CORRECTED COPY

SUBJECT: MOBIDIC HISTORY

DATE: 4 September 1967

FROM: G. M. Sokol

TO: P. B. Black

Encl: Section x.y, AN/MYK-1 (MOBIDIC) and UDOFT

Attached is my write-up of the history of MOBIDIC (which has been expanded slightly to cover UDOFT as well), submitted for inclusion in the history of SLS, which you are assembling.

As the author of the enclosed material, I reserve the right to review and approve any changes or deletions.

Recipients of information copies are urged to send me their comments.

G. M. Sokol

GMS/law

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The following section is respectfully dedicated to the many Sylvanians who contributed profoundly to the success of MOBIDIC, but who are no longer in Sylvania's employment: Watts Humphrey, John Terzian, Chan Morrison, Joe Parziale, Ray Castiglione, Ray Gazzola, Bob Hinds, Mel Haven, Harvey Tzudiker, Al Fullerton, Jean Sammet, Arthur Wouk, Norm Zachary; and to Fred Gigg ey, whose equally profound contributions to MOBIDIC were made while he served as an Army officer and who later became, for altogether too brief a period, a member of the Sylvania community.

"In the electronic systems industry, cause and effect are so remote from one another in time, that the causal relationship is scarcely ever accurately identified, and intervening events usually receive the credit or blame for a specific outcome."

- Ptolemy the Elder

Section x.y. AN/MYK-1 (MOBIDIC) and UDOFT

Recognizing early the inherent requirement of digital computer equipment for huge quantities of semiconductor devices, Sylvania established a Computer Development Section in 1946 as part of its Electronics Division. This Section designed and built for MIT substantial portions of the Whirlwind computer, one of the main fountain heads of current digital computer technology. In the ten years that followed, the same group, under various defense contracts, developed, and shepherded through production, a number of digital communications devices for cryptographic and anti-jam applications. Those devices used precisely the logical and circuit techniques most applicable to digital computers, and in addition, were frequently of a ruggedized or militarized design. The supervisors of the Section were constantly seeking an opportunity to apply their growing experience to authentic computer equipment.

In late 1956, after this Section had become a part of the SES Waltham Laboratories, two such opportunities presented themselves. Sylvania became aware that the Fort Monmouth laboratory of the Signal Corps was preparing to sponsor the development of a militarized van-mounted digital computer, and that the Navy and Air Force, through the facilities of the Naval Training Devices Center at Port Washington, Long Island, were preparing to issue a contract for the development of a Universal Digital Operational Flight Trainer (UDOFT) utilizing for the first time a digital computer to control aircraft cockpit simulators. Sylvania's awareness of these prospective procurements was vital, since Sylvania had

no reputation for computer work and would not have been solicited by either agency, had it not been for a concerted campaign to make our skills known both at Fort Monmouth and at Port Washington, and the constant interest and help of the Red Bank, New Jersey, Sylvania Field Marketing Office.

Several meetings were held with Fort Monmouth technical personnel, and though these had no influence at all on the specifications, they served to produce a strong mutual understanding and respect. The Request for Proposal for the MOBIDIC (Mobile Digital Computer), later to be classified the AN/MYK-1, was issued to the industry early in 1956, and Sylvania, recognizing, from the discussions at Fort Monmouth, that the Army was expecting to use the MOBIDIC program both to develop a piece of experimental equipment and to develop digital computer expertise in its own personnel, produced a proposal which was both technically sound and highly tutorial. Surprisingly, most of the recognized computer manufacturers who were solicited failed to see that the Army was in fact ordering a militarized general-purpose computer, and no-bid the procurement. Sylvania and RCA were the only two companies of size to respond, along with several smaller firms. Although Sylvania was not the low bidder, our bid was lower than RCA's and we won the award as the lowest bidder from any companies considered large and reliable enough to complete the program dependably. The tutorial content of our proposal is believed to have contributed significantly to our winning, since it promised the Army much more opportunity to learn through working with Sylvania. Work on the contract started in September of 1956.

UDOFT was won somewhat earlier, also because we were the lowest bidder from among companies deemed to have sufficient resources to be reliable. The UDOFT computer, which activated two cockpit simulators (the Air Force F100 and the Navy F9F jets) was of unique design, utilizing dynamic flip-flops in which a loop consisting of a gated amplifier and a delay line alternately recirculated clock pulses or suppressed them to represent binary "ones" or "zeroes". Arithmetic speed requirements were stringent and called for a very fast core memory, achieved by operating two memory units in an overlapping mode. UDOFT was, at that time, a remarkably high-speed computer, and UDOFT experience was used to advantage on MOBIDIC.

MOBIDIC itself used the more conventional Eccles-Jordan flip-flop circuit, but was probably the first fully transistorized general-purpose computer design ever undertaken for delivery to a customer. The first MOBIDIC (by now called MOBIDIC A) was delivered on schedule in December of 1959 as an experimental hardware test bed for use at Fort Monmouth. By that time, Army interest and confidence in MOBIDIC had grown, inspiring increasingly concrete objectives and plans. By that time, also, four additional MOBIDICs had been ordered, as well as numerous software packages, including a COBOL compiler.

The MOBIDIC B was ordered as a result of an unsolicited proposal for use in the mobile ARTOC (Army Tactical Operations Center) and incorporated two duplexed Central Processor Units for increased reliability. MOBIDIC C was to serve as a software test bed at Fort Huachuca, Arizona. MOBIDIC D was ordered for the Army Security Agency in Europe, and MOBIDIC 7A, ordered for the Seventh Army Stock Control Center in Zweibruecken, Germany, was the first MOBIDIC sent overseas.

Although successful operation of the MOBIDIC 7A was delayed by deficiencies in the peripheral equipment provided by another Signal Corps contractor, Sylvania provided a solution through use of a commercial tape transport. MOBIDIC went operational at the Stock Control Center in January of 1962 and contributed significantly to greatly increased efficiency in the Army's supply system, producing, for example, faster response to replacement parts requisitions and reducing the need for large and expensive inventories in Army Depots.

The success of MOBIDIC 7A was partly responsible for the diversion of MOBIDIC D to perform a similar function for the Army's Ordnance Supply Control Agency in Orleans, France. Today, MOBIDICs C, D, and 7A are stationed at ~~Kaiserslautern~~ Karlsruhe, Germany, supporting the supply function, while MOBIDIC B is being very successfully used by the National Bureau of Standards in research applications.

The Sylvania designed and built electronics of all MOBIDICs has established an enviable record for reliability, and in spite of the fact that the design is ten years old, many MOBIDIC features are now being offered in third generation commercial computers.

From the vantage point of history, performance on the program was excellent. The MOBIDIC program has exerted a greater and more constructive influence upon SES than any other program of its size. The MOBIDIC program produced an unparalleled sense of mission, dedication, esprit, rapport, and camaraderie in the people who worked on it, both in the Army and in Sylvania. Strong and durable personal relations were established between the Army and the Sylvania MOBIDIC teams, as reflected by a heart-warming "MOBIDIC Reunion" held in Washington in October 1966.

The impact of MOBIDIC upon SES was felt in many ways. From an original contact for $1.6 million, the program grew to a total of between $25 and $30 million. Technical performance, schedule performance, and cost performance were all good and the program made a greater than average contribution to SES profitability. Through MOBIDIC, Sylvania became, for a time, the foremost supplier of militarized computer equipment to the Army. Our performance on MOBIDIC figured significantly in the Army decision to award Sylvania the contract for the AN/MPQ-32 artillary locator radar system, and the MPQ-32's computer, using MOBIDIC circuit and logical designs in an advanced high density packaging arrangement, proved to be, in terms of performance and reliability, one of the more successful parts of the MPQ-32 program. MOBIDIC circuits and logic were used extensively on ASD-1 Computer and the PARADE, projects. and TIDEWATER

Circuit packaging techniques developed on MOBIDIC were used throughout on the BMEWS program. Much of SES-East's skill in transistor switching circuits and in magnetic core memory techniques can be traced to roots in MOBIDIC. Numerous contracts for memory storage units, militarized magnetic tape transports, systems studies, and more recently our participation in the Army's CS3 program and the TACFIRE contract definition phase, are all due to contacts, skills, and reputations created originally on MOBIDIC.

At the Corporate level, Sylvania followed the MOBIDIC program with interest, and authorized entry into the commercial computer field using the MOBIDIC design, modified for industrial fixed plant installation, and renamed the Sylvania 9400.

Two 9400's were ordered, one by the Pentagon's Office of the Assistant Chief of Staff for Intelligence, and the second by General Telephone Company of California. However, as the full investment implications of the commercial computer industry became clear, G. T. and E. officials reversed the Sylvania decision, SES withdrew from the commercial field, and General Telephone of California cancelled its order. Both 9400's were built and one was leased for several years to OACSI. The other was installed at the SES Needham facility and is used for scientific and business data processing.

As can be seen from the preceding paragraphs, MOBIDIC's influence upon SES was significant, long lasting, and largely favorable. However, there were some lessons which SES failed to learn from the MOBIDIC program. Our software performance was mixed, in that our on-site support to Army programming groups was good, but our in-house activities in developing utility programs and a compiler were mediocre as to cost, schedule, and end-product performance.

The Computer Development Section grew to Department, Sub-laboratory, and finally to Laboratory size in 1959, but then The Computer Laboratory was permitted to suffer attrition through transfer or loss of key MOBIDIC and UDOFT personnel. Although MOBIDIC and 9400 experience revealed that our strength lay in systems work and central computer electronics, and that we were weakest in the mechanical design required for computer input-output equipment, we made several costly forays into the peripheral equipment field at some financial loss to Sylvania, and delayed until too late heavy emphasis on new developments in central electronics. As a

result, SES is no longer pre-eminent in the design of computer systems, and the Computer Laboratory was dissolved in 1966. Likewise, the MOBIDIC emphasis on a very small high-talent Program Office, which produced constant pressure for job economy, tight contracts management, and close cost and schedule control, diminished in the face of much larger and more abundantly funded programs, and failed to contribute as much as it could have to cost consciousness and economical technical excellence. Rising overhead rates, a reduced sense of commitment by line supervisors to contract performance, and reduced profitability are all trends which could have been diminished or reversed if the MOBIDIC spirit had been nourished and supported more consistently within Sylvania, and if Sylvania's true strengths and weaknesses in the computer field had been better understood. To this day, many people mistakenly believe that the turning point was the G. T. and E. decision to stay out of the commercial computer market place. Nothing could be further from the facts, and that decision in retrospect remains profoundly right. In fact, the decision that led to the diminution of Sylvania's role in military computers came much earlier, and was made within SES. This was the decision not to use Sylvania's excellent capabilities to produce MOBIDICs for the much larger BMEWS program, but instead, to assist IBM in the development of their 7090 computer. This decision certainly proved to be right for BMEWS, but there is every reason to believe that a decision to use MOBIDICs instead would have proven to be equally right, not only for BMEWS, but for Sylvania as well.

Mr. Harold Silverstein, of the Department of the Army, has called MOBIDIC his "noblest adventure". So it was, also for many Sylvanians, to whom it represented a golden era in the history of SES.

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