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## ENGINEERING SERVICES

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The organization now known as ENGINEERING SERVICES originated as Product Maintenance and reported to Systems in 1960 when the first Control Data Model 1604 and 160 computers were shipped to the field. The Product Maintenance people received their training by actually helping build the machines or engaging in systems check-out. They were often literally shipped with the equipment to become site maintenance personnel.

Many of the early Product Maintenance representatives later became key people in Control Data's evolution into one of the world's largest corporations. Those early pioneers in computer maintenance have, over the years, moved into all facets of the corporation--marketing, systems design, software design, data services, professional services, and finance. They have contributed to and shared in the growth of the corporation's many activities.

During its lifetime, ENGINEERING SERVICES has reported to EDP Systems, Marketing, Services, Systems and Services and, for the past several years, back to Marketing. In fact, it is an organization that performs services for most organizations in the corporation. It is an organization that can report to any major segment of the company--and has reported to several. Due to its relative size and strategic importance, it should report to the top of the functional organization; and generally has over the years. This reporting relation-

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ship was originally unique among large computer manufacturers, and has been cited as one of the principal reasons for the continued success of the organization. The other organizational reason for success is that from Control Data's beginning there has been little fractionation of the maintenance function, that is, only one maintenance organization, which has provided stability.

During the period when the first equipment shipments were being made to the field, Product Maintenance personnel reported to a variety of people within the Systems organization. Eventually, as more and more equipment was shipped, the Product Maintenance group reported to James Harrison, who served as acting manager until early 1962 when K. F. Buelow assumed leadership. It was here that the story of ENGINEERING SERVICES as it exists today actually had its beginnings.

In early 1962, K. F. Buelow took over as Manager of the Product Maintenance group and changed the name to Customer Engineering. Buelow was actually the first "head" of the maintenance group, and was responsible for building the first field organization to support the equipment being shipped-- primarily to customers within the United States. Reporting to Buelow was G. Breckenridge, who headed up the field operation. This was the beginning of the first official organizational structure within ENGINEERING SERVICES.

In 1963 the first Customer Engineering parts warehouse was opened in Minneapolis. This operation later became part of the Customer Engineering logistics organization and was expanded to larger quarters in 1966, and again in 1968. In 1979 the entire operation was moved to the World Distribution Center in St. Paul. The operation was expanded into Europe

In 1969 when the European Data Center was opened in Frankfurt, Germany. Since 1963, a good share of the systems development resource expenditures of ENGINEERING SERVICES has been in the overall logistics area.

At about the time P. G. Thompson took over the top job as Director of Customer Engineering in the fall of 1963, Control Data had just concluded negotiations for its first major acquisition, the Computer Division of the Bendix Corporation. This acquisition proved to be a major milestone for Customer Engineering Services, since it doubled the field force from 150 to over 300 people and significantly added to the management strength within Customer Engineering. Many of the original people from the Bendix acquisition now hold key positions in ENGINEERING SERVICES and elsewhere in Control Data. The Bendix acquisition and the ones that were to follow constituted the beginnings of a "third-party" maintenance concept for ENGINEERING SERVICES, because it was now essential that Control Data Customer Engineers maintain equipment built by companies other than Control Data.

Under Thompson's administration, Customer Engineering developed a profit/loss system. Prior to that, Customer Engineering Services was a cost center in the "bundled" world of EDP Systems. With some minor modifications along the way, the profit center concept, introduced in 1963 has stayed with ENGINEERING SERVICES throughout the years.

Another turning point for Customer Engineering started around 1965 with expansion into the International Market through the shipment of systems to Europe. Due to the problems associated with distance, it was immediately apparent that a much more sophisticated technical support organization would be required than had previously been necessary to service the

U.S. market. The task of laying the groundwork for such an organization fell to R. F. Buelow, who returned to Customer Engineering in the Spring of 1960 as General Manager, reporting to G. S. Hanson, Vice President of Marketing.

One of Buelow's first tasks was to consolidate the field organization and establish a training department to emphasize training. During this time there was considerable growth for Customer Engineering, due to acquisitions such as Bendix, the Stromberg Transactor Division of General Time, Data Display, Inc., the Digigraphics Division of Itek, and the Librascope Division of General Precision. The latter acquisition gave Customer Engineering its first repair and refurbishment capability.

All of these acquisitions resulted in additional hardware to maintain, which created the need for upgrading the field organization and emphasizing training. At about this same time the corporation received probably the largest contract up to that time--the Postal Source Data System for the U.S. Postal Service. This \$25.7 million dollar contract involved several 3300 computer systems, with dual 1700 systems as tele-concentrators, and a large network of transactors and other kinds of terminals. To properly service this customer, a separate maintenance organization was formed in 1967, which was named Customer Engineering Special Programs. This organization eventually included the personnel responsible for the maintenance of DoD installations outside the United States (i.e. Vietnam, Heidelberg, etc.) and selected Intelligence Customers.

Although a certain amount of "mobility" was necessary within Customer Engineering during the 1962-67 period, Control Data was still basically a large system company that offered

"Cadillac" service at "Cadillac" prices. Since on-site Customer Engineers were the basic strategy in those days, there was no advantage to a "mobility" concept. To maintain our systems in Europe, it was common practice to send U.S. expatriates along with all systems sold overseas. Eventually, country nationals began taking over maintenance responsibilities in their respective countries. Coordination of Customer Engineering efforts outside the U.S. was originally the responsibility of the Midwest Region, and logistics was the responsibility of a special International Liaison group in Minneapolis.

Two major problems plagued the Customer Engineering organization during this period, namely production standardization and sales strategy. The first manifested itself with the first 6000 computers manufactured in Chippewa Falls, no two of which were built alike. This lack of production-line standardization in the early systems would plague the organization for some time. The second problem revolved around differences in staffing strategy between Customer Engineering and the Sales Organization, both of whom reported to Marketing. This problem could best be described as follows: "In those days we had some differences of opinion with Sales because Sales always wanted us to have CE's every place they were selling. The dilemma was that Sales was staffing to sell equipment today--this year--and Customer Engineering had to staff to support equipment already in the field. Thus, we had to resolve manpower deployment differences. The fact that both organizations reported to Marketing helped resolve the problem. This problem was especially acute in Europe where the country strategy had been to hire and staff CE's based on sales forecasts. This strategy resulted in excess CE's in many of the countries in anticipation of orders, that in many cases did not materialize."

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The organization that subsequently emerged as the ENGINEERING SERVICES of today was actually formalized from its earlier beginnings in 1968, when R. C. Hall was named Vice President of Customer Engineering. During 1968-1969, there was a significant build-up of headquarters support functions including, engineering, logistics, finance, quality assurance, operations support, etc., all of which have basically survived to the present day.

Two basic organizations were set up during this period--one to obtain reliability information from the field for engineering and design and, one to give broad support and product management to the field maintenance organization. The staffing of these functions was recruited generally from outside of Customer Engineering, since the needed expertise was not available within the organization. In many cases, the individuals recruited had formerly been protagonists of Customer Engineering. In all cases, they were experts in their respective fields, and became converts.

As head of Customer Engineering, Hall was driven by two strong motivations--the need to provide customer satisfaction and the need for effective planning. He believed that quality maintenance and quality products were the key to customer satisfaction. Thus, Customer Engineering began a number of programs that eventually evolved into a corporate dedication to Reliability, Availability, and Maintainability in the design of its products. With regard to planning, Hall's favorite expression was: "An organization without a plan is an organization without management." This emphasis on the need for planning has prevailed and has been largely responsible for the successful growth of the organization since 1969.

Another turning point for ENGINEERING SERVICES occurred in 1969, with the addition of an organization called Facility Engineering and Construction. Prior to this internal acquisition, Customer Engineering had been strictly a maintenance organization. With this new organization, which was in the site planning and construction business, the name Customer Engineering was not broad enough to cover the total responsibility. Facility Engineering and Construction was then renamed Engineering and Architectural Services, and the total organization was named Maintenance Services.

Starting in 1968, emphasis was placed on improving field reporting methods for the purpose of providing design and manufacturing with reliability/maintainability data to permit them to better assess equipment performance in the field. Among the first of these new reporting systems was UFRS, the Unified Field Reporting System. The data provided by such reporting systems also helped the Maintenance Services headquarters staff develop new techniques to manage the business. The main reasons behind the reporting systems, however, stemmed from Maintenance Services' dedication to product quality and customer satisfaction.

During late 1969, a Task Force was chartered to review the advisability of having Maintenance Services maintain software. The Task force was chaired by R. C. Hall. The reason for the desirability to combine hardware and software maintenance was the result of "Unbundling" and the desire to have a combined and integrated maintenance capability, thus freeing Analyst Services to expand their applications development strategy. Another reason for the decision was the realization that the line between software and hardware would become increasingly blurred as the new technologies progressed. Thus in 1971, Maintenance Services began Category I software

maintenance. The program proved to be too costly for the corporation, since operating systems at that time had been highly modified, by both the customer and our analysts. What the effort did accomplish, however, was to move customers toward our standard operating systems, and thus reduce our analyst support costs.

J. B. Kee became Vice President of Maintenance Services in January 1970. At that time, although there were some small system and terminal maintenance personnel, the majority of the personnel were assigned to a particular location and system (on-site). This "on-site" strategy was becoming increasingly costly, due to the inefficient use of manpower. In addition, the increasing complexity of the systems made it very difficult for these small "on-site" groups to retain a high level of broad technical competence. Thus, in order to reduce maintenance costs and improve the technical level of the maintenance personnel, a MOBILITY strategy was adopted.

Project "Cold Turkey" was an experiment along those lines, and consisted of depriving a 5300 system of the on-site CEs, the spare parts, and the documentation - in that order. "The reaction of customers in those days," recalls a CE executive, "was that if you pulled a CE off the site, it wasn't a cut different than taking heroin away from a dope addict. That's why the title 'Cold Turkey' meant something to us." One of the outcomes of the project was the development of CAMS (Computer-Aided Maintenance Scheduling), for in order for the "cold turkey" not to turn out to be a "dead turkey," the maintenance organization had to know when to provide preventative maintenance.

In April of 1970, Maintenance Services was moved to the newly formed Services Group under R. M. Price. Maintenance



Services, along with Data Services, Education Services and Analysts Services, became the central implementing organizations supporting our services strategy.

An outgrowth of the MOBILITY program to reduce maintenance costs and improve quality, was the development of the CSI, or Customer Service Index. This later became the QSI, or Quality Satisfaction Index. The QSI is still in use today, and is the quality index against which performance and capabilities are measured. During the same period, CEQA's (GE Quality Audits) were also developed. These eventually became Site Audits, and emphasized our quality concepts and facilitated the auditing of our mobility sites.

With the introduction of the MOBILITY strategy, in 1971 we introduced multiple maintenance contracts (Schedule J, etc.). This was a key strategy since it allowed customers to choose various levels of service, at different prices. It was a first in the industry and tended to quiet the outcries that Control Data's maintenance costs were too high, and thus placing the corporation in a more favorable competitive position. The different services still included the "Cadillac" type of service, but it also included "fix it yourself and we'll supply the tools" as well as other options.

In 1970, due to our economic difficulties, and the fact that our manpower levels were geared to marketing revenue forecasts, Maintenance Services developed its own financial plan, choosing to revise and reduce the revenue figures supplied by Marketing. In addition, an extensive family of key indicators relating to business and operational fundamentals was developed in 1971. The combination of the new financial plan and the key indicators made it possible for Maintenance Services to more accurately pinpoint areas of the business that required attention.

In 1972 Maintenance Services was renamed ENGINEERING SERVICES. Within ENGINEERING SERVICES, at the beginning of the year were Customer Engineering, Engineering and Architectural Services (later to be renamed Facilities Planning and Construction), OEM Parts Sales, and two kinds of third-party maintenance activities. The third-party maintenance activity was a new thrust that was the result of our strategic planning and the desire to expand and diversify the revenue base.

1972 also became a milestone year as far as making a profit was concerned--and they have made a profit each year since that date.

In the third party maintenance, two steps were taken at about the same time. These were an acquisition, and the establishment of a new business. The first was the acquisition of Syntonic Technology, which gave ENGINEERING SERVICES the capabilities to perform "industrial maintenance." Syntonic was basically a communications maintenance company, but were moving into the maintenance of terminals and small systems. During this period, the strategy was to keep Syntonic separate from Customer Engineering. This strategy was the result of a requirement in that market, which demanded an "arm's length" relationship between the two maintenance groups so that competitive technical data would not be transmitted to our CDC sales organization.

The other step was to begin building a third-party maintenance organization; with the principal thrust being IBM equipment. This new organization was named Field Engineering. Initially, this was to be on a "cherry picking" basis; in other words, only selected products in selected key cities would be targeted. We also attempted to acquire Comma Cur-

poration, but they were not, at that time, interested. Although the success of this venture became questionable in 1974-1975, there was never a doubt about the usefulness of the technical talent in the organization, since it was providing the nucleus of a critically needed talent in the blossoming End User Maintenance business.

In 1971, in an attempt to provide the CE's with appropriate recognition, the "Sigma-Phi-Alpha" (Superiority in Performance and Achievement) recognition program was developed. This program eventually evolved into some of the recognition programs in effect today. This program was different than earlier programs which had recognized a single CE. Since the performance of maintenance was essentially a team effort the individual selected felt embarrassed, and the other team members felt slighted. The "Sigma-Phi-Alpha" program was a TEAM recognition program. One CE manager summed it up as follows: "We learned two things. One engineering kind of guy--and that includes the Customer Engineer--doesn't like incentive programs - the carrot dangling out there. Do this and you get that. He says, 'that's part of my job. Pay me what it's worth and I'll do it. On the other hand, the breakthrough we really made was the realization that although engineering types don't like incentive programs, they love a program that is based on recognition. It HAS to be recognition, and TEAM recognition in most cases is the only appropriate level. Yes, we made some mistakes in trying to set up programs in those days, but I don't think the overall effort was a mistake. The lessons we learned then are still with us today, and the recognition programs have contributed to a low attrition rate. In fact, many of the early recipients of recognition are our managers today."

During 1969-1972, three major problems emerged which had a major impact on ENGINEERING SERVICES and the corporation.

Two of the problems were manufacturing quality, the bi-pin connector and the "Maga" card, and the third was the recession of 1970--all of which had a significant effect on the corporation.

In commenting on these problems and ENGINEERING SERVICES' reactions to them, a GE executive summed up the philosophy that has spelled success for the organization in spite of technical and economic problems.

"We've had many quality kinds of problems, some of the nuisance variety and some of the size that could have been catastrophic. Like back in the early days of the 6000 where we had no two of a kind; or the large disk files where everytime the lights would blink you knew you had heads crashing all over the country. I think the strength of the organization has been that it has been able to react to those quality problems and somehow keep the thing glued together and get fixes made and survive. It's not a lot different than the medical profession. Now that we've got a 'Stay Well' program for people instead of a reactive 'Get Well' approach, I think the same things hold true for computers. We're at the point now where we're using more 'Stay Well' kinds of things for computers than we are 'Get Well' kinds of things."

In 1972 what might constitute one of the early "firsts" for the corporation--and may still be a "first"--was moving Hans Barthelme of Germany to the U.S. and actually having a European Manager live in the U.S. environment and manage a line field organization, using U.S. management techniques. Since then, ENGINEERING SERVICES has continued bringing foreign nationals to this country for a tour of duty in an actual live experience as a U.S. Manager.

O. K. Staton became Vice President of ENGINEERING SERVICES in April, 1973. It is interesting to note that O. K. Staton had started with the corporation as a "white hat" CE and had worked his way through all the field management levels prior to assuming this responsibility. MOBILITY was underway and a sound organization with competent personnel existed. All the tools were at hand for ENGINEERING SERVICES to capitalize on the earlier efforts.

In 1973 we acquired the COMMA Corporation. The Field Engineering organization having just started up, was operating at a loss, and it was thought that the acquisition of COMMA would provide enough density and mass to start to turn a profit. The two organizations, now called COMMA, lost money in 1974, and have had a difficult time turning a profit since that time.

As it later turned out, the investments in these operations during the 1973-74 period provided Engineering Services with the critical technical talent required to survive in the plug-compatible peripherals market as it exploded. Without that investment in third-party maintenance expertise, ENGINEERING SERVICES could have been a severe throttle on the corporation's ability to grow in the peripheral end-user market. Our experience determined that maintaining plug-compatible peripherals on IBM systems in a hostile environment, required IBM systems expertise.

During the 1974-75 period, as the result of a study of product families and key indicators, ENGINEERING SERVICES "pulled back the throttle on revenue and growth," and concentrated on controlled growth to optimize profit. During this time the worldwide head count stabilized at approximately 6,000 so that from 1975 to today, head count has

stayed essentially flat. According to an ES executive: "We reached the densities that allowed us to take advantage of handling additional equipments, since we were in the mobile mode. We could handle additional systems without adding more people. And, we continued developing tools to aid mobility--such as Concurrent Maintenance, Remote Technical Assistance, Computer-Aided Dispatching, GAMS II, FILS, OPTICS, ARTES, SUMMIT, etc. That allowed us to capitalize on the structure that we put in place. The thing that created the profitability was that we could continue to grow revenue just by adding systems, but we weren't required to continue adding people at the same rate." To further streamline the organization and better utilize the available management, ENGINEERING SERVICES instituted the concept of matrix management in 1975.

A key milestone for ENGINEERING SERVICES was the establishment, in 1975, of Engineering Services Education. Between 1967-1975, all training was developed and delivered by Control Data Institute which, admittedly, had interests that were out of the general sphere of CE training. Permission was granted to ENGINEERING SERVICES in early 1975 to assume the responsibility for all CE training. One of the key factors in obtaining this charter was the EIC Seminar, which had been developed in 1972 to train first level field managers. ENGINEERING SERVICES developed this seminar without the assistance of CDI, since CDI did not have the experience or resources necessary to develop such a training program.

The establishment of this education organization was the forerunner to taking the lead in PLATO computer-based education activities and developing individualized instruction materials to be administered in the field as part of a dis-

tributed education network. This capability is considered especially important to ENGINEERING SERVICES since it has always invested heavily in the training of its people, most of whom are entry-level. The benefits of this are two-fold--it makes for a more effective employee, and shows up in the low attrition rate that is common to ENGINEERING SERVICES.

During this time, in the case of recognition programs, ENGINEERING SERVICES instituted a successful "Branch of the Month" recognition program which only became inoperative after it had run out of branches to recognize. In 1977, the first official U.S. Fall Management Conference was held as an overall recognition event not unlike the 100% Club. It was so successful that it became a scheduled annual event, each with a theme designed to motivate the participants to strive even harder during the coming year.

Of the two nearly "wrong" paths, of the earlier years, both of them began to show signs of paying off in the late 1970's. With regard to software maintenance, a FS executive has commented: "The things we saw in those days about systems getting more complex and that we would actually have to maintain software in order to be able to maintain hardware is becoming truer even today. So, we've almost come full circle and we're back -- at this point in time anyway -- to the point where ENGINEERING SERVICES is going to have to maintain the operating system piece of the software.

As the decade of the '80's got underway, things began to look even brighter in the area of third party maintenance, a venture that was questionable in the early '70's.

With firm commitments to pursue network maintenance services and home computer repair, ENGINEERING SERVICES feels that it

has evolved from being a follower of Control Data product direction to being a leader in terms of opening up new markets and finding new customers for ENGINEERING SERVICES and Control Data. To further that end, ENGINEERING SERVICES established its own Marketing organization in 1979.

In January of 1980, ENGINEERING SERVICES opened its new headquarters complex in the western suburbs of Minneapolis. This constituted another major breakthrough for the organization, as it marked the first time the 20-year-old division had a home of its own. In April of 1980, O. K. Staton was replaced by J. H. Caldwell as Vice President of Engineering Services and a new era was beginning.

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