase	20.0	19.6
General Automation	53.8	60.0
Harris	24.6	30.0
Hewlett-Packard	10.6	10.7
Honeywell	17.9	21.4
IBM	11.9	12.8
Microdata	20.3	16.2
Modcomp	17.9	23.3
NCR	19.8	15.5
Northern Telecom (Sycor)	41.7	30.0
Perkin-Elmer	19.8	26.2
Prime	8.3	8.2
Raytheon	55.6	67.2
SEL	11.1	16.7
Tandem	6.9	0.0
Texas Instruments	14.5	18.3
Univac	22.6	26.7
Varian	23.3	38.5
Wang	15.6	19.3
Total Sites	17.2	18.6

- Impressively high degree of customer loyalty for **Tandem**
  - Consistently high also for **Prime, HP, IBM** and **DEC**
- Persistently low for **Raytheon** and **General Automation**
  - Most sizable negative shifts for **Basic Four** and **Varian**

NET PAST-YEAR SHIFT IN RESPONDENT ATTITUDE TOWARD CURRENT SUPPLIER

ALL SITES



DBMS USAGE PARTICULARLY HEAVY AMONG MICRODATA, HP AND TANDEM USER SITES

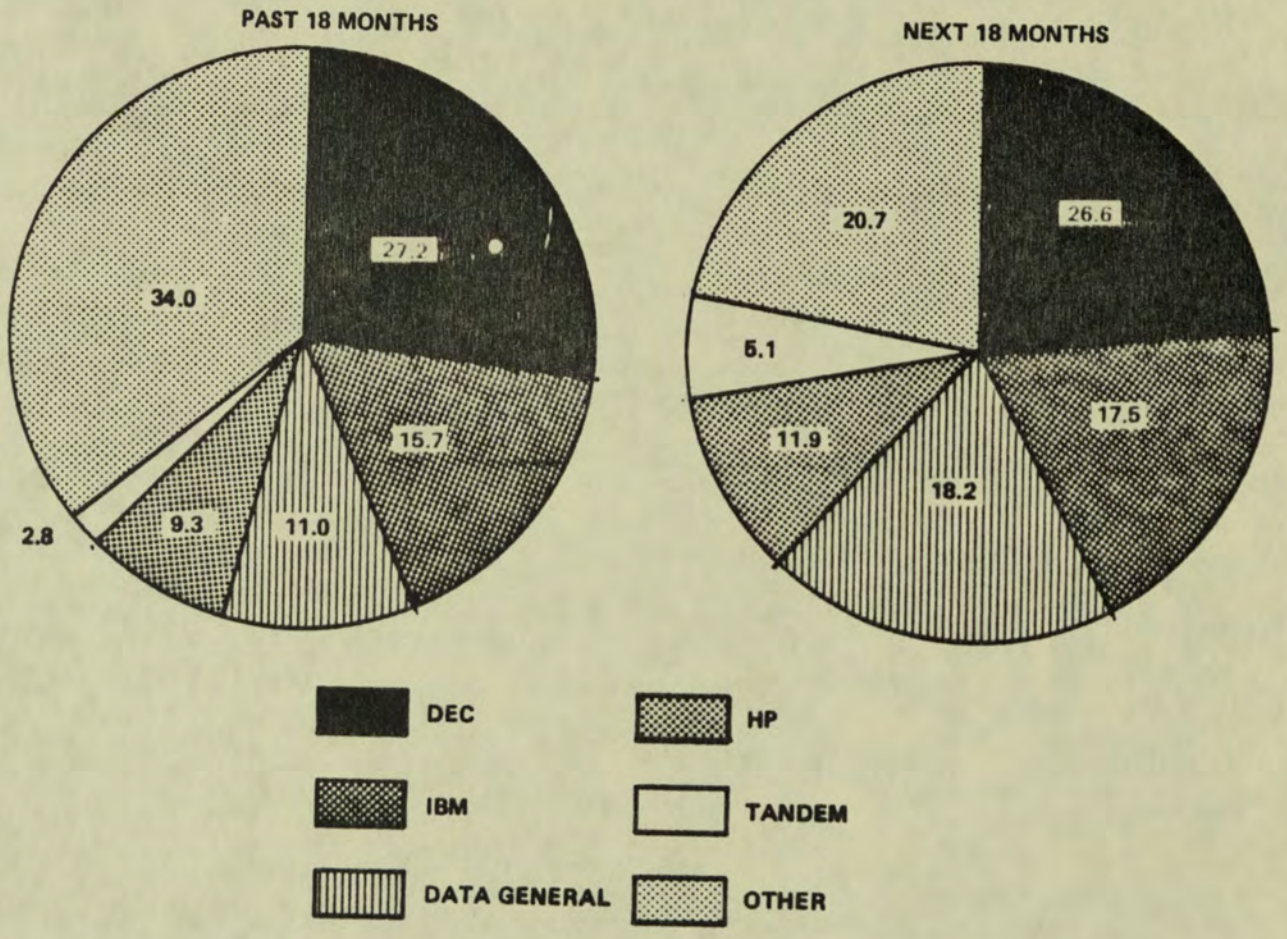
PRINCIPAL SUPPLIER	PERCENT OF SITES WITH DBMS	PERCENT OF SITES WITH NETWORK SOFTWARE
Basic Four	22.4	–
Burroughs	19.1	16.9
Computer Automation	27.3	9.1
Data General	24.6	7.0
Datapoint	14.4	12.8
DEC	26.9	12.0
Four Phase	10.1	7.1
General Automation	26.9	19.2
Harris	35.0	–
Hewlett-Packard	61.6	11.1
Honeywell	15.0	12.4
IBM	11.4	6.0
Microdata	73.9	2.9
ModComp	16.7	26.7
NCR	15.3	1.4
Perkin-Elmer	35.4	10.8
Prime	32.5	13.5
Tandem	56.7	36.7
Texas Instruments	17.1	8.6
Univac/Varian	36.4	15.9
Wang	15.3	2.8
All Sites	23.9	8.5

- High incidence of network software implementation among Tandem users also

SHARE DISTRIBUTION OF RESPONDENT MINICOMPUTER PURCHASES

TOTAL SYSTEMS

PERCENT OF INDICATED SPENDING (IN DOLLARS)



- Survey data suggest Data General rebound after unfavorable trend of past few years
  - Share expansion indicated as well for IBM and HP
  - Tandem shown as continuing to far outgrow the industry as a whole
  - Rising percentage for Perkin-Elmer also

TANDEM

MEMORANDUM

TO: DISTRIBUTION

DATE: 11-2-81

FROM: PAUL HANSEN

SUBJECT: TANDEM'S AWARENESS WITH TOP LEVEL MANAGEMENT IN U.S. CORPORATIONS

The advertising department has just completed four awareness studies. The results for the first two, Wall Street Journal and Business Week, are attached.

Background

The same questionnaire was mailed to 1,000 Business Week and 1,000 Wall Street Journal subscribers in the following positions: Chairman of the Board, President, Vice President and General Manager. Furthermore, they were selected for only those industrial categories that Tandem is interested in selling to. They were mailed and returned before the new corporate advertising campaign started.

The same questionnaire was mailed to 1,000 Computerworld and 1,000 Datamation subscribers who are MIS Directors and Data Processing Managers. The results of these two studies have not been tabulated. When they are I will share the results with you.

BUSINESS WEEK AWARENESS STUDY RESULTS

1. How familiar are you with the following companies?

	Hewlett Packard	Prime	Tandem	Digital Equipment	IBM
TOTAL RESPONSES	460	460	460	460	460
Very familiar	31.1	5.0	2.8	22.6	64.2
Familiar	30.4	7.2	4.6	26.1	23.9
Somewhat familiar	23.3	15.0	11.1	21.3	10.0
Know name only	11.5	17.8	22.4	17.0	1.5
Don't know at all	3.7	55.0	59.1	13.0	0.4

2. Which of the following products do you associate with these companies?

	Hewlett Packard	Prime	Tandem	Digital Equipment	IBM
Micro-computers	27.6	6.3	6.1	20.2	15.4
Mini computers	55.9	23.5	15.7	49.8	29.6
Business computers	42.4	15.4	10.2	37.6	78.9
Mainframe computers	11.7	4.1	3.7	15.9	76.3
Respondent familiar but no answer	11.5	8.5	12.2	11.7	1.1
Respondent not familiar	3.7	55.0	59.1	13.0	0.4

3. Based on your own personal knowledge or impressions, which of the following characteristics do you associate with the listed companies?

	Hewlett Packard	Prime	Tandem	Digital Equipment	IBM
Batch processing computers	15.7	8.0	4.6	20.4	58.9
Guaranteed 99% uptime computers	7.8	.9	8.9	6.1	23.5
On-line transaction processing computers	27.0	11.3	9.8	33.9	59.3
NonStop computers	5.4	1.5	7.6	6.1	23.5
Scientific computers	49.6	4.8	2.6	20.4	32.63
Modularly expandable computers	21.3	10.0	8.5	33.9	38.9
Respondent not familiar/No Answer	3.7	55.0	59.1	13.0	.4

4. Please check the one category which best describes the function you perform within your company. (Please check only one)

4.8 Chairman of the Board	5.2 Director
20.4 President	27.4 Vice President
8.1 General Manager	21.3 Production and operation
	10.1 Other

5. What kind of business is your company engaged in?

2.0 Mining	44.1 Manufacturing
3.3 Transportation	8.3 Wholesale trade
5.9 Retail trade	19.3 Finance
11.5 Services	2.0 Other
	.6 Refused/No Answer

WALL STREET JOURNAL AWARENESS STUDY RESULTS

1. How familiar are you with the following companies?

TOTAL RESPONDENTS:	318	318	318	318	318
	Hewlett Packard	Prime	Tandem	Digital Equipment	IBM
Very familiar	29.6	6.3	2.5	19.5	67.9
Familiar	29.6	6.0	5.0	20.4	22.6
Somewhat familiar	19.2	8.8	12.6	19.2	6.3
Know name only	14.8	17.3	22.0	19.2	2.2
Don't know at all	4.4	50.3	47.8	14.5	0.0
NO ANSWER	2.5	11.3	10.1	7.2	0.9

2. Which of the following products do you associate with these companies?

TOTAL RESPONDENTS:	296	122	134	249	315
	Hewlett Packard	Prime	Tandem	Digital Equipment	IBM
Micro-computers	39.5	8.2	9.2	20.9	27.9
Mini computers	53.0	48.4	32.1	55.4	45.4
Business computers	44.3	33.6	20.9	54.2	84.8
Mainframe computers	15.9	17.2	16.4	24.1	66.7
NONE OF THE ABOVE	10.1	12.3	25.4	5.2	1.3
NO ANSWER	4.1	15.6	18.7	6.8	1.0

3. Based on your own personal knowledge or impressions, which of the following characteristics do you associate with the listed companies?

	Hewlett Packard	Prime	Tandem	Digital Equipment	IBM
TOTAL RESPONDENTS:	296	122	134	249	315
Batch processing computers	19.6	17.2	8.2	26.1	57.1
Guaranteed 99% uptime computers	8.4	7.4	15.7	9.6	22.5
On-line transaction processing computers	26.7	29.5	17.2	38.2	63.8
NonStop computers	6.1	3.3	14.9	10.0	27.6
Scientific computers	48.3	13.1	5.2	26.9	34.3
Modularly expandable computers	21.6	21.3	19.4	31.7	38.4
NONE OF ABOVE	15.5	20.5	32.1	13.7	7.6
NO ANSWER	18.2	27.9	29.9	24.5	9.8

4. Please check the one category which best describes the function you perform within your company. (Please check only one)

TOTAL RESPONDENTS: 318

4.7 Chairman of the Board	12.6 Director
16.0 President	23.3 Vice President
20.8 General Manager	14.5 Production and operation
	8.2 _____ Other (please specify)

5. What kind of business is your company engaged in?

TOTAL RESPONDENTS

2.5 Mining	31.4 Manufacturing

2.5 Transportation

7.2 Retail trade

20.8 Services

4.4 Wholesale trade

17.6 Finance

OTHER

2.8 CONSTRUCTION

3.5 SALES

2.5 UTILITIES

1.6 GOVERNMENT

3.1 OTHER

American Banker September 9, 1981

Computer Drives Data Processing for Three Seattle Thrifts

Special to the American Banker

SEATTLE — Thanks to the use of the latest technology, the future has arrived ahead of schedule at Washington Federal Savings & Loan Association here.

In gearing for a new on-line transaction-processing system to handle management of branch-office information, the $700.9 million-asset Washington Federal and two other thrifts — the $244 million-asset University Federal Savings & Loan Association and the $293.6 million-deposit Puget Sound Mutual Savings Bank — are participating in a joint data-processing venture.

The three institutions estimated that the system they needed should be able to handle 12,000 to 15,000 transactions per day. With projected growth, this number might grow to 25,000 by 1985. So the system had to have the capacity to accommodate this growth.

One problem, however, arose. In 1981, the growth in the area and in Washington Federal's business has been greater than anticipated. The three partners, with 50 branches, have generated up to 33,000 transactions per day.

"Thanks to sound planning, evaluation, and selection of equipment, programming alternatives and a well-managed implementation," noted William A. Cassels, Washington Federal vice president and data processing manager, "the system we selected is not only coping with the unexpected growth, but is designed to handle virtually any degree of growth that might be encountered in the future."

Washington Federal was founded in 1917. Today it has some 200 employees, 22 branches in western Washington, and a high profit ranking in the S&L industry.

"Our teller-transaction-processing plan was to develop a concept that could handle the combined requirements of all three users, as well as their projected growth," Mr. Cassels said. Plans called for a system so organized that after an on-line period of three or four years, Washington Federal's two partners could buy a similar system of their own and switch over smoothly without any programming or interface problems, he explained.

For now, the jointly-owned data-processing center is at Washington Federal's main Seattle headquarters and consists of one four-processor Tandem NonStop system with two billion bytes of disk storage on 300-megabyte disk drives, two tape drives, and two high-speed line printers.

Links 240 Teller Terminals

This central system is linked to the 240 teller terminals in the 50 branches through eight phone lines with full duplex modems at each end.

Each teller terminal, developed by International Systems Corp., Spokane, Wash., consists of a keyboard, video display, and passbook/receipt printer. Typically, a branch will have three or four of these teller stations plus one administrative station.

"Although our tellers need some training," Mr. Cassels said, "our terminals are menu-driven for speed and simplicity. Each teller can identify the type of transaction via an English-language menu which is tutorial to the extent that it specifies the next step to be taken.

"Once the type of transaction has been determined, the teller then enters the account number and the amount," he added. The data are then transmitted to the central processor; the passbook is updated, or, if required, a receipt is printed, and the transaction is completed.

To reduce the burden on the central processors and at the same time provide the branches with increased processing power, the teller stations are "smart" terminals in that they can edit each teller's entry for valid data and compress these verified data into the shortest possible message.

Electronic Journal

In addition, each branch maintains an electronic journal which stores details of the previous three days' transactions for review, error tracing, and other administrative needs.

"Before adoption of the present on-line system," Mr. Cassels said, "we did what many financial institutions do. We used batch processing provided by a service bureau. Information was pulled together manually from daily reports and physically sent to the service bureau for batch processing on an overnight schedule.

"As efficient as our service bureau was, the batch-processing operation still resulted in information being a day old before our central administrative managers and the branches received it."

The new on-line system provides more information on a more timely basis, according to Washington Federal. Tellers formerly had to look manually through file cards, sometimes make phone calls to other branches, and check other sources before they could complete a single transaction, he recalled.

"Now they simply call up a customer's file on a display terminal screen, and in seconds they have complete, up-to-date information. The process has been reduced from minutes to seconds."

File Management

Overall file management is another major application of the Tandem system. Washington Federal has three primary files: a master file, a history file, and a name-and-address file.

The master file contains information on the current status of each account — current balance, dates of last transactions, interest, Social Security number, etc. The history file captures details of all transaction made for the past six months.

The system also allows flexibility, Mr. Cassels said, in operating procedures. For example, a teller can gain access

Continued from page 12

to any account by either account number or by customer name. In addition, any teller can call up and display any customer's history file. A single master file covers all three partners in the system; however, no single institution can gain access to files of their thrift partners.

"Although we do use Tandem file management software, we wrote most of the applications software ourselves," said Mr. Cassels. "For example, we used Cobol for our on-line applications programs. These include deposit, withdrawal, general ledger, mortgage loans, file maintenance, and inquiry."

For other nonspecific applications programs, the S&L used Tandem's Tal, or Transaction Application Language. Under this software umbrella, the institution created two programs. One is Termsyn, which controls each of the eight phone lines for sending transactions between tellers and processors under overall management of Tandem's data-communications software. The other program is known as Sysman — a systems management tool which helps route transactions by application to the proper processor module.

"Our next step will probably be implementation of Tandem's TMF transaction monitoring facility, which will help us maintain data-base consistency during concurrent transaction processing," the data processing manager said.

Washington Federal evaluated a number of systems before choosing Tandem. "In most cases, other systems would require frequent and expensive replacement of equipment as our needs expanded," Mr. Cassels noted. "The modular Tandem system permits growth without any software modifications and was available at a cost that compared favorably with either leasing or buying competitive systems."

20-Month Project

The design and implementation of Washington Federal's present system was a 20-month project. The staffing level resulted in this being a 10 man-year project. Mr. Cassels stressed that the S&L completed the project on time and within budget.

"Along with our 7 a.m.-to-7 p.m. span of on-line activity every working day, we still do a substantial amount of batch processing at night, using the Tandem system for this as well," he said. Batch processing produces hard copies of reports on file maintenance, journals, statements, and interest checks. In addition, the S&L produces management reports covering such items as account balances so that branch managers can spot trends, exceptions, or other transactions that they want to keep an eye on for any reason. This material is delivered to branch managers by messenger.

"All in all, our ability to provide the high degree of customer service we are aiming for has been dramatically improved," Mr. Cassels concluded. "We don't experience overloading, for example, since our system could respond in the unlikely event that all 240 tellers wanted to transmit a transaction simultaneously. Average arrival time per transaction processing is one per second, although in peak times, such as the first of every calendar quarter, it can go up to one and a half to two per second. Average time to complete a transaction, including printing a receipt or updating a passbook, is three to six seconds." ■

Broker Information Terminal System Termed

By George Fulmore
Special to CW

SAN FRANCISCO — In the competitive securities industry, the flow of information over the past decade has accelerated at an alarming rate. And all signs point to a continued acceleration. Brokers are concerned with more issues and the trend is to move further and further away from the emphasis on traditional stocks and bonds to an emphasis on diversified investment services, including tax shelters and various options strategies.

In short, because of the vast amounts of information required at a moment's notice, the securities industry is ripe for a computerized information inquiry system. And in San Francisco, the Sutro Group, a diversified financial services organization with 14 branch offices in California and Nevada and nearly 200 brokers, described its Broker Information Terminal System (Bits) as the securities industry's "system of the future."

Bits Goes On-Line

Designed, developed and now maintained and operated for Sutro by Computer Systems Design, Inc., also a San Francisco-based firm, Bits went on-line in February 1979, giving Sutro managers and brokers direct access — via desktop video display terminals — to a broad range of marketing and customer account information.

At Sutro, Bits is implemented on terminals provided by Quotron System, Inc. The result is that information such as current prices of stocks on the various exchanges, the Dow Jones averages and business news summaries are available from the same terminals that provide Bits information, such as the available purchasing power, current positions (holdings of stocks and bonds) and recent transactions for any customer account.

Other valuable information available from the Bits data base includes listings of a broker's customers who hold positions in specific securities, bulletins from the firm's product line departments or its research department, Standard & Poor's stock reports for any of approximately 3,600 listed securities and even a glossary of securities-related terms.

Broker Productivity Studied

What all these inquiry functions and others add up to is improved customer service plus increased broker productivity, according to Sutro's director of planning, George H. Baldwin, who recalls the impetus to develop Bits.

"In 1977 Sutro asked our accounting firm to do a study of broker productivity," he said. "What they did was basically a time and motion study, and they discovered that the reason brokers were not more productive was that they spent a lot of time walking around, away from their desks, not talking on the phone.

"What they found brokers to be doing was walking around getting information. Based on this study, we concluded that we could achieve a substantial increase in broker productivity by bringing the information that the broker needed to the broker's workstation."

It has been two years since Bits was implemented and Baldwin reports: "We think that the underlying assumptions that we made when we created the system are more valid now than ever. This is an information-intensive business and it is going to become an even more information-intensive business. Right now our product line is so complicated that a broker can't possibly memorize everything that we can offer his client."

Integrating Bits into his daily routine — as a definite factor in his productivity as a securities broker — is

'System of the Future' by Securities Firm

Randy V. Rosso, a Sutro vice-president. Having been at Sutro for nearly 23 years, Rosso has been in the securities industry long enough to remember the days when his job required literally "living on the phone with the margin clerks [in order to get up-to-date customer account information]." Today, however, all the customer account information he needs is as close as his Bits terminal.

Using Bits Functions

A typical day for Rosso today begins with his logging on the Bits system and receiving a list of the "Front Page News," or a list of titles for the 40 bulletins that most recently have been entered to the system's data base by one of Sutro's product-line managers or its research department.

After displaying and reading through any of these that are new to him, he then uses the Rank function to rank the usable buying power and available cash as of that day for his customers. Next, he uses the Customer Information (Cust) function to check that all previous day trades by his customers are listed as completed transactions. "If I don't find something in the customer's record of transactions that should be there, I find out why," he said.

Throughout the day, Rosso makes use of other functions, such as the commission calculator that calculates and displays commissions on a single- or multiple-execution order or the options yield calculator that calculates and displays the approximate yields from proposed options strategies.

But in addition to the various Cust functions, it is Standard and Poor's Automated Research (Spar) function that Rosso finds most valuable, especially when he gets a call from a customer who wants information on an issue about which Rosso knows few details. In such a case, he quickly brings the Spar series of displays for that issue to his screen, scanning through them to collect the information that he needs to advise the customer.

"Prior to the time Bits has been around it was a lot more cumbersome to get something like that done and took a lot more 'leg' work," he said.

"Bits saves me a tremendous amount of time and that is what productivity is all about. It also makes a broker look damn smart to a client, because all his account information and just about any information about an issue is literally at his fingertips. A client can ask you just about any question he wants, and 'bing, bing, bing,' you have the answer for him."

Tandem/16 Hardware

Computer Systems Design (CSD) senior technical consultant, Bob Fyles, was involved in the early phases of Bits development, including the installation of the Tandem/16 computer system as the system to develop and support Bits.

The current hardware configuration includes three CPUs, which have 960-, 868- and 480K bytes of memory, respectively. There are six Tandem 200M-byte disk drives and two tape drives and the system supports approximately 400 terminals.

"Among the major factors that we were looking for when we selected the Tandem," Fyles said, "were the reliability of the hardware, the ability to upgrade the system in a modular fashion and the feature of 'fault tolerant' Tandem Nonstop processing. We wanted a system that was on-line transaction-oriented and was fast.

"Our response time for a Bits inquiry is less than two seconds now on a system that performs thousands of transactions per week plus supports a variety of systems other than Bits. And the Nonstop feature of Tandem is all they say it is. We have had a history of excellent reliability."

But along with all the success of the system, director of planning Baldwin pointed out an irony: "We're so far ahead of everybody else that some of our own people don't know what they're sitting on," he said.

"Where we have achieved the greatest results is with brokers who come from other brokerage firms. They think it is the greatest thing since sliced bread. We know that several million dollars worth of production has come into this firm because of the Bits system.

"The next thing that we want Bits to provide is a highly sophisticated order-entry system that will eliminate all the problems the firm has now with its semiautomated system," Baldwin added.

"That's being developed right now. After that we will be able to provide our biggest customers with terminals in their homes where they can dial up Sutro through an acoustical coupler, get their own margin information and enter their own trades. That will happen within three years."

Fulmore is a technical writer with Computer Systems Design, Inc.

Ofc. copy

MANAGEMENT

A fresh crop of 'fail-safe' computer firms

Tandem had the field to itself for four years as sales soared past $100M a year. Now 4 new competitors eye a potential market of $700M

The pioneer in redundant computer systems, Tandem Computers Inc., racked up dramatic sales increases in the past four years: Revenues were $7.7 million in 1977, $24 million in 1978, $56 million in 1979, $109 million in 1980 and $144 million in the first three quarters of 1981. With numbers like those, it was only a matter of time before additional startups, backed by venture capital, also entered the market.

The new companies, which design redundant products that, like Tandem's, minimize computer downtime, include August Systems Inc. in Beaverton, Ore; Parallel Systems Corp. in Englewood Cliffs, N.J.; Stratus Computer Inc. in Natick, Mass.; and Synapse Computer Corp. in Milpitas, Calif. All four companies employ multiple central processing units and associated peripherals. If one CPU goes down, the others continue to function.

$700M market and growing

The United States market for commercial applications in which a system absolutely cannot fail—such as nuclear power-station monitoring—is only $30 million to $40 million a year in current shipments, estimates Kenneth Bosomworth, president of International Resource Development Inc. in Norwalk, Conn. But the market for which a multiprocessor system is an "attractive feature" is $600 million to $700 million in current U.S. shipments, and growing, he says.

According to Bosomworth, Tandem currently supplies about one-third of this market, including niches in transaction processing, data acquisition, telecommunications and, to a lesser extent, process control. Another third is controlled by systems houses that buy computers—typically from Data General Corp., Digital Equipment Corp. and Prime Computer Inc.—and configure their own multiprocessor systems. The last third is controlled by computer companies whose reputations are generally in other areas but which nevertheless know how to hook up two computers in a dual-processor system—*a la* Tandem—for fail-safe applications. This group includes Harris Corp., Modular Computer Systems Inc., Perkin-Elmer Corp. and Systems Engineering Laboratories Inc.

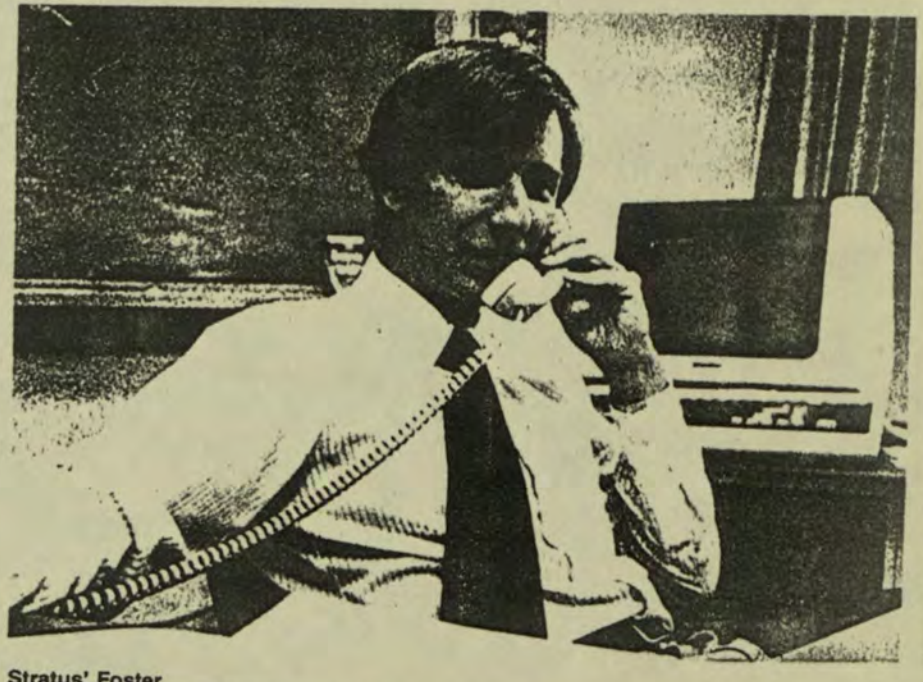
Hewlett-Packard Co., from whose ranks Tandem's founders hail, is also "looking into" redundant systems, "but to this point we've never seen the need to make a nonstop system as Tandem [with its trade-marked NonStop system] defines it," an HP spokesman reports.

Other minicomputer companies such as DEC would also like to get into this largely unexplored market, suggests Stratus president William Foster. But they all have the same problem, he says: "backward compatibility with the stuff they've been doing for years and years." Backward compatibility is also a problem for Tandem, Foster contends. "They're a $200 million company with 300 customers. They do a very large amount of repeat business. The pressures on them to be backward compatible with mistakes they've made years ago is very, very strong."

The only way to take advantage of 1981 hardware "is to throw out everything you did in the past and start from scratch," Foster asserts.

Focus on transaction processing

Three of the startups have targeted transaction processing as their system's primary market, currently dominated by Tandem. Stratus' 32-bit system, aimed at large-scale commercial accounts such as banks, insurance companies and reservation systems, will be available at year-end, priced from $100,000 to $1 million. Shipments should begin in early 1982, Foster says. A former vice president of software development at Data General and manager of computer



Stratus' Foster

Promising unique architecture and comprehensive software, Foster says his product will hit the marketplace in early 1982

systems engineering at Hewlett-Packard, Foster notes that his system will rely "more heavily on hardware than it does on software to achieve reliability," but that "we will have more software on the initial release of our product than any manufacturer has ever had," including International Business Machines Corp.

Co-founders with Foster in the 17-month-old venture include Robert Freiburghouse, past president of Translation Systems Inc., a software supplier, and Gardner Hendrie, a former Data General engineering director who, while at Honeywell Inc., developed the first 16-bit minicomputer. With 40 employees already on the payroll and plans to hire 40 more, Stratus has already raised some $6.7 million in capital from Business Development Services Inc. (General Electric Co.), Charles River Partnership, Hellman Ferri & Co., Institutional Venture Partnership, Merrill Picard Capital (Bank of America), Olivetti Corp. and The Palmer Group.

Although the marketplace now belongs to Tandem, Foster predicts that Stratus will run up more frequently against IBM primarily because of the computer giant's large installed base, a sentiment shared by officials at Synapse.

With 43 employees, Synapse is "one or two years" away from a product, reports Mark Leslie, president and former western area director for Data General. "We're looking only at the transaction-processing market," he says. His system, employing 32-bit machine architecture but with a 16-bit internal processor, will offer "a wide range of performance," Leslie says. It will also offer "very unique software in the areas of operating systems, database and transaction processing," he promises.

600-megabyte storage

"We're looking at a standard array of disks," Leslie reports, "but I would say that rather than being in the 80-megabyte range, we'll be probably more in the 160- to 600-megabyte range."

Leslie co-founded Synapse a year ago last month with Stanton Joseph, former director of federal marketing at Data General; Stanley Meresman, former vice president of finance at Verbatim Corp.; and Elliot Nestle, past western development director for Perkin-Elmer Corp.'s Computer Division (Interdata). The new firm so far has raised $7.8 million in financing from a series of investors. They include a venture-capital group headed by Jesse Aweida, founder and chief executive of Storage Technology Corp.; Bessemer Ventures; Burr, Egan, Deleage & Co.; Hambrecht & Quist; InterWest Partners; Merrill Pickard Capital; a group headed by L.J. Sevin, founder and former chief executive of Mostek Inc., and Benjamin Rosen of Rosen Research Inc.; Sofinnova; Technology Venture Investors; and WestVan.

Started last spring with an undisclosed amount of capital from unnamed investors, Parallel Computer Systesm is also designing a high-speed 32-bit machine with multiple-megabyte memory for transaction processing. It will probably be available in 1½ to 2 years in an expanded price range.

Transaction orientation

"We recognize the very large need for transaction-oriented systems," says Emmanuel Wittels, president. "We studied the IBM transaction-type system and the Tandem type and saw the bottlenecks and inefficiencies in performance and throughput. But in our architecture, we feel we've optimized our systems for maximum performance and efficiency."

Wittels, a past vice president of the computer systems division of Avionic Products Engineering Inc., once the producer of the Word Stream word processor, says his system will offer "a comprehensive software package" and will be equipped with virtual memory, a capability that will allow users to run programs that are larger than main memory.

Co-founder with Wittels in the venture is Philip Messinger, a Wall Street investor and cofounder of Alpha Numeric Inc., which later sold it product line to the Autologic division of Volt Information Sciences. Parallel will initiate a second round of private or public financing in "the next year or two," Wittels predicts.

Parallel's Wittels

The latest company to surface in the redundant systems marketplace, Parallel is 1½ to 2 years away from product introduction

Also working in redundant hardware is August Systems, but according to David Willoughby, president, the company is "not targeting Tandem's market." Instead, August is aiming its initial products at industrial and commercial process control, a $1.5 billion marketplace that requires altogether different types of packaging, software and hardware sizes. The three-year-old company recently introduced its first product, the Can't-Fail fault-tolerant computer line, which employs three central processing units, each featuring an Intel 8086 16-bit microprocessor. The CPUs "vote" to verify correct data, detect incorrect data and arbitrate results. Pricing the system at about $30,000 in a minimum configuration, plus an additional $6,000 to $90,000 for the process interface, the company expects to produce 28 of the machines by year-end.

"We've come up against Tandem two or three times in the marketplace," Wensley reports, "and almost always in large installations in which both types of equipment would be used. But let's not say anything about the future. We don't know which way they're going."

Tandem, meanwhile, introduced its fourth generation of equipment, the NonStop 2, in April. The pioneer is not particularly worried about its new competitors. "Best of luck to them," says David Mackie, vice president for marketing operations. Given Tandem's seven-year lead and its astounding growth rate, Mackie contends that "unless we screw it up internally, I don't see how anyone can catch us."

AL FURST

August Wensley

Using fault-tolerant technology, Wensley is targeting the process-control market

TANDEM

MEMORANDUM

TO: FIELD SALES PERSONNEL
DISTRIBUTORS

DATE: OCTOBER 2, 1981

FROM: PAUL HANSEN
ADVERTISING MANAGER-MARKETING COMMUNICATIONS
CUPERTINO

SUBJECT: NEXT AD REPRINT IN SERIES OF TESTIMONIAL ADS

Attached is a copy of the completed Security Pacific ad and a detailed write-up of the Security Pacific application.

You may order additional copies of this reprint by completing a Literature Request Form and returning it to this office.

Still to come is the Motorola ad which you can expect around the end of October.

If we have missed any sales people in your office, please contact Christine Collins, Marketing Communications, so that we may ad them to our distribution list for future information.

3 each

SECURITY PACIFIC NATIONAL BANK
Automated Loan Collection

Security Pacific National Bank is the tenth largest bank in the U.S., with $30 billion in assets. Security Pacific maintains over 600 branch offices throughout the state of California, with headquarters located in Los Angeles.

Problem:

In 1979, Security Pacific started looking to acquire a computer system and application software for use by the Security Pacific Consumer Leasing Division; loan collection was planned as a secondary application. However, by the end of 1979, the leasing market declined while, at the same time, high escalating interest rates necessitated better control and accounting of loan activity (home improvement, installment loans, and charge cards). Since outstanding money was suddenly worth 20%, loan collections became a high priority.

Debt collections were handled manually at each of Security Pacific's 600 offices, and at collection centers. Loan information was scattered in tickler files and on ledger cards. Not only was the paperwork cumbersome but by the time information was collected and compiled for a summary report, the data was out-of-date.

The bank decided to centralize all collections to six regional adjustment centers in northern and southern California and a charge card center. The six centers would communicate with a central system and data base in Woodland Hills via a terminal network. The charge card center would be housed at the Woodland Hills facility.

Alternatives Considered:

The main criteria for system selection were: cost, system reliability, backup capability, data base management, peripheral or memory limitations that would inhibit growth, system software, vendor support, and data communications capability. Secondary considerations included ease of use, documentation, and the ability to generate management reports.

"We first looked at packaged systems with the application software already developed," reports Harold Einstein, Vice President, Security Pacific,"but none provided the data base management, system reliability, and modular expandability that we needed. Although the system wouldn't run 24 hours a day, it was imperative that it be operational during working hours. Once business was committed on-line, we could not tolerate interruptions due to downtime. It's funny ... customers can understand telephones being down, but not computers.

They will tolerate a delay in paperwork, but get annoyed at delays caused by a computer."

"Since we rejected packaged systems, that meant we would be writing our own programs. Software tools to help develop applications then became important."

When a Request for Quote was generated for the leasing system, eight computer companies submitted bids. The project management team chose five semifinalists -- DEC, Hewlett-Packard, IBM, Datapoint, and Tandem -- for detailed comparative study. Based on this, Tandem was selected. Eventually when collection became high priority, Tandem was again compared to various other computer alternatives and still judged to be the best.

Why Tandem?

"It was not the least expensive in terms of hardware, but when you looked at five-year life cycle costs (research and development, investment, and operating) Tandem was the lowest. Also, Tandem was the only vendor that had an off-the-shelf fault-tolerant system for the continual availability that we needed."

"The deciding factor was Tandem's superior system software for applications development," continued Einstein. "Since we didn't want to reinvent the wheel, we used all the Tandem software available. Before we started the project, I was told application design/development for the basic collection system (i.e., the system that met the user's specifications for the regional adjustment centers) would take four or five people at least two years. In reality, with three programmers, we did it within nine months."

The Tandem Solution:

Security Pacific has a six-processor NonStop system with mirrored discs at the Woodland Hills headquarters. This supports 80 local terminals for charge card, 170 remote terminals (point-to-point) in the regional centers, and 10 printers. The system was installed in its permanent location in December 1980, and ready by January 1981. The following month the regions went on-line one at a time.

There are over 1,500,000 accounts on disc, and at any given time, roughly 80,000 of these are delinquent or "active." Each record is 300-500 characters in size. The system handles over 100,000 transactions a day, half of which are data base updates. Each transaction that involves the retrieval of a new account requires about 22 data accesses and takes an average response time of five seconds.

The current system consists of 420 application programs, all less than 64K to take advantage of parallel processing across the Tandem multi-processor architecture. There are also 77 user screens, (the original 40 screens were developed within 1-1/2 months using PATHWAY).

Application design and development of the basic collection system were done by three programmers with just one week of NonStop system training; the detailed

design took 10 man-months, and programming 15 man-months. All programs are written in COBOL. "One person who was not a programmer became interested in programming after attending the one-week Tandem training," explained Einstein, "so I sent her to a COBOL class at UCLA. Before she even finished the course, she was programming on the NonStop system."

Staff members at the regional centers were trained in two days. For the first three days of operation, Security Pacific continued the manual paperwork as a backup, but when it soon became apparent that everything was running smoothly, the manual backup was eliminated.

Current Applications:

If a loan payment is five days overdue, the account becomes "active" in the collection system data base. When payment is 15 days overdue, the Tandem system sends the information to the appropriate collection center where a financial consultant attempts collection. While talking to the customer on the phone, the consultant has the complete account history on the terminal in front of him/her. If a customer responds with "the check is in the mail," the consultant can instruct the system to recall the account again if no entry is posted within the next 2 or 3 days.

The Tandem system is also linked to Western Union for automatic generation of collection letters.

After loan collections were operational, Security Pacific added lease accounting, general ledger, accounts payable, program development/documentation system, and word processing. Eventually, the Tandem system will also handle consumer loan recovery and loan charge-offs.

Benefits of the Tandem System:

"The first six months on-line at the adjustment centers increased delinquent loan collection efficiency by over 100%, and that figure may go as high as 150% after all enhancements are fully implemented," commented Einstein.

The increased productivity resulted mostly from elimination of paperwork and greater labor efficiency. "We reduced financial consultant's paperwork 95%. One regional center now accomplishes more work, with 1/3 fewer employees. At the six adjustment centers, the number of effective collection calls a day jumped from 7,425 to over 16,500 with less people, however." In addition, Security Pacific's overall delinquency ratio and loan charge-offs have dropped considerably.

Centralization of debt collection data is a tremendous asset to senior management. Bank executives now obtain information that's current within 24 hours. More importantly, they can spot early trends, such as delinquency in a particular loan class or in a particular region.

What about system availability? Has the NonStop system lived up to expectations? "So far, the system has never gone down by itself although it seems

like we've tried to destroy it a few times. For example, while the system was stored temporarily in a basement, the air conditioning failed one weekend. When we came in on Monday morning, despite the heat, the Tandem system was still running."

"Another time we had a brownout that lasted over an hour. The NonStop system went down for less than 60 seconds, then came right back up with its battery backup power. The other computers in the same facility died, and three days later we still had problems with some of them."

In its company newspaper, Security Pacific projected a $4 million savings by the end of the first full year of collection system's operation due to the more efficient delinquent loan collection operation. In other words, the Tandem NonStop system paid for itself within eight months.

"At Security Pacific, the bottom line on our **Tandem NonStop™ System** is projected to be $4 million per year savings in collection operations; system payback complete within eight months."

Hal Einstein, Vice President,
Security Pacific National Bank.

"Our Tandem NonStop System has increased delinquent loan collection efficiency by over 100%. Before we installed the system, each of our 165 financial consultants placed an average of 45 effective calls per day; that figure has now jumped to over 100 per day.

"Now that the system has been installed, the overall delinquency ratio and loan charge-offs have gone down dramatically. It's a direct result of having up-to-the-minute accurate information at our people's fingertips. Paperwork is no longer misplaced; we reduced financial consultants paperwork 95%. No more handwritten follow-ups; no more files in transit and difficult to locate or assess as to current status.

"The Collection Automation System is currently installed at six adjustment collection centers; it was designed and developed in nine months by three programmers instead of two years by four or five people normally expected for such an undertaking. And staff member training was completed in two days at each center, with no previous experience.

"With demonstrably more capability and productivity per employee, we will get everything we were looking for in our Tandem. On line ahead of schedule. Under budget. And system payback complete within eight months after full implementation."

The NonStop System. Uniquely suited to on-line transaction processing where continuous availability is critical to your business operation. Up-to-the-minute information at your fingertips, on a continual basis, without fail. To help you run your business better.

The NonStop Company. Tandem. Fully supported by a worldwide sales, training, service and manufacturing organization.

For information on how a Tandem NonStop System can improve your productivity or your P/L statement, call your local sales office or Tandem Computers Incorporated, 19333 Vallco Parkway, Cupertino, California 95014, U.S.A. Toll Free 800-538-3114 or (408) 725-6000 in California.

TANDEM
NonStop Computing Systems

F.Y.I., Mike

COMPUTERS

The push for fail-safe systems

Eastern Air Lines Inc. stands to lose as much as $20,000 a minute in lost ticket bookings if its computerized reservations system breaks down. Merrill Lynch, Pierce, Fenner & Smith Inc. could drop $50,000 on just one wheat futures order during a 20-minute computer outage. Businesses all over the country are becoming more vulnerable than ever to a loss of computer power. "Computer failures show up in the company's profit and loss statement," laments Frank M. Heinzmann, Eastern's vice-president of computer and communications systems.

Not too long ago, the only way for a company to make sure that such costly breakdowns did not happen was to buy two complete computer systems—one to handle the work and the other as a backup in case the first system failed. Eastern, for example, needs three computers to run its reservations but has three more of the giant systems standing by in case of a breakdown.

Tandem Computers Inc. was the first manufacturer to offer a system that eliminated the need for a user to buy two separate computers to ensure that the system would always be operating. The Cupertino (Calif.) company found a ready market: It has doubled its sales each year since it shipped its first Non-Stop computer in 1975. The Tandem system teams up two or more computers that share the work load and take over for each other in case one unit fails. The demand for such reliable computers is growing so fast that Tandem expects its revenues to soar from $109 million in 1980 to $1 billion by 1985. "A great majority of users are recognizing that continuous availability of computers is something they are willing to pay for," says Michael P. De Santis, a computer industry analyst at San Francisco's Robertson, Colman, Stephens & Woodman.

August System's Willoughby and Can't Fail model: The market is "just waiting to be tapped."

Encouraged by Tandem's spectacular success and by the declining cost of computer hardware, several startup companies are incorporating subsystem redundancy in the design of their new computers to make them more reliable. "The underlying need is there just waiting to be tapped," says David W. Willoughby, president of August Systems Inc., a company that in August began to ship its own Can't Fail computer. "Over time," comments Richard J. Matlack, a vice-president at Dataquest Inc., a Cupertino market research company, "everyone is going to want [these reliability] features."

Built-in spare parts. Not to be left behind in this rapidly changing marketplace, an increasing number of established computer makers are adding backup parts to their machines.

Sperry Corp.'s Univac Div., for example, has put duplicate circuitry into the crucial arithmetic section that is the brain of its year-old 1100/60 computer. This and other features will give Sperry customers "greater on-the-air time in the future," according to Vincent M. Donovan, who is vice-president of customer and marketing support. Similarly, Prime Computer Inc. is redesigning its computer systems to include built-in spare parts for all vital functions. "If a chip goes down," explains Thomas A. Jordan, a product manager, "there's another chip right next to it to take over its function."

For the new computer startup companies such as August Systems, it is easier to build redundancy into their machines because they do not have to make their computers compatible with existing product lines. As a result, they can take greater advantage of new technology that allows them to combine two entire computers in one machine. August System's new computer, for instance, is really three computers in one system, yet the Salem (Ore.) company estimates that its starting price of $50,000 is only 40% higher than the price of a comparably powered minicomputer system containing just one computer. And Stratus Computer Inc., which was founded in 1980, plans to roll out a so-called super minicomputer next year that features a dual-computer design.

The demand for such computers is expected to continue to soar as more companies automate their offices and factories. "As you get highly paid white-collar professionals [depending on] a system, the cost of [the computer] being down is very high," explains John P. Morgridge, marketing vice-president at Stratus. And as computers take on more of the load in running oil refineries and power plants, the cost of a breakdown could become even greater. A computer

Information processing / CONTINUED

failure in such instances "could cause an oil spill or another Three Mile Island," says August System's Willoughby.

Despite the potential for costly delays or even disaster from a computer breakdown, not all manufacturers are convinced that redundancy is necessary. "It is not terribly price-effective," argues Seymour Kraut, vice-president and general manager of field engineering at Honeywell Information Systems Inc. Instead, he says, "the premium is on design and building it right the first time."

To accomplish this, Honeywell is replacing defect-prone wiring in its latest line of computers with printed circuit boards and more complex integrated circuits that include more of the connections on the chips. Similarly, Amdahl Corp. has cut the number of circuit boards from 55 in its 470 computer to 12 in its new and more powerful 580 series.

Chief selling point. As the reliability of all computers increases, customers are beginning to demand higher performance from the peripheral storage devices, terminals, and communications links that are vital to reliable operations, especially when the data processing is being done by a remotely located computer. American Express Co., for example, has more than 45,000 credit authorization terminals attached to its computers; if the communication lines fail, the system becomes useless. To make sure such problems do not happen, Amex is currently installing equipment that automatically reroutes calls around any out-of-service lines. Rockwell International Corp. now spends $100,000 a year to lease duplicate communications lines between many of its Southern California offices. This investment, says Lawrence E. Manly, vice-president of operations, "has a payback if the main line fails only once a year." For this reason, "reliability will be a major part of the [communications customer's] purchase decision," says William J. Moody, a general manager of industry sales for the Long Lines Dept. of American Telephone & Telegraph Co.

As computer makers proliferate, reliability will increasingly become the industry's chief selling point. Hewlett-Packard Co. and Wang Laboratories Inc. already sell computers that are guaranteed to work 99% and 98% of the time, respectively. Predicts Prime's Jordan: "That approach will [soon] be inevitable across the industry." ■

THE WALL STREET JOURNAL, THURSDAY, NOVEMBER 5, 1981

Now the Latest In Computers Is 'Fail-Safe'

By William M. Bulkeley
Staff Reporter of The Wall Street Journal

Companies that depend on computers get hurt when their computers go down. The risk can be averted, but only at great expense, by employing *two* computers, one of them as a back-up that can go into action if the first fails. Now entering the market, however, are systems that computer engineers believe are practically fail-safe.

Tandem Computers Inc. introduced the first one, its NonStop system, in 1976. The company says NonStop has become a phenomenal success. Tandem's success has attracted other entries into the fail-safe market. Stratus Computer Inc., a new company based in Natick, Mass., yesterday introduced its own "fault tolerant" system, and another new Natick company, Sequoia Systems Co., plans to develop a similar one by 1983.

The market for super-reliable computers could become large. Strategic Inc., a San Jose, Calif., market research firm, estimates that sales of what it calls survivable systems reached $75 million last year and will grow at a compounded rate of 45% a year for the next six years to reach $1.44 billion in 1987.

Comparable Prices

Tandem prices its NonStop around $190,000 and upward; Stratus prices will begin at $123,350. The prices are comparable with those on other minicomputer systems with similar performance.

"Our objective is to make the computer as reliable as the telephone," says William Foster, president of Stratus. Interactive computing, in which a user employs a terminal to communicate directly with a data processor, has increased the interest in systems that don't go down, he says. Interactive systems are becoming widespread in offices, factories, stores and banks.

That has made business more dependent on the computer; when the system fails, it's much like halting a factory assembly line. Airlines can lose reservations and customer good will; banks can lose funds transfers and large sums of interest.

Pitney-Bowes Corp., the postage-meter company in Stamford, Conn., started using a Tandem system in 1979. Pitney-Bowes was marketing a remote postage-meter resetting system by which a computer could increase the amount of postage available to a user by telephone line. The service required approval of the U.S. Postal Service, which demanded reliability. Customers also wanted assurances of reliability. Pitney-Bowes says the Tandem it installed is up "over 99.9% of the time," far greater than the big Univac that the company uses for most of its corporate data processing.

No Crashing

Knight-Ridder Newspapers Inc.'s commodity news service in Kansas City, Kan., uses a NonStop system to collect and edit reports from its news bureaus and direct the news to subscribers. "We can't have something that will go down," says Carl Arbers, director of systems operations. Since September 1980, he says, unscheduled downtime has totaled only three-and-a-half minutes, and that was caused by power failures. "Reporters never lose their copy because of system crashes, either," he asserts.

Telecredit Corp., Tampa, Fla., verifies checks and credit cards for stores equipped with small computer terminals. Telecredit installed a Tandem computer, says David Hatala, manager of communications, because if the system stops "our business stops."

Fred Meyer Savings & Loan Association, a Portland, Ore., subsidiary of American Savings & Loan, bought a Tandem system for its automatic tellers. The Tandem also backs up the S&L's main computer to allow human tellers to serve customers when the main computer, an International Business Machines Corp. processor, goes down. The Tandem, says Gerald Neuburger, systems programming manager, is down "four to five hours a year. With the mainframe, we're probably down that much a week."

Lots of Redundancy

Tandem manages its reliability by making use of multiple storage and processing units that can perform their own chores as well as take over if another unit fails.

Stratus' new computers, the first of which is scheduled for delivery in January, employ low-priced, high-performance circuitry to duplicate every function in the computer. So much redundancy, or duplication, is wired into the computer that a customer can remove and replace a circuit board while the system hums along.

Despite its reliability, Tandem's NonStop has gone into relatively few data processing locations. Gerald L. Peterson, director of marketing, says part of the trouble lies in establishing Tandem's credibility, because it is a relatively new and unknown firm. Many customers, he says, have bought NonStop systems to try in new operations instead of taking a bigger step and replacing existing systems with NonStop. And airlines, which require high reliability, haven't yet bought NonStop. "They have a tremendous investment in their mainframes," he says, "and the software that runs those systems. No airline is going to move real fast to make big changes there."