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OF
HISTORICAL INTEREST



A PART OF SDC'S HISTORY

1950-1957



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U. S. AIR FORCE
SYSTEM TRAINING PROJECT

STP DOCUMENT
(SD SERIES—INTERNAL DISTRIBUTION)

THE STORY OF SDD

F. N. Marzocco

SD-1094

1 October 1956

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The Story of SDD

F. N. Marzocco

In the fall of 1951 less than half a dozen people were working in the Systems Research Laboratory; in the fall of 1956, 850 people are working in the System Development Division all over the country. Their jobs have changed, too, as the work has moved out of the laboratory and into the field.

The Systems Research Laboratory

In August, 1950, John Kennedy, a RAND consultant at that time, drew attention to the need for studying human factors affecting man-machine behavior in a man-machine system. His suggestion that RAND set up a department of psychology led to the establishment in May, 1951, of the Systems Research Laboratory. By mid-October laboratory space had been leased at 410 Broadway in Santa Monica and the staff had grown to include Kennedy, W. C. Biel, and R. L. Chapman, psychologists, and Allen Newell, a mathematician.

The first study undertaken by the Laboratory was "Project Simulator," chosen because of the Electronics Division's interest in the Air Defense System and encouraged particularly by M. O. Kappler of that Division. A fairly complete physical model of the Air Defense Direction Center at Tacoma, Washington, and partial models of three associated early warning stations were constructed. Synthetic air defense situations could be presented on the mock-up radar scopes using data computed and printed out by IBM machines, and there were additional provisions for presenting coordinated early warning and flight plan data.

A group of 28 college students was selected to serve as the crew for the initial experiment, known as "Casey," and the station was manned from February 4 to June 8, 1952. The major purpose of the experiment was to study complex organizational behavior, but innovations introduced during the training phase appeared to lead to outstanding performance by the crew. A briefing was conducted by the Systems Research Laboratory staff at Air Defense Command headquarters in August, 1952; the Command, interested in training implications of the "Casey" experiment, agreed at that time to supply officers and airmen for another.

The second experiment, "Cowboy," was run with a military crew supplied by the Western Air Defense Force during January and February, 1953. This experiment was similar to the first, with added simulation of an adjacent Air Defense Direction Center and of the Division Control Center.

In this experiment the difficulty of the problems was increased periodically as the crew worked eight hours a day for about five weeks. The experience with the civilian crew was duplicated when the military crew learned to cope with problems that would have been impossible to handle without such training.

Fourteen officers from Headquarters, Air Defense Command, including the then Vice-Commander, Major General F. H. Smith, Jr., observed various parts of the run. A briefing was requested of RAND, to cover the results of the "Cowboy" study and to produce recommendations on how these might be applied to training Aircraft Control and Warning crews. The briefing, which took place at Colorado Springs on March 19, 1953, led to the formation of a Joint Air Defense Command - RAND Study Group.

The Study Group first convened in Santa Monica in early April, 1953. Its instructions were to devise plans for producing suitable target simulation equipment, for computing problem materials rapidly, and for transferring the system training techniques from the laboratory to the field within a practical time scale and at an acceptable cost. The group was to consider all reasonable alternatives for accomplishing the detailed development and installation of the program, including the Air Force itself or a contractor other than RAND.

The report of the Joint Study Group was made in May, 1953. The report described a System Training Program that would permit adequate simulation of the air defense environment, that would give team training to teams of appropriate size, and that would provide immediate feedback of knowledge of results to the whole team. The report recommended that the Air Defense Command adopt the program and implement it with the least practicable delay. The report pointed out also that only by drawing extensively on RAND's facilities and knowledge could the program be instituted within any reasonable period of time, although RAND's participation might be only temporary until the program had been installed completely.

The Joint Study Group's report was received enthusiastically by the Air Defense Command and transmitted immediately to Headquarters, USAF. The response from Washington recognized the importance of increasing the air defense system's capability, but required that the training program be given a thorough field test in one Air Division before USAF would make any large-scale commitment. A revised budget estimate and new time scales were prepared, and the 27th Air Division, which includes southern California, was designated by the Air Defense Command as the one in which the development and test phase of the revised program would be carried out. RAND was officially committed to develop the System Training Program and install it in the 27th Air Division when Air Defense Command Contract AF 33(600)-26134 was signed on August 21, 1953.

The original services contract gave RAND \$1,200,000 to be used over a fourteen-month period for developing the System Training Program into a field program and installing it in the 27th Air Division. The last three months of the fourteen were to be devoted to a field test of the program.

The System Training Project

Adapting the System Training Program on a crash basis from the laboratory to the field required that three different groups of RAND people work closely together. The Electronics Division contributed personnel to develop equipment; the Mathematics Division contributed personnel and machine time to develop problem materials; while the whole of the Systems Research Laboratory worked to develop the field program itself. An Air Defense Command Task Group was also set up to work with RAND on the program.

The laboratory staff was expanded and additional space obtained at 1515 Fourth Street, Santa Monica. Indoctrination of the enlarged staff called for a new laboratory run, and the "Cobra" experiment took place in February, 1954, using a military crew. Immediately following the five-week "Cobra" run, the Systems Research Laboratory began a thorough investigation of the 27th Air Division. Operations, both at Division Headquarters and at each site, were studied. The communications and electronics capabilities throughout the Division, including radar characteristics and terrain masking of radar targets, were reviewed. Intelligence information, fighter deployment, and the distribution of real air traffic were investigated. Other data were gathered on the characteristics of aircraft and the handling of flight plans. All this mass of data had to be gathered, digested, and somehow turned into problems that would give system training to the Division.

Equipment that would present blips on the radar scopes at the sites being trained had been described in the report of the Joint Study Group. The Problem Reproducer Equipment was to read 70-millimeter film and translate the spots into surveillance and height signals for the appropriate radar scopes--real ones rather than mock-ups. The equipment had to be capable of working with different kinds of radar sets, of permitting a quick change from problem data to real data, and of being used with the 15-J-1-c target generator. The latter would present simulated radar returns corresponding to fighters under the control of the radar station.

A subcontract was let to RCA shortly after RAND's own contract had been signed and called for development of six pre-production models of the Problem Reproducer Equipment. Other subcontractors were also involved in developing the digital-to-analog converter and the camera, lens, and special cathode ray tube to be used at RAND in making problem films for the Problem Reproducer Equipment.

The links in the chain leading from data to completed film were forged by developing a library of paths showing air traffic routes. Appropriate aircraft were added and three-dimensional representations of the flights were computed on desk calculators. Other descriptive information, particularly appearances and fades on the various radars, was then added to each flight and all this material compiled into a single flight library. A problem was to be specified by choosing flights that

would satisfy the purposes of the problem and assigning a start time to each. Programs were developed by which RAND's 701 could take over at that point, tracing each flight through the two-hour problem, computing the coordinates for each blip for every station, and controlling the camera equipment in making the films.

The film for each site would be only one piece of problem material. It was also necessary to develop a number of maps, lists, and scripts. Some would permit simulation of various telephoned inputs to the system while others would be used by the Training Operations Report Team monitoring each exercise at each site. These materials, like all the other development requirements, were worked out by a cooperative effort.

The fourth run in the Systems Research Laboratory was "Cogwheel," which began on June 17, 1954, and lasted two weeks. The main purpose of "Cogwheel" was to orient 27th Air Division officers and teach them both the principles and practice of system training, although the actual materials used were similar to those of the earlier experiments. System Training in its modern form was installed at Boron, California, in August, 1954, and installation at the other three sites of the Division followed shortly after.

August, 1954, was also the time when field trials of the System Training Program were to begin, and an operational suitability test was started almost concurrently with the field installation. It was immediately apparent that some of the equipment had to be modified; the first operational suitability test found the Problem Reproducer Equipment and the associated computed materials operationally unsuitable unless certain changes were made. The equipment itself was classified by the Air Proving Ground Command as "tentative standard," a designation that permitted procurement in limited quantities.

The operational suitability test was only one aspect of the evaluation of the field program. While it was clear that equipment difficulties had to be eliminated, it was also clear that the program was working. Major General Smith, Vice-Commander of the Air Defense Command; Major General Bergquist, Deputy for Operations of the Air Defense Command; Major General Todd, Commander of the Western Air Defense Force; and Brigadier General Andrew, Commander of the 27th Air Division, were among those who observed the System Training Program in the field and recognized its importance.

As early as January, 1954, the Air Defense Command had asked RAND to begin planning for installation of the System Training Program in 150 sites rather than the 100 recommended in the Joint Study Group's report. In July, 1954, the Air Defense Command submitted to Headquarters, USAF, a qualitative operational requirement that the program

be installed in 152 sites. This was followed by a request that results obtained in the 27th Air Division installation constitute the basis for approval of the expanded program, and the approval was given on October 15, 1954.

The needs of a field program were sufficiently different from those of a research program that the System Training Project, with W. C. Biel and M. O. Kappler as Co-Directors, was set up as a separate entity from the Systems Research Laboratory. The first organization chart of the System Training Project, November 1, 1954, shows nine training specialists, two engineers, ten problem technicians, five secretaries, and five clerks. The total is somewhat misleading, however, since it does not show the continuing contributions of the Mathematics and Electronics Divisions.

Funds to continue the program, \$1,553,989, were provided by a Supplementary Agreement to Contract AF 33(600)-26134, signed on November 15, 1954. The agreement covered RAND services for maintaining the System Training Program in the 27th Air Division and for making additional installations during fiscal year 1955. The Air Force also contracted with Radio Corporation of America at this time for fifty AN/GPS-T2's, the modified Problem Reproducer Equipment.

Developing the System Training Program further, installing it throughout the country, and maintaining it after it had been installed were obviously going to take a large staff. In preparation for the expansion the project was organized in December, 1954, into seven functional groups: Simulation, Problem Production, Development, Field Installation, School and Training Aids, Research and Analysis, and Engineering. By March, 1955, when the project moved to 1905 Armacost, a rented facility in West Los Angeles, ninety people were listed as working directly on the project.

The work done on the program during 1955 is fairly well shown by the names of the groups above. The Field Installation title, however, did not correspond to a job until the end of October--the equipment contractor ran into considerable difficulty first in producing the AN/GPS-T2's and then in setting them up at the sites. The result was that only the four westernmost Air Divisions had had the System Training Program installed by the end of 1955. The program was installed in three more divisions, exhausting the fifty AN/GPS-T2's, by the spring of 1956.

A second operational suitability test of the System Training program was conducted in the 27th Air Division in August, 1955. The program was found operationally suitable this time and the equipment declared "standard." The designation permitted the Air Force to contract with the Union Switch and Signal Division of the Westinghouse Air Brake Company for delivery and installation of 132 AN/GPS-T2's. The first equipment installations under this contract were to be finished in time for installation of the training program to begin in September, 1956.

The SAGE Program

Some 1950 tests, combining data handling work being done at the Digital Computer Laboratory of the Massachusetts Institute of Technology with radar data transmission equipment from the Air Force Cambridge Research Center, led the Air Force to suggest that a laboratory be established to continue the program. The Lincoln Laboratory was therefore formed in August, 1951, to develop an effective continental air defense system. Its largest project was to develop the Semi-Automatic Ground Environment system which uses high speed digital computers to receive, process, and transmit air surveillance, identification, and weapon guidance information. The SAGE system was accepted by the Air Force in April, 1953.

The specialized equipment designed to do the SAGE job at a Direction Center is designated the AN/FSQ-7, and that at a Control Center, the AN/FSQ-8. Both include a duplexed computer and a great deal of additional equipment. A contract to produce FSQ-7's and FSQ-8's was given to the International Business Machines Corporation. Another contract provides that the general task of coordinating all the many activities involved in establishing SAGE as a working system be done by the Air Defense Engineering Service, a group within the Western Electric Company.

The SAGE system is semi-automatic in that many of the functions that must be performed by people in the manual system are done by machine in SAGE. Nevertheless, an operations crew at a SAGE Direction Center consists of over one hundred officers and airmen, a figure that includes only those working on air defense jobs. One effect of substituting SAGE for manual air defense is to increase personnel needs while requiring greater skill from the individuals and more effective integration from the team. Recognition of the critical training problem in SAGE led to some discussions among System Training Project and Lincoln Laboratory personnel in 1954. The discussions had to do mostly with the possibility of system training for SAGE, although they also covered the possibility that RAND's simulation techniques could be used during checkout of the SAGE system. These discussions continued into 1955, when a new element was introduced.

The SAGE system requires computer programs, the instructions for the FSQ-7's and FSQ-8's, at each Direction Center and Control Center. A single master program was to be written for the Direction Centers and another for the Control Centers, after which the master programs would be adapted for use at any particular location. The adaptation procedure makes the program correspond to local geography and gives the computer the data it needs on radar locations, boundaries, airbase locations, CAA flight plan checkpoints, fighter aircraft characteristics, etc. After the programs had been written they would have to be checked out, and even then there would be a need for continuing revision as errors were detected or air defense procedures changed or new weapons were incorporated into the air defense system.

While Lincoln was to write the master programs and the adapted programs for early installations as part of the SAGE development, someone had to

take over from Lincoln at an appropriate time. The Air Defense Command, following the Air Force policy of utilizing contractor services wherever these contribute directly to operational effectiveness, turned to RAND and its System Training Project as the only group with the necessary knowledge of air defense and programming. An additional consideration, important to the Air Force, was that RAND was already a member of the Air Force family.

On April 7, 1955, Major General F. H. Smith, Jr., called F. R. Collbohm to discuss RAND participation in SAGE. M. O. Kappler then attended a joint Air Defense Command - RAND meeting at Colorado Springs on April 20-22, attended also by Lincoln and IBM as advisers. A rough plan was drawn up at that time. The feeling, both of RAND management and of the Trustees, was that the new task would conflict with RAND's primary purpose but that RAND must accept it because no other contractor was available, and because of the importance to national defense. The final decision was reached at a conference held at Colorado Springs on May 14, 1955, among Major General F. H. Smith, F. R. Collbohm, J. R. Goldstein, L. J. Henderson, and M. O. Kappler. The implication of the decision was that the project would now become permanent.

The plan was that Lincoln would write the Master Air Defense Program and adapt it for use in an experimental SAGE direction center, the first two operational SAGE direction centers and the first SAGE control center. The System Training Project was to adapt the master program for all following installations and to maintain and modify the programs. It is not enough to provide only that the machines of a man-machine system will operate well. The men have to be able to work effectively with the machines. Recognizing this, the Air Defense Command made system training another service to be provided by RAND for SAGE.

The System Training Project was reorganized in preparation for the expansion necessary to do the SAGE job, and a number of personnel were borrowed from Project RAND's Numerical Analysis Division. In order that those scheduled to do SAGE programming could become sufficiently acquainted with the master program, arrangements were made to have them work directly with the Lincoln programmers. The first group arrived Lexington on July 5, 1955, and the number (and proportion) of programmers provided by RAND has increased steadily since then.

SDD Today

The System Training Project was made a RAND Division in September, 1955, when it was called the System Training and Programming Division. Its present name, the System Development Division, was adopted in December, 1955.

Funds to support the early RAND-SAGE effort were the excess that could not be spent on system training because of the forced delay while waiting for the second run of GPS-T2 equipment. Funds for fiscal year 1956--\$6,763,097--were provided on October 31, 1955, by a second Supplementary Agreement to the basic services contract. A third Supplementary Agreement, for \$13,191,987, was signed July 1, 1956. The work statements accompanying both agreements called for RAND services in providing system training for manual air divisions, system training for SAGE, and SAGE computer programming.

Installation of the System Training Program was completed in seven Air Divisions by the middle of May, 1956. Fifteen training specialists have been assigned to the field to maintain the program in those divisions. Each division each month receives two new problems closely geared to its training needs and to the real life situation. A large part of the work being done in Santa Monica is devoted to designing and producing the problems and to keeping up all the data required. Other work includes a research program aimed directly toward improvement of system training and a development program by which improvements are introduced.

The period from May to September, 1956, was filled by intensive preparation for installation of the training program in the remaining nine Air Divisions. The field activity began again on September 24, and installation of the program will have been completed in the continental United States by mid-May, 1957. Each of the nine divisions will have an average of seven training specialists there for a five-week period, including the two training specialists assigned permanently to the division. Further installations will be made only in individual radar sites as these become operational.

There are considerable pressures to increase the scope of the System Training Project. Early in 1955 the Royal Canadian Air Force indicated a desire to learn about the program and a number of additional inquiries followed. A party of visitors in September, 1956, took back to Canada an estimate of the cost to install the program in their country. The Far East Air Force also has established an operational requirement for system training, although the chances that the requirement will be satisfied seem somewhat small. An extension of system training in still another direction is in the planning stage; in this case, ground based training for Airborne Early Warning.

Planning for SAGE system training has continued. One effect has been to merge many of the SAGE and manual requirements in the flight and problem computation programs being written for the IBM 704. Additional programming required, both for the 704 and for the FSQ-7, will be started

later in 1956.

The intention in 1955 was to send a limited number of RAND programmers to Lexington, where they could learn the contents of the SAGE programs and be ready to take over when the time came. This approach was modified when it became apparent that the original estimates of time and effort required to write the programs were far too small. Rather than require Lincoln Laboratory to hire a large number of programmers and release them after RAND would have begun its own build-up, RAND agreed to start hiring its programmers immediately and make their time available to Lincoln.

One of the least heartening events of 1956 has been the announcement of a considerable slippage in the completion dates for the SAGE operations programs, despite the combined efforts of Lincoln and RAND. The feeling has been that as many as possible of the resources that could not be used as intended because of the slippage, should be used instead to prevent any further slippage. In addition to its responsibility for taking over later from the Lincoln Laboratory and for providing personnel earlier, the System Development Division has now assumed full partnership with Lincoln in the planning and preparation of early operational programs.

About 80 RAND programmers are working with Lincoln in preparing the 70-odd detailed subprograms that will make up the master program for the FSQ-7. The master program is being written in such a way as to be usable in the experimental subsector. Adaptation of the master program for the first operational SAGE Direction Center, at McGuire Air Force Base, will begin later in 1956.

Another group of 65 RAND people is working with Lincoln in developing procedures to be used in installation and checkout of programs at the SAGE sites. About 20 of these are in fact already at work checking out the earliest parts of the master program on the prototype FSQ-7 at IBM's Kingston, N. Y., plant.

The installation job at any SAGE direction Center involves a systematic checkout of all the pieces of the program. Experts in each piece must be available around the clock. There will have to be about 50 programmers at each site during the installation phase, and many more at the earlier sites. The installation of the first site is expected to take about 18 months. This period will be reduced gradually to about 6 months as better procedures are learned by the installers, kinks in the machines are ironed out, and the programs are better prepared and documented. The anticipated reduction in installation time will be compensated by increasing the rate of new starts, so that there will be a requirement for about 500 installation programmers in early 1958 and continuing for some years until all installations will have been completed.

Preparation for the field activity has required a steady build-up of RAND personnel at Lexington. About 45 new programmer trainees have been hired each month since mid-1956; about 75 were in training during September, 1956. There will be a temporary slow-down in new hires while the recruiting teams concentrate on getting suitable supervisory personnel.

Other preparation taking place in Lexington includes that for the FSQ-8 master program and for the shake-down in the experimental subsector.

The numbers of people and the length of time that will have to be spent in the field during SAGE installations call for extensive administrative preparation. New procedures have been devised to handle temporary changes of station that in some cases will be for a year or longer. A Field Services Group has been set up to solve in advance the various problems that will come up with installation and maintenance of the field program. One set of data with which Field Services is working comes from a survey of practices by other organizations having large field units. Another set comes from on-site investigations by RAND administrative personnel of about a third of the planned SAGE sites, including all the remote ones. One of the major problems will be the provision for housing in the field, particularly in remote areas, and RAND is assuming the obligation of procuring and furnishing housing as required.

Another aspect of the housing problem is the immediate one of providing office and computer space. The Division had grown so large by February, 1956, as to require a major move by two departments and most of the administrative personnel from the West Los Angeles building at 1905 Armacost Avenue to 1333 Sixth Street, Santa Monica. The move was conceived as an interim measure until a new Santa Monica building at 2500 Colorado Avenue was ready to receive both the Armacost and Sixth Street contingents. A long series of delays, including a major strike, intervened and a number of additional moves of parts of the organization have been necessary. The most recent was to 1452 Fourth Street, Santa Monica.

The building at 2500 Colorado is now scheduled for completion on January 1, 1957. Its 100,000 square feet were designed to hold 550 people, and it should be possible to get 650 in. At the same time it will be necessary to supplement the space by retaining 1905 Armacost and part of 1452 Fourth Street. One wing of 2500 Colorado will be finished on November 1, 1956, at which time an IBM 704 will be installed there. This should meet most of the Division's computing needs until mid-1957 when a second 704 is to be installed.

The 704's, with additional accounting machinery, will be needed primarily for preparing system training materials. There will be another requirement for a high speed computer that can be used to check out adaptations and revisions of the SAGE programs. The seventh production model of the FSQ-7 is being diverted for this purpose and will be installed in Santa Monica in July, 1957. The Air Force has approved construction of a reinforced concrete shell. The building will be located behind 2500 Colorado, and its 36,000 square feet will hold the FSQ-7 and some additional accounting machinery.

There will be minimal provision for office space in the FSQ-7 building. Additional space must come from an additional building. The developer of the Colorado Avenue area has prepared a proposal for a new building of 133,000 square feet to be erected at 2400 Colorado. This building will seat 650 people comfortably, and it is hoped that Air Force approval can be obtained in time to move in by October, 1957, when the FSQ-7

installation will be complete.

The office situation at Lexington has been near critical for some time. Plans call for the construction of eight Butler buildings of 9600 square feet each. The buildings will be located on the grounds of Hanscom Air Force Base, adjacent to Lincoln Laboratory. The first two units are to be completed by the end of October, 1956--a slippage of several months from the original plan, occasioned again by a series of delays including a major strike. The remaining units are to be ready for occupancy by mid-December, providing accommodations for a total of 800 people.

Not all the people in the Butler buildings at Lexington will be from RAND; other contractors will take space there, as will the Air Force itself. There will be considerable crowding through the summer of 1957. Unless additional buildings should be constructed, the crowding will be relieved only as RAND personnel are withdrawn for transfer to Santa Monica. The withdrawal is scheduled to begin around October, 1957, when the FSQ-7 will be ready for use and 2400 Colorado ready for occupancy. The move, which will take about six months, will involve over 300 people and still leave about 50 to complete jobs that must be done at Lincoln Laboratory.

A look at the System Development Division at the end of 1957 should show the Lexington operation declining with field and Santa Monica operations expanding. Of the staff of 1800, about 300 will be in administration and services. Seven hundred technical people will be providing ongoing system training for the complete manual air defense system of the continental United States and will be installing system training at the earliest SAGE sites. Eight hundred technical people will be installing SAGE computer programs in the first six sites and preparing to start installations in five more during the following year. "Preparing to start" will still be a key concept for the System Development Division as it continues to translate ideas into reality.

The RAND Corporation
Santa Monica, California

MEMORANDUM

Date: 28 November 1956
M-5655

To: All SDD Personnel

From: F. R. Collbohm

1956 has been marked by increasing national interest in the services of the System Development Division. The rapid growth of the organization is tangible evidence of this interest; informal and formal requests for your services, some taking the form of invitations to bid, have been increasing and are indicative of things to come. The widening scope of the System Development Division's activities has been the direct result of your performance.

At the recent meeting of the RAND Corporation Board of Trustees, we told them of SDD's demonstrated capability to handle major assignments and that we felt that SDD was at a point of maturity where we should consider setting it up as a separate Corporation. We further pointed out that because of the differences in basic assignments between SDD and Project RAND, we felt that each group could best carry out its respective purpose through the development of two separate companies. We submitted, and the Board approved, a plan whereby the Division with Air Force approval, will be set up as a non-profit corporation, to be known as the System Development Corporation, with close management and financial ties to the RAND Corporation. By such action, we are confident that the future growth and competence of your organization can be enhanced.

The close management ties with RAND will be evidenced by the top Officers of the System Development Corporation. They will be:

Chairman of the Board	F. R. Collbohm
Vice Chairman and Chairman of the Executive Committee	J. R. Goldstein
President	M. O. Kappler
Vice President	W. C. Biel

Other officers will be filled by the Board of the System Development Corporation at its Organization Meeting, probably in the first quarter of 1957.

The financial stability of the new Corporation initially will be assured by the RAND Corporation. At the outset, the working capital will be provided by RAND. Fees earned will gradually provide the new Corporation with its own working capital and funds for self-sponsored research; sometime in the future it can and will be financially independent of RAND.

To: All SDD Personnel

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Personnel regulations, fringe benefits, and salary structure will be the same as those of RAND. When you become employees of the System Development Corporation you will lose none of the right you now enjoy as employees of The RAND Corporation. We hope to make possible, as far into the future as we can now see, the transfer of personnel from The RAND Corporation to The System Development Corporation and vice versa, with no loss to the individual of vacation accumulation, retirement service credit, or other service credits.

We are now in the process of actually establishing the System Development Corporation. The initial Board of Trustees will be small, consisting of some Trustees of The RAND Corporation plus Kappler and Biel, with a few outside personalities brought in to insure diversification. We hope to be able to announce the membership of this Board at an early date.

The target date of 1 July 1957 has been set for the implementation of the change-over. Although much remains to be done before we can have any assurance of meeting this date, I wanted you to know our plans at the earliest practical moment. To you who have done so much to make this action desirable and possible, my warm congratulations.

F. R. Collbohm

M E M O R A N D U M

January 9, 1957
SM-88

TO: All Technical Personnel
FROM: W. C. Biel and M. O. Kappler
SUBJECT: RESEARCH IN SDD

I. Contract-Sponsored Research

The responsibilities of the System Development Division under its ADC contract are mainly of a development, implementation and production character. While these aspects of our activity have had high priority, it has always been recognized that in order to carry out these responsibilities, research contributing to program improvement and to evaluation must be carried on.

As individuals work in their jobs they undoubtedly see important areas in the programs where improvements are needed, and where research can be most fruitful. It is necessary to the continued growth and success of our programs that decisions be made and implemented on the basis of scientific investigation whenever feasible.

Techniques now exist within the present departmental structure for implementing research on improvement of the program. The purpose of the above comments is not to describe the techniques for implementing this research as they operate within the departments but to record our recognition of the need for this research. If there are any questions about how this is done within your department it is suggested that you discuss this with your group or department head.

II. RAND-Sponsored Research

Individuals or groups also have research ideas not related to contract activities. A limited number of these activities can be carried out under RAND-

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Sponsored Research. This money is made available on a limited basis out of corporation funds to sponsor research which does not fall under the statement of work of RAND's military contracts but which contributes to the public welfare and national security. It is felt that many types of research activities and findings contribute to these causes. Perhaps deserving of special attention is research which leads to new methods of studying and improving systems and which explores new areas of application. If SDD, and its successor, SDC, is to continue in the forefront of the "system" field, it will have to encourage new and sometimes unorthodox approaches to many such research problems. The allocation of funds for RSR will be small for some time to come. After SDC is formed there will need to be a period when earnings can be accumulated for working capital and operational reserve. There will be competition for this same money for expenses in proposal preparation, new product development, SDC-sponsored research not included in these, and other expenses. During the time that funds for research are limited, small grants will tend to be favored over large ones but as more funds become available it is intended that major research projects can be supported. In general, the same policies stated here will be continued after SDC is operational.

This section of the memorandum sets up a plan for implementing research activities which fall under RAND-Sponsored Research and which can be carried on within our particular space, personnel, security, and financial conditions.

When an individual (or a group of individuals) has seriously considered the need for conducting a particular research project and wishes to carry out this research he should:

A. Write up the proposal including at least the following information:

The purpose and brief description of the research

The space, equipment, computing requirements, etc.

Type and number of subjects (if any)

Experimental design and data collection and analysis plans

Per cent of time experimenter will spend on the research,
data analysis and report preparation (may be up to 100%);
total number of months

Other personnel assistance required

Travel required

Relevant experience for this work, including experience at SDD

Value to public welfare or national security

- B. Submit copies of his proposal to his Group Head and Department Head for consideration as to whether (or when) the man can be spared from his present or proposed duties for the amount of time required.

- (1) The Department Head will forward the proposal to an SDD Committee on RAND-Sponsored Research. This Committee will consist of a member appointed by the Head of each Department, and chaired by one of the Technical Coordinators appointed by the Co-Chiefs. The duties of this Committee are to evaluate the proposal from (a) a technical point of view as well as (b) from the feasibility standpoint (facilities and subjects available, etc.). The Committee should call upon whatever experts are needed to assist in judging the proposal. A realistic estimate of the cost of the proposal should be obtained from the Contracts and Fiscal Group. The Committee on RAND-Sponsored Research

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will make recommendations to the Co-Chiefs regarding the merit of supporting the proposed research with RSR funds.

- (2) The Co-Chiefs will consider the recommendations and if favorable consideration is given, will request allocation of such RSR funds by RAND.
- (3) As a general rule preference in recommending grants will be given to those who have longer employment with SDD.

C. If the funds are made available, the appropriate Department Head will provide the necessary administrative arrangements for the conduct of the research.

III. It is felt that with the possibilities of conducting the necessary Contract-Sponsored Research for program improvement and of conducting RAND-Sponsored Research on topics not covered by the contract but contributing to the public welfare and national security that a major step will be taken toward expanding the information available for improving our programs, the professional growth of our personnel, and furthering the prestige of the organization.

W. C. Biel

M. O. Kappler

WCB/MOK/rh

MEMORANDUM

TO: All SDD Employees
FROM: W. C. Biel, M. O. Kappler
SUBJECT: MANAGEMENT OF SDD AND SDC

February 12, 1957

SM-497

- I. Primary responsibility for the management of the System Development Division rests presently with The RAND Corporation Board of Trustees as the policy-setting body, and with the Corporation Officers who have been delegated the responsibility for implementing RAND policy. Similarly, the Board and Officers of the System Development Corporation will be responsible for the exercise of management functions, in the sense of "top management," when SDC is established.

As a practical matter, the day-to-day management of our activities becomes the concern of many individuals, both directly and indirectly. The purpose of this memorandum is to identify some of these individuals and groups of individuals and to delineate their respective responsibilities for the management of the Division and the new Corporation.

The three groups which are to share in this over-all management responsibility are:

1. The Management Committee
2. The Steering Committee
3. The SDD (later SDC) Staff

II. The Management Committee.

Under the general guidance of the Board and Officers of the organization, the Management Committee will concentrate on the formulation, development, and modification of general administrative policy. While technical matters may be considered, the Management Committee's major concern will be with problems of administration, such as personnel policies, financial problems, and the organization of the Division. The Committee will meet each week.

The Management Committee will consist of the Co-Chiefs, Department Heads, the Head of Administration, and the Head of Contracts and Fiscal Administration. Substitutes for absent members will not ordinarily attend Management Committee meetings.

III. The Steering Committee.

Within the framework of broad SDD policy, as determined by the Board of Trustees and implemented by the Management Committee, the Steering Committee will concern itself with the formulation and execution of our technical programs. It will be the responsibility of this group to perform the necessary technical planning and coordination to insure that program objectives are met. Problems of scheduling, budgeting, work progress, facilities, and allocation of resources will be dealt with by the Steering Committee in its weekly meetings.

TO: All SDD Employees

2.

February 12, 1957

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III. The Steering Committee (Continued)

The Committee will consist of the Co-Chiefs, Department Heads, Technical Coordinators, a representative of Administration, and Head of Public and Technical Information as regular members. In addition, the heads of the several military groups will be asked to attend for discussion of appropriate agenda items. In the absence of regular members, substitutes may attend; additional participants will be invited as necessary for specific agenda topics.

IV. The SDD (later, SDC) Staff.

In order to give the foregoing committees the benefit of the widest possible consideration of both technical and administrative problems, the SDD Staff is to be established. Meetings of the Staff will provide the opportunity for discussion of the implications of management planning and decisions, and will also provide a medium for the expression of representative points of view regarding major items of concern to the SDD organization.

Meetings of the Staff will be held at intervals of from four to six weeks. The agenda for each meeting, with a somewhat detailed outline of each item, will be distributed well in advance in order to give members the opportunity to devote some consideration to the topics to be discussed.

Agenda items may be proposed by any Staff Member. Particular attention should be given to topics that are known or felt to be of general concern to the organization as a whole.

The composition of the Staff will be as follows: The Co-Chiefs, Department Heads, Head of Administration, Group Heads, Technical Coordinators (one of whom will serve as Secretary), Head of Public and Technical Information, and appointed members.

Initial appointments to the Staff will be made by the Management Committee. In making these appointments, primary consideration will be given to those individuals who have made significant contributions to the program, who have seniority of service, who can contribute mature and sound advice, and who can be expected to participate actively in the affairs of the Staff. Additional appointments, based on the same criteria, will be made from time to time as necessary to insure adequate inter-disciplinary representation as the composition of the professional staff changes. Staff Members should call the attention of their respective Department Heads to candidates for additional appointments to the Staff.

It is expected that the Staff will initially number about sixty. As the organization grows, the Staff will also grow, reaching ultimately a total membership of about twice that number.

Staff Members not occupying line supervisory positions will be encouraged to use the title in correspondence. In addition, all members will be identified by the symbol "S" following their names on the monthly organization chart.

TO: All SDD Employees

3.

February 12, 1957

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- V. Two of the groups discussed above (the Management Committee and the Steering Committee) are already in being. The Staff is to be established immediately. A list of the initial membership will be published shortly, together with the date and agenda for the first meeting.

W. C. Biel

W. C. Biel

M. O. Kappler

M. O. Kappler

JKH:lj

Initial Membership of the SDD Staff

Alexander, L. T.	Ogg, F. E.
Allen, W. H.	Olsen, R. E.
Benington, H.	Parkin, T. R.
Berger, R. M.	Patton, H. R.
Bertram, S.	Pelta, E. R.
Besnard, G. G.	Peterson, R. M.
Biel, W. C.	Porter, E. H.
Bogosian, A. G.	Robinson, M. A.
Boguslaw, R.	Rogers, M. S.
Bosak, R.	Rome, S. C.
Braun, V. J.	Rowan, T. C.
Callan, R. W.	Sackman, H.
Canter, R. R.	Schaefer, W. C.
Carnes, P. F.	Schell, F. J.
Carter, L. F.	Schwartz, J. I.
Chesler, D. J.	Schwarz, J.
Christie, L. S.	Sepmeyer, L. W.
Dahnke, H. L.	Simmons, R. F.
Davis, J. R.	Staugus, L. W.
Davis, R. H.	Steel, T. B.
Dawson, H. E.	Suffield, F. G.
Edrington, T. C.	Sweetland, A. F. M.
Elmer, G. A.	Talbert, G. E.
Esling, R. H.	Tarwater, J. W.
Fitzwater, M. E.	Tombach, H.
Fliege, S. E.	Turner, L. G.
Friedman, N.	Waller, E. A.
Gawain, G. C. V.	Willmorth, N. E.
Goodwin, W. R.	Wolin, E. R.
Gordon, E. S.	Wong, J. P.
Greenberg, P. D.	Zimmerman, W. S.
Harman, H. H.	
Harrington, R. W.	
Haverty, J. P.	
Hertzka, A. F.	
Herzog, J. K.	
Holmen, M. G.	
Hunt, D. H.	
Jensen, B. T.	
Johnson, G. H.	
Kao, R. C.	
Kappler, M. O.	
Kinslow, H. A.	
Kristy, N. F.	
Lawson, C. M.	
Lintner, R. M.	
Maatsch, J. L.	
Madden, J. D.	
Marshall, R. R.	
Marzocco, F. N.	
Matousek, J. F.	
Melahn, W. S.	
Miller, G. E.	

MEMORANDUM

15, Rev. (7-55)

TO: All SDC Personnel
FROM: M. O. Kappler
SUBJECT: LONG AWAITED ANNOUNCEMENT
COPIES TO:

DATE: 6 December 1957
MEMO NO.: SM-5672

The basic services contract and the supporting facilities contracts, covering our work for the Air Defense Command, have been officially transferred from The RAND Corporation to the System Development Corporation.

Many of you will recall that we have made several predictions about the effective date of this transfer, and that these predictions have proved inaccurate; the inaccuracies have been the result of delays in procedures and channels over which we have had no control. I am happy to say that no more predictions are necessary, since SDC commenced contract operations on December 1, 1957.

A news release is being sent to newspapers, trade magazines and writers throughout the country; a copy is attached. Also attached is a descriptive brochure and the first issue of our monthly paper. Additional copies of the brochure are available in stockrooms at our various locations.


M. O. Kappler

JKH:lj
Encs.

SYSTEM DEVELOPMENT CORPORATION
2500 Colorado Avenue
Santa Monica, California

Exbrook 3-9411

NEWS RELEASE
(Please note release date)

The RAND Corporation of Santa Monica, California, announced today that negotiations have been successfully completed with the United States Air Force for the transfer from RAND to the newly-formed System Development Corporation of a \$20-million contract to provide professional technical services to the Air Defense Command. The new corporation is, like RAND, non-profit and it has been established to carry on the activities formerly performed by the System Development Division of RAND, utilizing the same facilities and the same personnel. Headquarters of the new corporation are at 2500 Colorado Avenue in Santa Monica, and it is expected that the two organizations will work closely together.

F. R. Collbohm, President of RAND, will also serve as Chairman of the Board of Trustees of the System Development Corporation. Decision to form the new corporation, Mr. Collbohm pointed out, was reached after it became apparent that the rapidly expanding specialized activities of the System Development Division were becoming increasingly outside the scope of RAND's primary function as a scientific advisory organization engaged in long-range research principally for the United States Air Force.

President of the new corporation is M. O. Kappler, formerly Co-Chief of the System Development Division, who has been associated with the work of the organization since its beginning as an experimental RAND study in 1953.

The System Development Corporation is working on two major projects, both having to do with Air Defense. The first of these is the development, installation and maintenance of a System Training Program for the air defense system. This program provides realistically simulated emergency and wartime

air situations, such as enemy raids on probable U. S. targets, which give the air defense system practice in defending against air attack. Exercises can be scheduled frequently, in any weather, and may involve as much or as little of the air defense system as desired. System training serves to augment the Air Force program of so-called "live" exercises, during which the United States is "raided" by SAC (Strategic Air Command) bombers. The training program is helping personnel of the Air Defense Command develop increased flexibility for meeting any emergency.

The new corporation's second air defense job is that of "programming" for the computers in the SAGE (Semi-Automatic Ground Environment) air defense system. Programming is a comparatively new technical field in which persons with training in logic and mathematics prepare problems for solution by modern computing machines.

The SAGE system, soon to be activated throughout the United States, uses a network of huge, high-speed electronic digital computers to process information about the some 30,000 flights a day over this country. The computers are connected directly to radars, Ground Observer Corps posts, weather stations, and other information sources, all of which transmit data about the constantly changing air traffic picture. Each aircraft detected by the radars is correlated by the computer with all related information. This information is shown on situation display panels to Air Force personnel of the SAGE center. If an aircraft is an "unknown," the computer will direct interceptors to the unknown, transmitting accurate information to the interceptor pilots about the speed, altitude and direction required for identification and necessary action. Ground-to-air missiles may also be launched and guided to their targets by the computers.

To perform its many vital and complex functions, each of the SAGE computers must be equipped with a "computer program," consisting of hundreds of thousands of individual instructions that tell the computer what to do with each bit of information it receives. This highly technical job of "programming" for the SAGE computers is being carried out by the System Development Corporation in conjunction with personnel of the Air Defense Command.

The System Development Corporation's principal place of business is in Santa Monica, California, although it presently has a large contingent working in Lexington, Massachusetts, where SAGE was originally developed. Also, there is an extensive field organization, with Corporation representatives permanently stationed at major Air Defense Command installations throughout the country, as well as teams of computer programmers moving from one SAGE installation to another to introduce programs into the computing machines and check their operation.

The System Development Corporation employs nearly 1,800 people, including psychologists, mathematicians, engineers, computer programmers, and other technical specialists, as well as a supporting staff of non-technical and administrative people. The non-profit corporation is governed by a Board of Trustees drawn from leaders in science, industry, and public life. In addition to F. R. Collbohm, the Board includes: John Gardner, President of Carnegie Corporation of New York; W. T. Golden, New York financier; J. R. Goldstein, Vice President of The RAND Corporation; E. E. Huddleson of the law firm of Cooley, Crowley, Gaither, Godward, Castro and Huddleson of San Francisco; and H. P. Robertson, Professor of Mathematical Physics, California Institute of Technology.

The Corporation's officers are: M. O. Kappler, President and also a member of the Board of Trustees; W. C. Biel, Vice President and member of the Board of Trustees; L. G. Turner, Secretary; and J. H. Berkson, Treasurer.

Under the terms of the Corporation's charter, income from contract operations is used in furtherance of a program of research and development in the interests of national security and the public welfare.

System Development Corporation facilities in Santa Monica include a new 110,000 sq. ft. building, housing offices and computing equipment; a 60,000 sq. ft. building in which a modified SAGE computer has been installed for the development and exhaustive checking of the complex computer programs before they are taken to the SAGE sites; and a third office building, now under construction.

In discussing the contract transfer to the new corporation, Mr. Kappler said, "At present, the energies and talents of the System Development Corporation are devoted exclusively to problems of Air Defense. However, there is every reason to believe that these same specialized skills--in training and in computer programming--will find equal applicability to other military as well as non-military problems associated with the 'Age of Automation.'"

A MEDAL FOR HORATIUS

or

The Order of the Purple Shaft

Rome

II Calends, April, CCCLX

SUBJECT: Recommendation for Senate Medal of Honor

TO: Department of War, Republic of Rome

I. Recommend Gaius Horatius, Captain of Foot, CMCMXIV, for the Senate Medal of Honor.

II. Captain Horatius has served XVI years, all honorably.

III. On the III day of March, during the attack on the city by Lars Persena of Clusium and his Tuscan army of CXM men, Captain Horatius voluntarily, with Sergeant Spurius Lartius and Corporal Julius Herminius, held the entire Tuscan army at the far end of the bridge, until the structure could be destroyed, thereby saving the city.

IV. Captain Horatius did valiantly fight and kill one Major Picus of Clusium in individual combat.

V. The exemplary courage and the outstanding leadership of Captain Horatius are in the highest tradition of the Roman Army.

JULIUS LUCULLUS

Commander, II Foot Legion

Ist Ind. AG. IX Calends, May, CCCLX

TO: G-II

I. For comment and forwarding.

II. Change Paragraph III, line IX, from "saving the city" to "lessened the effectiveness of the enemy attack." The Roman Army was well dispersed tactically; the reserve has not been committed. The phrase as written might be construed to cast aspersions on our fine army.

III. Change Paragraph V, line II, from "outstanding leadership" to read "commendable initiative." Captain Horatius' command was II men—only I/IV of a squad.

J. C.

IId Ind. G-II. Ides, June, CCCLX

TO: G-I

I. Omit strength of Tuscan forces in Paragraph III. This information is classified.

II. A report evaluated as B-II states that the officer was a captain Pincus of Tiferman. Recommend change "Major Picus of Clusium" to "an officer of the enemy forces."

T. J.

III Ind. G-I. LX Ides, January, CCLXI

TO: JAG

I. Full name is Gaius Gaius Horatius.

II. Change service from XVI to XV years. One year in Romulus Chapter Cub Scouts has been given credit for military service in error.

E. J.

IVth Ind. JAG. XIId of February, CCCLXI

TO: AG

I. The Persena raid was not during wartime; the temple of Janus was closed.

II. The action against the Persena raid, ipso facto, was a police action.

III. The Senate Medal of Honor cannot be awarded in peacetime (AR CVIII-XXV Paragraph XII, c.).

IV. Suggest consideration for Soldier's Medal.

P. B.

Vth Ind. AG. I day of May, CCCLXI

TO: JAG

I. Soldier's Medal is given for saving lives; suggest Star of Bronze as appropriate.

E. J.

RANdom News

VIth Ind. JAG. II Calends, September, CCCLXI

TO: AG

I. XVII months have elapsed since event described in basic letter. Star of Bronze cannot be awarded after XV months have elapsed.

II. Officer is eligible for Papyrus Scroll with Metal Pendant.

P. B.

VIIth Ind. AG. I Ide of October, CCCLXI

TO: G-I

For draft of citation for Papyrus Scroll with Metal Pendant.

G. C.

VIIIth Ind. G-I. Calends, October, CCCLXI

TO: G-II

I. Do not concur.

II. Our current fine relations with Tuscany would suffer and current delicate negotiations might be jeopardized if publicity were given to Captain Horatius' actions at the present time.

T. J.

IXth Ind. G-II. VI day of November, CCCLXI

TO: G-I

I. A report (dated D-IV) partially verified, states that Lars Persena is very sensitive about the Horatius affair.

E. T.

Xth Ind. G-I. X day of November, CCCLXI

TO: AG

I. In view of information contained in preceding

VIIIth and IXth Indorsements, you will prepare immediate orders for Captain G. G. Horatius to one of our overseas stations.

II. His attention will be directed to Paragraph XII, POM, which prohibits interviews or conversations with newsmen prior to arrival at final destination.

L. T.

Rome

II Calends, April I, CCCLXII

SUBJECT: Survey, Report of DEPARTMENT OF WAR

TO: Captain Gaius Gaius Horatius, III
Legion, V Phalanx, APO XIX, c/o
Postmaster, Rome

I. Your statements concerning the loss of your shield and sword in the Tiber River on III March, CCCLX, have been carefully considered.

II. It is admitted that you were briefly in action against certain unfriendly elements on that day. However, Sergeant Spurius Lartius and Corporal Julius Herminius were in the same action and did not lose any government property.

III. The Finance Officer has been directed to reduce your next pay by II I/II talents (I III/IV talents cost of one, each, sword, officers; III/IV talent cost of one, each, shield, M-II).

IV. You are enjoined and admonished to pay strict attention to conservation of government funds and property. The budget must be balanced next year.

H. HOCUS POCUS

Lt of Horse, Survey Officer

—Reprinted from *KOMENTS*, Vol. 2, No. 4, June 1, 1957, pp. 4-8

Qui nescit scribere non putat esse laborem; tres enim digit scribunt, totum corpus laborat.

—FROM a Monk of St. Gall, in Eadbert, *Cod. MS.S. Gallens*, No. 243, ap. ARX, I, 87