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Comments on Organization and Planning for Korea Advanced Institute of Science

by

KunMo Chung

reviewed by

F. E. Terman

(Recommended Circulation only among KAIS Planners)

Supplement to
Survey Report on the Establishment of the
Korea Advanced Institute of Science

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Donald L. Benedict

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Franklin A. Long

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Prepared for
US Agency for International Development
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INTRODUCTORY REMARKS

This document is a supplementary report to the Survey Report on the Establishment of the Korea Advanced Institute of Science, which is a new graduate school of applied science and technology being established in Korea. The main report, which was submitted to U.S. AID in December, 1970, deals with the need, the feasibility and the major features of the organization, operation and policies of KAIS. In this supplement, we wish to present additional information on the organization, operation and policies of KAIS and our recommendation for the developmental schedule for the new institute. Since the main report includes our recommendation on the future expansion of KAIS activities and the general relationship between KAIS and other institutions within and outside Korea, we also describe some operational methods in these areas.

Our major purpose in this supplement is to help the hardworking and ambitious Koreans achieve their goals for KAIS. We believe that KAIS will become invaluable in modernizing Korean higher education and advancing Korean industrialization. A successful KAIS will force the improvement of other graduate schools in Korea, provide competent faculty members for other Korean colleges and universities, produce the critically needed well-trained engineers for Korean industries, improve developmental research necessary for the competitive export markets and, above all, enhance self-confidence among responsible Koreans.

There will be difficulties and agonizing moments in the process of achieving a successful KAIS. KAIS is a totally new concept on the Korean scene and involves many features to which the Korean society has not yet become accustomed. We hope that the people involved in KAIS will not become discouraged and compromise long-range values in response to pressures of the moment. KAIS has many friends who are prepared to lend helping hands for this worthwhile cause.

The present supplementary report is one such example. It is hoped that this supplement will be of assistance to those who have the responsibility for establishing KAIS, although the recommendations given here should be regarded as providing possible solutions that should be considered in relation to alternatives, rather than outlining the only proper way to proceed.

This supplement report is mainly based on the general conclusions and ideas obtained from the inspiring informal discussions on the subject among the KAIS Survey Team members, which was headed by Dr. F. E. Terman. Dr. Terman reviewed this supplement report and improved its contents vastly. Also, Dr. D. L. Benedict made a substantial contribution in Chapter I of this Supplementary Report. However, some estimates, which had to be made with limited information are solely the author's responsibility. The kind interest and valuable contribution by Dr. Benedict, Dr. Long, Dr. Martin and Dr. Terman on the KAIS project is sincerely appreciated.

I. ADDITIONAL REMARKS ON ORGANIZATION, POLICIES AND OPERATIONS

A. Board of Trustees and Advisory Councils

The law, the presidential enforcement decree and the articles of KAIS adequately describe the responsibilities of the Board of Trustees, (Appendix A of the main report). The Board of Trustees has full responsibility for the Institute and is the ultimate authority for KAIS. The Board has the right to set the operational schedules, and has control over all financial policies. The Board appoints and dismisses KAIS officials, establishes major regulations and also has the right to alter the articles. The Board also authorizes all major programs recommended by the faculty and awards all degrees, both earned and honorary.

The duty of the Board is to set major policy matters and oversee major developments of the Institute. However, the Board does not carry out the daily business of the Institute, which is correctly delegated to the president and his administration by the law. At KAIS, the president is the chief executive officer. Since chairmen of boards are chief executive officers in many private schools in Korea, care should be taken to avoid confusion on administrative authority in the early days of KAIS. Major policy making and administration are clearly divided between the Board of Trustees and the President at KAIS. The president is the only trustee to receive a salary from the Institute. No other trustee may receive any compensation for his service on the Board except nominal transportation and subsistence expenses for attendance at the board meetings.

Terms of appointment to the Board are set at three years. This term may be short, but it provides an early opportunity to replace a trustee who does not fit, does not enjoy the participation, or has a change in his other responsibilities and cannot continue to serve. Normally a trustee would be expected to take one or two years to become acquainted with KAIS activities, and so would require an extra term to serve effectively. Desirable trustees should be urged

to serve additional terms so that they can make substantial contributions. During the Institute's formative years, each trustee should be prepared to give one-half to one day per week to the development of the Institute. Also, each trustee should continuously look for ways in which he can make important contributions.

In the main report, the Survey Team suggests two advisory councils, one made of senior academic people and the other consisting of industrial leaders. Both councils report to the Board and advise the Board and the President on important policy matters which require broader views. As in the case of trustees, members of advisory councils would be chosen for their distinguished positions in Korean academic and industrial organizations. They render services to KAIS out of their deep concern for the development of Korea and do so without any compensation. Honor and pride would be associated with the appointment to council member, but a desire to contribute must also be a factor. Terms of appointment may be determined individually by the Board of Trustees. A trustee who has become emeritus after successful tenure on the Board may become a lifetime council member, while a president of a major Korean university may be invited to serve on the academic council during his tenure at that institution.

The academic advisory council is to be composed of elder statesmen of Korean higher education, responsible administrators of Korean universities, representatives of professional societies and distinguished scholars. There should be a balanced representation of Korean academic circles, especially complementing the Board of Trustees. Foreign representatives may be considered also, since graduate education must meet international standards and command international respect.

The major function of the academic advisory council is to alert the Board as to the up-to-date trends in undergraduate and graduate education in science and engineering and to supply authoritative evaluations of the ongoing educational

operations of the Institute. Also, for some advisory council members, the association with KAIS activities may provide information useful in the improvement of their own institutions. Through this type of feedback interaction, KAIS can contribute significantly in upgrading Korean higher education in sciences and engineering. In the areas of research activities and the opening of new fields, the advisory councils can give most pertinent opinions from which KAIS will benefit.

The industrial advisory council would be useful, on the other hand, in providing KAIS with first hand information on Korean industry and national economic planning. Beyond the technical collaboration, KAIS must look ahead and keep in touch with the expanding Korean economy. For example, if the government should decide to build up the heavy machinery industry, KAIS should understand the purpose, scope and details of the plan and find ways to contribute positively. In particular, it should give appropriate emphasis toward producing the required manpower, and should attempt to identify and formulate relevant research projects that would conform to appropriate academic standards and principles. The industrial advisory council should also keep KAIS informed about the job market for KAIS graduates and suggest opportunities for industrial funding of research and development. Fund-raising for KAIS is another important function of the industrial advisory council. Since this council will have a balanced representation of Korean industries, and will be composed of financial, government and industrial leaders, it can have a profound influence in making KAIS an important factor in Korean industrial development.

B. President - Administrative Organization

The president is the chief executive officer at KAIS and is responsible for the administration of all academic, financial and external activities of KAIS. As discussed in the main report, the ideal president of KAIS is a Korean scientist who is academically respectable, administratively talented and spiritually devoted to Korea and KAIS. Candidates should be carefully screened by a

committee and the best available candidate appointed as president. The screening committee should be appointed by the Board of Trustees and would report its findings to the Board of Trustees. A typical screening committee would consist of one or two trustees, one or two representatives of the advisory councils and one or two senior professors representing the faculty. In choosing the president, the screening committee should emphasize the candidate's potential to contribute to KAIS rather than his past record at other jobs. Most careful attention must be given to the selection of the president, since he is the single most important person for a successful KAIS.

The president is the head of the administration of KAIS and is assisted by an organization as suggested by Fig. 3-1 in the main report.

The duties of the administration include the following:

- 1) To select and recommend to the Board all appointments to the administrative staff, the faculty and teaching personnel, to evaluate the entire teaching staff, and to recommend promotions and salary increases.
- 2) To select and admit students, to record their educational progress, to administer scholarships and student aid and to oversee student welfare and health.
- 3) To prepare all schedules and establish the Institute calendar.
- 4) To administer all research projects, sponsored or unsponsored.
- 5) To prepare and submit all budgets and operating plans, and administer expenditures under the approved budget.
- 6) To maintain suitable and constructive public relations including particularly relations with industry.
- 7) To implement the physical development of the Institute.
- 8) To maintain a placement service for graduates and foster alumni contacts.
- 9) To establish policies for the student's extra-curricular activities jointly with the faculty.
- 10) To develop and supervise all courses, laboratories and programs.
- 11) To make recommendations to the Board regarding the distribution of students among different fields of study.

12) To maintain close contact with the suggested U.S. coordinating office and receive the necessary external input (as discussed in the main report, Chapter 4).

13) To prepare long term development plans and to up-date these plans. (A definitive three year plan and a five year loose plan may be required.)

The vice president for academic affairs assists the president in carrying out activities related to duties 1, 2, 3, 9, 10 and 11 as described above. He evaluates departmental recommendations for teaching programs and monitors degree requirements, program calendars and program announcements. The vice president for academic affairs also coordinates interdepartmental and intra-center activities including the library and the computing center and administers student affairs.

The vice president for development assists the president in carrying out activities related to duties 4, 6, 8, 12, and 13 as described above. He also is in charge of industrial liaison, continuing education and organizing short courses and special programs. The vice president for development supervises the research coordinator, who administers grants and contracts for research and helps faculty members in developing their research activities. The master planner and publication director are under this vice president, who should work closely with the vice president for academic affairs in order to set up realistic developmental plans.

Vice presidents also attend Board of Trustee meetings as non-voting secretaries. In behalf of the president, vice presidents may report business matters and express opinions at the board meetings. In the absence of the president, a vice-president represents the president as a trustee ex-officio.

The business manager prepares financial reports and budgets, projects the long range financial needs, and secures the auditable financial records with the assistance of the comptroller, who supervises the accounting and payroll. With the aid of the director of construction and maintenance, the business manager also supervises the construction and improvement of the buildings and other facilities and the operation and maintenance of the facilities. Dormitory operation is an additional responsibility of the business manager.

The president will create or abolish administrative jobs as required to carry out the administrative duties. His three main assistants, two vice presidents and the business manager, will form the administrative leadership of KAIS.

Faculty members would fill almost all administrative jobs except for some purely administrative service jobs under the business manager. Therefore, department chairmen, center directors, research coordinator, continuing education director, etc. may also teach and perform research work while carrying out their administrative duties. Balanced load distribution is desirable and proper credit should be given to each activity. As will be discussed later, KAIS faculty members should be compensated with a liberal salary scale and are to receive well-designed fringe benefits including housing, transportation, etc. Some important non-faculty administrative members under the business manager should receive salaries and benefits comparable to faculty members. Without a strong and stable administration, KAIS will not be able to carry out its mission efficiently. Good administrators are as important as good faculty members. In the formative years, the Board should give utmost care in hiring non-faculty administrative personnel. Limiting the number of non-faculty administrators to a minimum necessary level, requiring probationary status during the initial period of appointment and utilizing a contracting system will enable KAIS to maintain a fresh and flexible administration. Initially, the business manager, comptroller and the director of maintenance may be regarded as important non-faculty administrators.

C. Faculty

Responsibilities of the faculty should be as follows:

- 1) To establish admission requirements and to plan all curricula and courses under guidelines provided by the President, academic vice president and the Board of Trustees
- 2) To establish degree requirements
- 3) To establish teaching standards
- 4) To establish policies for research, both sponsored and unsponsored
- 5) To consider the conduct of the students
- 6) To establish policies on student extracurricular activities
- 7) To constantly improve courses and curricula

Academic standards of the highest degree must be maintained in teaching and research. Students are going to be the major product of KAIS and so great attention by faculty members must be given to students.

The faculty of KAIS consists of the president, vice presidents, the professors, associate professors and assistant professors. Administrative personnel are members of the faculty only to the extent that they have concurrent faculty appointments. Other teaching members may attend the faculty meetings but are not entitled to vote. Under full scale operations at the proposed level, KAIS should have about 50 professors of various rank with the following distribution:

- ~ 40% in the rank of full professor and associate professor with tenure or on temporary probationary appointments with prospects of tenure
- ~50% in the rank of assistant professor or instructor on term appointments
- ~10% visiting professors with one or two year appointments.

There would be some adjunct professors and a few lecturers. The large number of assistant professors and instructors assures a vigorous core of up-to-date, energetic and inspired young scholars who can stimulate KAIS and use its excellent facilities to develop their abilities. The policy of appointing them without tenure allows many men to gain experience in an excellent environment from which they can go to tenured positions in other universities, or to leadership positions in non-academic organizations.

This group of junior faculty members should be regarded as individuals of high promise who are being prepared for important roles in Korea's future; i. e., they are men who are still being trained. The older faculty members and the academic administrators should accordingly take an active interest in the continued development of these young scholars, and work with them as one would with other mature students.

All appointments to the faculty are made by the Board of Trustees upon the recommendation of the president. The faculty members are selected with the same vigor and objectivity as the president and vice presidents. Available candidates are screened by a committee for academic ability, potential for filling the defined vacancy, devotion to the objectives of KAIS, and personal characteristics.

The faculty selection committee would consist of the academic vice president, the department chairman related to the faculty position and one or two "external" members who are appointed by the president. These "external" members should be chosen among distinguished scholars who understand KAIS's goals. Some members of industrial visiting committees and university advisory council members can serve as "external" faculty selecting members effectively. In filling a tenure position, KAIS should attempt to obtain the Korean national best suited for the position, irrespective of whether he is at KALJ, at another institution, in industry or abroad. Even when filling nontenured faculty positions, it is important that there be competition, and that KAIS offers the job to the best qualified individual from a slate of three to five individuals who are the three to five best qualified Korean nationals one can find anywhere in the appropriate age range. Somewhat unique for appointment at KAIS, industrial experience would be counted favorably, and lack of any past contact with industry would be a negative factor for many openings. Candidates must understand that KAIS will concentrate on the level of education and the areas of study needed by Korean industry.

Initial appointments from outside KAIS in each rank except temporary appointments shall be for two years. (Non-faculty members including instructors are appointed for one year for the initial appointments.) Appointments for Assistant

Professor beyond the initial two-year appointment are recommended to be for three years. Appointments for Associate Professor beyond the initial two-year appointment are generally for three years, reappointment at the end of this term carries tenure. Appointments for Professor beyond the initial appointment should carry tenure. The president, with the concurrence of the Board, may eliminate the initial probationary appointment period of some faculty members recruited from outside the Institute for tenure level positions.

Tenure signifies that the faculty member has established himself as a regular member of the Institute and that he may look forward to continued service without the necessity of recurring appointments so long as he acquits himself as a scholar, a gentleman, and a member of the academic world, and effectively discharges his duties at KAIS. The tenured faculty is the backbone of KAIS and its integrity, ability and vitality is its source of strength.

Tenure cannot imply absolute security since it must be related to the financial situation and educational commitments of KAIS which will determine its teaching and research programs. However, termination of the appointment of a tenured faculty member because of financial exigencies should be considered only as a last resort.

The basic criterion for promotion of a faculty member is his contribution to the objectives of KAIS. The factors to be considered are the quality of his performance in his assignments, his rate of scholarly and professional growth and his contribution to the reputation and general welfare of KAIS.

The Education Council at KAIS forms a direct channel of communication between the faculty and the top administration. The council is composed of the president, who will be chairman of the council, vice presidents, chairmen of departments, directors of centers and several tenured professors and associate professors elected by the faculty. The council should review the standard for the teaching staff, curricula and syllabi, the granting of degrees, student quotas,

admission qualifications, research grants, scholarship awards, etc. The council should meet periodically and may set up subcommittees to deal with some specific problems.

Salary scale and benefit policies are frequently mentioned as one of the most critical problems in recruiting and maintaining the desired faculty. It is important to set a realistic salary scale to enable the faculty members to live as well as they could in other countries. In return, KAIS faculty members should not be allowed concurrently to hold positions elsewhere except for certain acceptable and desirable duties compatible with KAIS policies. These exceptions will be discussed later. By setting a liberal salary scale, KAIS will be able to attract the best talent that is available and its faculty members would be required to commit their entire professional effort for the benefit of KAIS. The experience of KIST indicates that such a policy can produce the desired results.

Salary payments should be made in twelve equal monthly payments starting with the beginning of the new academic year. The regular academic staff members are appointed on the basis of either nine-months or twelve-months of full time duty, depending upon their duties at KAIS. The staff members appointed on a nine-month basis may work at other educational institutions, industry or governmental agencies during the three months. This practice is to encourage KAIS faculty members to make contact with the outside world and to devote their time to such special projects as sponsored research or workshops. The additional compensation during the three month period is acceptable for faculty members holding nine-month appointments.

Extra employment by KAIS faculty members such as consulting for industry should be treated cautiously. Consulting for industry can increase the benefits that KAIS brings to Korean industry and it gives professors valuable experience. Since such benefits should not be lost, there should be some way to allow or even encourage some desirable consulting. On the other hand, excessive extra employment by KAIS faculty members may have

disastrous results and destroy KAIS's reputation totally. One possibility to be considered is a set of strongly controlled extra-employment guidelines for KAIS faculty. Time permitted, payments received, work completed and other details associated with extra employment could be handled by the KAIS administration. For example, the consulting fees could be received by KAIS on behalf of its faculty members. There should be limitations both in the time used for extra employment, and the amount of compensation received personally by faculty members through consulting work. One possibility would be to limit consulting to two or three days a month, with all income in excess of expenses to be paid into a segregated account, the funds in such an account to be made available to the professor for research expenses, travel to professional meetings, or similar purposes.

Normal Load

A full time load for a faculty member is difficult to formulate in exact terms. In general, however, a full teaching load at the Institute consists of two courses or two sections of one course at a time. Additionally, faculty members must carry out thesis supervision of, normally, two master's students and one ScD student. There will also be other activities including committee and administrative work over and above those normally pertaining to teaching. Also, time must be available for maintaining relations with industry. If sponsored research is to be carried out, reduction of the teaching load may be appropriate. This load is not light and may involve excessive hard work, unless the administration effectively supports faculty members. In all good conscience, the Institute should do everything possible to minimize non-productive duties by faculty members through proper administrative support. For example, the production of class notes can be greatly simplified by maintaining an efficient publication specialist. Faculty time devoted to the administration of sponsored research projects can be greatly reduced by a well-functioning research coordinator. However, the average hard working faculty member may have to devote fifty to sixty hours per week to successfully carry out all of his duties.

Examples of Load Estimates (per semester)

<u>A. Department Chairman</u>	<u>Load Estimate</u>	<u>Category</u>
Teaching a seminar course	20%	I
Administrative duties as chairman	40%	II
Committee work	10%	II
Thesis supervision (2 MS or 1 PhD)	10%	III
Contract research	20%	IV
<u>B. Senior Professor</u>		
(1) Teaching a lecture course	30%	I
KAIS approved duty for professional societies	10%	II
Committee work	10%	II
Thesis supervision (2 MS and 1 PhD)	20%	III
Contract research	30%	IV
(2) Teaching a lecture course	30%	I
Teaching a seminar course	20%	I
Committee work	5%	II
Thesis supervision (2 MS and 1 PhD)	20%	III
Contract research	25%	IV
(3) Teaching a lecture course	30%	I
In charge of student affairs	30%	II
Thesis supervision (2 MS)	10%	III
Commissioned writing of a book (with support)	30%	IV
<u>C. Junior Professor</u>		
(1) Teaching a lecture course	30%	I
Teaching a laboratory course	30%	I
Thesis supervision (2 MS)	10%	III
Research supported by KAIS	30%	IV
(2) Teaching a lecture course	30%	I
Teaching a seminar course	20%	I
Committee work	5%	II
Thesis supervision (1 MS and 1 PhD)	15%	III
Contract research	30%	IV
(3) Teaching a laboratory course	30%	I
Extra credit for supervision of a teaching laboratory	20%	I
Thesis supervision (2 MS and 1 PhD)	20%	III
Contract research	30%	IV

- Note 1: Classification of categories of duties
- I: Teaching duties
 - II: Administrative duties
 - III: Thesis supervision
 - IV: Supported research and publication activities
- Note 2: Every regular faculty member except the president and vice presidents should carry a minimum of 20% load in category I.
- Note 3: No professor except the president and vice presidents should carry more than 50% load in category II.
- Note 4: Every regular faculty member except the president and vice presidents should supervise at least one thesis student. (Category III)
- Note 5: Every professor should have a minimum of 20% load in category IV.
- Note 6: Contract research would include research under government grants or contracts, industrial research supported by private firms, research supported by agencies, etc.
- Note 7: Industrial consulting duties should not be counted into the regular load estimates. Consulting fees collected by KAIS for a professor should be credited to a separate special account for the professor and would be used by him in purchasing books or instruments, attending professional society meetings and taking care of some creditable expenses for professional activities.
- Note 8: No professor should be allowed to practice industrial consulting while his duties at KAIS do not account for a full 100% load of which 20% should be in Category IV. Thus, a professor should first try to draw industrial research contracts to build up his load at KAIS.
- Note 9: In these examples, the load associated with the industrial relations is not explicitly shown. However this load is included either in the load for committee work or in the load allocated to the contract research.

Leaves and vacations should be properly managed at KAIS. A faculty member may be granted a leave of absence without pay, provided his request is approved by the President. Sabbatical leaves are authorized each year by KAIS for a limited number of faculty members who have served at the Institute for at least six years and have achieved tenure status. The purpose of the sabbatical leave is to render the recipient more useful to KAIS as a teacher, an investigator or as an administrator. A sabbatical leave is not an extended vacation. Candidates will submit a proposed study or research plans for the period of leave and write a brief letter report upon their return. Sabbatical leaves should be awarded for either a full year at one half the academic salary or for one semester at full salary. In accepting a sabbatical leave, the faculty member agrees to return to KAIS for additional service for more than one year.

Both faculty members and supporting staff members should receive a specified period of vacation. This is not systematically practiced in Korea. However, a paid vacation period is recommended for the morale and refreshment of the KAIS faculty and staff.

Fringe benefits for faculty members of KAIS should include attractive housing quarters, an adequate retirement system, health and life insurance program, use of institute-owned transportation, etc. The Institute might also sponsor some educational programs for children of faculty and staff members. In view of the tight situation for primary and secondary schools in Korea, such a provision could be one of the most cherished fringe benefits. Another possibility is a small health clinic to be used by all of the Institute's family.

From KIST's experience, the provision of housing quarters has proven to be essential in attracting scientists and engineers from abroad. The housing situation in the Seoul area is extremely tight and presents a serious social problem to salary earners. Korean planners recognized this problem and have incorporated faculty housing facilities in the Science Park and the apartment building will be shared by other members of the Science Park. This will create a small community of scientists

and engineers and will relieve members of the Institute of one cause of excessive socioeconomic pressure. The retirement system and insurance programs are necessary and should be implemented. A possibility in this connection which might be considered is the formation of a Korean Teachers Insurance Program which KAIS members would join. A transportation program by institutionally owned facilities is a common practice in Korea and widely accepted as a fringe benefit; KAIS should adopt such a service.

D. Curricula Considerations

In the main report, the Survey Team recommended six initial fields of instruction and pointed out some principles to be followed in organizing the curricula. It was pointed out that KAIS will be mainly concerned with MS programs during the initial years and the faculty should assume the primary responsibility for formulating the curricula. Therefore, discussion here is mainly applicable to MS programs in the formative years, when the faculty will be in a developmental stage.

There would be basically four different types of courses at KAIS; (1) "Refresher" or "preparatory" courses, (2) "core" courses, (3) principal major courses, and (4) elective courses. "Refresher" or "preparatory" courses are oriented to prepare students for the regular training at KAIS. It is to be expected that some of the entering students will have been working in industry for several years after graduation from undergraduate school and need refreshing in languages, in mathematics, and possibly in basic technical subjects. Also some students could have weak areas due to unbalanced undergraduate training. Even good students who successfully pass the qualifying examination could benefit substantially by taking some "refresher" courses. Credits earned by taking "refresher" courses should not be counted toward the degree requirements. Ideally, the "refresher" courses would be offered during the Summer term preceding the new academic year. Subjects such as the following would be appropriate as "refresher" courses:

Modern Language Courses in English, Russian and Japanese

Calculus and Differential Equations

Modern Physics and Laboratory

Computer Programming

Elementary Electronics and Laboratory.

"Core" courses should be taken by every student entering KAIS and passing grades in these courses would be required for the successful completion of the degree requirements. These courses will ordinarily be offered during the first year of the MS program. Although graduate programs tend to be specialized, modern science and engineering frequently shows interdisciplinary characteristics. Thus, a successful research scientist or engineer must be trained to face any problem somewhat related to his specialties. The following courses might be offered as "core" courses:

- (1) Statistics including probability
- (2) Survey course on materials
- (3) Mathematics for scientists and engineers
- (4) Industrial Management and Engineering Economy
- (5) Introduction to Instruments and Advanced Electronics
- (6) Classical Mechanics and Electromagnetics

In addition to the above "core" courses, students would be required to attend weekly seminars conducted at KAIS. One of the seminars should be on "Economic Development in Korea".

The principal major courses in each field should be taken by MS degree students to fulfill the degree requirements in that field. These courses can be taken in parallel with "core" courses. Also elective courses can be taken by students with respect to their specialization. We give here some possibilities in each field.

1. Mechanical Engineering

- * Machine design - dynamics, balancing, vibration

- * Macro- and micro structure of materials - including aspects of cutting, grinding, drawing, joining, welding, fastening

Metal refining

- * Heat treatment of metals and their properties

Corrosion and environmental effects

Engines - internal and external

- * Heat transfer

Nuclear reactors

2. Chemical Engineering and Applied Chemistry

- * Chemical processes and control equipment

- * Organic chemicals and processes

- * Inorganic chemicals and processes

Ceramics - characteristics and processes

Catalyzed reactions and catalyst processing

- * Polymer technology - manufacturing, properties, drawing, extruding and molding, degradation dyeing and treating

Electrochemical technology

Pharmaceutical chemistry

Water resources

3. Electronic Sciences

- * Active devices - electronic, electromechanical and electromagnetic

- * Passive devices - electronic, electromechanical and electromagnetic

- * Properties of electronic materials and their preparation

- * Circuit networks and device applications

Lasers and masers - principles and applications

Microwave components

4. Communication and System Engineering

- * Information theory and processing
- * Mathematical coding and programming
- * System theory and automatic control - self organizing and adaptive systems
- * Computer components and application
- Radar technology and applications

5. Industrial Engineering and Management

- * Planning, scheduling and control method
- * Quality control
- * Plant design and assembly line layout
- * Cost estimating - cost benefit analysis
- Organization and human relations
- Material, product and process flow
- Production equipment
- Econometrics
- Financing
- Marketing
- Technology transfer

6. Basic Science and Applied Mathematics

- Numerical analysis
- Differential equations
- Linear algebra
- Introductory quantum mechanics
- Nuclear reactions (low energy)

6. Basic Science and Applied Mathematics (continued)

Theory of electromagnetic waves

Solid state theory

Thermodynamics - classical and quantum

Plasma waves and instabilities

Design of experiments and data analysis.

Courses marked by * are recommended principal major courses. Unmarked courses can be regarded as recommended elective courses. Students in one field may take courses in other fields as electives.

Many of the courses cited above should be multi-purpose, broad-spectrum type. They can be split to be more specialized as KAIS turns to greater scientific and engineering depth, and becomes larger. In the early days they can best serve the needs by being broad and practical.

The composition of the curricula into "refresher", "core", "principal major" and "elective" courses can be effective only if the academic schedule is set wisely. In the current Korean system, the academic year is uniformly set by the Ministry of Education to provide usually a month's recess in the winter and one and one-half month's summer vacation. The beginning of the academic year is in the early spring. Various entrance examinations are held in the late winter. Therefore, it seems appropriate that KAIS also hold the student selection some time in February. After a brief period for graduation and rest, students are expected to enter the ten-week military training during the spring months. After the military training, students accepted for admission may participate in a brief industrial tour to gain first hand observation of Korean industrialization. During the summer, students may work at some designated industrial plant or take "refresher" courses at KAIS. The summer work period would be essential for well-qualified students who are sponsored by an industrial firm but are without industrial experience. During the work period, such students can learn the nature of the problems of the

industrial firm and establish a relation with their sponsors. Older students who are sent to KAIS for graduate study by their employer, can appropriately take "refresher" courses during the summer. Therefore, it is recommended that KAIS start its academic year in September. By shortening the winter recess the regular academic year could end in early June. This arrangement will be particularly useful in securing many fine visiting professors from overseas. It also is more satisfactory for those KAIS faculty members who would like to work overseas when on leave.

MS candidates without practical experience would be required to write a thesis for the partial fulfillment of the degree. It is recommended that the thesis topic be a practical problem. For example, the design of a chemical process can be an appropriate subject while a feasibility study of a simple industrial undertaking can also be acceptable. During the initial one or two years, when KAIS is not ready to carry out substantial experimental work, much thesis research can be favorably carried on in the "field" with joint sponsorship of KAIS and industry or government. The spirit of the thesis research is to provide the student with the initiative and self confidence required to formulate and solve problems. As recommended in the main report, a reasonable effort on thesis research may require one semester of full time work, which should be spread out over the second year of the master's program.

E. Instruction Policy

KAIS programs are oriented toward the production of manpower having the leadership qualities in science and technology necessary for the rapidly developing Korean industry. In order successfully to execute those programs a few of the principles on which the programs are based will be given. First, modern engineers are faced with situations requiring an extremely wide range of knowledge. A substantial part of this knowledge is acquired as needed on the job and by lifelong study. While a student, the engineer should learn how

to get the desired information and how to utilize knowledge in practical problems. He should be trained to use library materials, including journals and reference books, should be able to use modern instruments and computing facilities and should know how to gain understanding through discussion with peers in his field. Secondly, the students must receive a sound education in a core curriculum, which is common to several departments. The number of special courses should be kept at a minimum. Exposure to more than one is able to digest contributes little. Students should be required to pay the desired intensive effort on important courses. Associated with this point is the fact that the efficiency of the teaching program improves as class enrollment increases up to at least 30 or 40. No classes except seminars should be given with enrollments less than 10. KAIS will be able to reduce instruction costs and save professors' time for other activities, including informal contacts with students, and liaison with industrial activities.

Lectures at KAIS should be complemented by recitation periods, reading assignments, reports and some field trips. It is desirable to orient the traditional classroom lectures toward the presentation of problems and the current approaches in solving the problems. Students should be encouraged to initiate independent studies on the course content using library materials and problem solving. The classroom lectures should do more than repeat lecture notes, which can be written in advance and distributed to the students prior to the discussion in the lecture room. It is conceivable that professors will spend more of their time in preparing the lectures and lecture notes than in actual contact time in the classroom. The resulting classnotes may be used for the possible publication of textbooks which can reach a wider audience, and for the improvement of the course content by succeeding professors. It is recommended that KAIS maintain a functioning reproduction facility to prepare classnotes. In view of the lack of adequate textbooks in Korean, lecture notes at KAIS can be distributed to students at other institutions and practicing engineers. In

fact, the preparation of technical literature in Korean might be a very important function that KAIS could perform for Korea.

The library at KAIS should be a central place for the learning process. Assignment should involve regular reading in the library to insure that the students acquire the habit of consulting the literature available, and learn the procedures involved in locating needed information. It is assumed that a graduate will need to keep abreast in his field and continue to learn whatever he needs for his future work. Students would also use the library as a place to study. The library should accordingly be equipped with adequate reading room space to serve all members of KAIS. In view of the difficulties in securing expensive books published abroad, private collections of specialized books will be limited for some time in Korea. Hence, whatever books are available in Korea should have a high utilization rate, a fact which makes a well-functioning library a most useful facility in a Korean graduate school. Unfortunately, the present graduate schools have substandard libraries due to the lack of funds. KAIS should not be another example of this weakness. The content and utilization of the library should be the pride of KAIS. The architectural design of the library should include such features as easy access from the main KAIS building and dormitories, quiet reading rooms, operationally laid-out book shelves for quick access for readers, and inexpensive reproduction facilities. The Survey Team recommends that KAIS have a functioning library in operation from the time its doors are first opened to students. The librarian may be one of the first administrators to be appointed. As a final word of caution, the library should not be considered as a storehouse of books; second, a substandard budget for the library can have a disastrous effect in the long run.

After the library, the next emphasis would be on the teaching laboratories. As a basic principle, exposure to modern laboratory instruments and test equipment will be stressed as much as possible in the KAIS instruction program. One desirable distinctive characteristic of the KAIS education will be that a

KAIS graduate is well trained for laboratory work and knows how to use equipment. Experiments that require some initiative and judgment on the part of the student, rather than prepared cookbook experiments, are preferable. An open-door policy to encourage independent investigation offers possibilities for individual initiative. At the same time, professors will render guidance in order to bring each student into contact with the full range of the facilities. Students should take complete responsibility for defining the investigation, choosing the measurements and instruments, analyzing the results, and evaluating the significance. It may take a great deal of time for KAIS professors to prepare functioning teaching laboratories and continuously improve them. During the formative years, professors in charge of teaching laboratories may receive extra credit for their efforts in the evaluation of teaching loads. In view of the priority fields already chosen, the initial teaching laboratories may be in the following: materials testing laboratory, electronics laboratory, computer center and chemistry laboratory.

The teaching laboratories described above are closely related to research laboratories, where students would carry out their thesis investigations. For most students, the thesis investigation becomes the most significant laboratory experience. It is usually an individual effort under the supervision of a designated professor. Therefore, there would be close correlation between research laboratories, which can reflect professors' research interests and projects, and students' thesis investigations. It is most appropriate that KAIS maintain research laboratories which are relevant and also useful in producing results. One can easily maintain an inactive laboratory at a great expense simply because it is there. KAIS administration should be bold enough to discard projects which have lost their momentum and value in achieving KAIS's goal. Further comments will be made on research at KAIS later to elaborate more on the functions of the research laboratory.

The performance of students in both classroom lectures and laboratories should be evaluated by appropriate examinations. Although examinations are to grade the student's performance, the aspect of education and training achieved through examinations may be as important. Frequent examinations encourage a student to work steadily and effectively. He develops useful habits of making every day count, measuring progress in terms of days or weeks instead of years and comparing his performance with others. For these purposes, single all-or-nothing examinations given at the end of a course do not represent the best educational practice. Also to be noted is that the best examinations stress the ability to apply facts and fundamental principles in new ways and unexpected situations rather than the ability to repeat what has been heard. Favorable consideration might be given to a combination of open-book and closed-book examinations to broaden the abilities that are being encouraged.

A thorough graduate education includes training in verbal and written communication. Engineers and scientists, particularly the leaders are required to make reports, to confer on their work and participate in professional activities. Practice to achieve fluency in verbal communication when expressing opinions to authorities and elders is especially important for Korean students, who are rather shy and unwilling to dispute issues even when their work requires it. Informal relaxed group discussions in the presence of professors and other students may help them to learn that respectful behavior is compatible with objective, friendly and even aggressive discussion of technical matters; various forms of seminars are useful for encouraging students to speak. Students should also be required to present reports or comment on what they have read, heard and seen. Topics are numerous including technical reports, literature reviews, presentation of research results, reports on industry visits, etc. Students should become accustomed to supporting their opinions in the face of questions and criticism from others and learn how to improve their presentations and reports with the help of other's opinions.

KAIS's commitment to close association with Korean industries requires students' exposure to industry. Professors should use field examples for illustrating lectures; a promising means in this connection is scheduled field trips to industrial plants. In many cases, industrial problems may become research topics and lead to possibilities for cooperative activities shared by students and engineers.

Most graduate schools make use of visitors in their educational programs. KAIS should maintain seminars and symposiums given by scientists and engineers within and outside Korea. In organizing these activities student needs should be uppermost. The very natural tendency to seek world-famous professionals and spend much time on entertaining them usually contributes little to the students. Better returns result from treating visitors as working contributors; some experts are superb for this purpose and enjoy it greatly.

F. Research

As discussed in the main report, research will be an integral part of KAIS's educational program and students will greatly benefit by participating in research projects. Thesis research should be a major aspect of the graduate training. Also, research should be one of the most important faculty activities, and represents one of the best ways to contribute to the scientific and technological communities in Korea and abroad. An active and meaningful research program will quickly bring an international reputation to KAIS. Therefore, KAIS must provide a solid plan to foster research activities and support them in the best possible manner. The principal aspects of research activities include: 1) faculty initiative and formation of research groups, 2) funding, 3) administrative support, and 4) publications and reports. It is expected that any promising candidate for a faculty position at KAIS would be strongly motivated for a successful career as a scientist or an engineer and have a definite research interest in a specialized field. During the recruitment, every candidate would submit a plan outlining his teaching interest

and a proposed research program. His research plan may be the continuation of work in the area of his doctoral dissertation or a new topic which is conceived by the candidate. In any case, KAIS must evaluate the merits of the plan in terms of its scientific value and also the setting in which KAIS is located. A topic can be of the highest scientific value, but the execution of the research plan may be impractical at KAIS because of funding and manpower available. A topic may be suitable at KAIS, but the proposer may apparently lack the training and capability to carry out the plan. Another problem may be that the proposed research is too singular to develop into a program which will involve students and possibly other faculty members. In research, faculty initiative is most important and should be correlated with KAIS's objectives.

In practice, a group of scientists and engineers working together daily is very advantageous. The concept that a 'critical mass' is required in order to achieve an effective research group is well accepted. KAIS faculty members with related interests may be grouped into small units to form cells with critical mass in carrying out research and in the teaching of students. By reaching the critical mass, faculty members will not be isolated and trapped into 'choking' conditions scholastically. A critical mass group may be as small as two or three faculty members with related interests, together with some doctoral and master's students. In addition, it will ordinarily have some part time members who are lecturers or adjunct professors at KAIS or faculty members at other institutions. Sometimes, scientists or engineers at other research institutions at the Science Park may become active members of the group. A visiting professor would be ideal to relate the group's activity with activities abroad. Research projects would be carried out by the group with intensive cooperation among its members. We propose some possible research groups on the following page. Exact topics to be attacked by these groups are not given, since they must be decided by each group. Since groups are formed around common research interests, they can be formed and dissolved. Moreover, there can be a continuous common interest in the broad sense among a larger number of faculty members. Thus, faculty members

Examples of Suggested Initial Research Groups

(1) Materials Group

This group may carry out investigations on the physical and chemical properties of metals and alloys and on methods of improvement to put those materials to some interesting uses. This group may consist of faculty members from Mechanical Engineering, Basic Science and Applied Chemistry.

(2) Petrochemical Group

This group would carry out research projects to investigate chemical processes associated with petroleum including synthesis of new chemicals and optimal production methods of some desirable chemicals. Faculty members from Chemical Engineering and Applied Chemistry will form this group.

(3) Circuit Synthesis Group

Composed of faculty members from Electronic Sciences and Systems Engineering, this group will carry out research on circuit synthesis.

(4) Management Specialists Group

This group will analyze the various management systems in practice and would try to improve them by introducing new management methods and devices. Faculty members in Industrial Engineering and Management will form such a group.

Also, one can visualize research groups such as Computation and Computer Group, Solid State Physics Group, Pharmaceutical Chemistry Group, Polymer Chemistry Group, Communications Group, Technology Transfer Group, etc.

belonging to different research groups might find a continuing common interest between themselves, and this common interest can be reflected through successive related research projects. In such a case, these faculty members would form a research center as proposed in the main report. There are many successful examples of research centers, which are interdepartmental and organized for research purposes. Research Laboratory of Electronics at MIT is one example and Polymer Research Institute of Brooklyn Poly is another example. In fact, almost every great technical university has one or more such research centers. These research centers are as permanent as departments. While a research group may be considered as an informal gathering of specialists, a research center is an organization that pursues research vigorously in a particular area on a permanent basis. Its director carries the same administrative responsibility as a department chairman. For all practical purposes including budgeting, and faculty evaluation, a research center is an administrative unit.

It is customary that each faculty member should seek research funding from government agencies, industry and private foundations inside Korea and abroad. Of course, there would be some research projects which merit strong support but do not receive outside funding. Especially for new faculty members, startup grants are often necessary. For such cases, it is recommended that KAIS set up an internal research fund as a part of its annual budget. The internal research fund would be used most productively in supporting projects necessary for KAIS education and as startup grants for new faculty members. The fund should not be distributed evenly among the faculty members irrespective of the need or considered as a possible source of research funds for incumbent professors on those research topics which can be supported by external agencies. There will be great competition for any research funds available in Korea and abroad. Therefore, not only good proposals but also intensive efforts are needed to obtain grants or contracts. The Survey Team recommends that KAIS appoint a Research Coordinator. The Research Coordinator would carry out the following tasks:

- 1) Secure information on possible sources of research funds
- 2) Inform faculty members of these funds
- 3) Assist faculty members in preparing research proposals
- 4) Transmit proposals prepared by faculty members
- 5) Negotiate with the funding agencies jointly with faculty members
- 6) Keep records of the research projects
- 7) Provide clerical support for research projects
- 8) Carry out adequate public relations with respect to ongoing research projects at KAIS
- 9) Prepare a yearly report on KAIS research
- 10) See that the project sponsor receives adequate reports (both verbal and written) on progress of research

Thus, the major administrative chores associated with research projects are to be handled by the Research Coordinator. However, other administrative people will also assist the Research Coordinator to enhance KAIS research work since research is one of the major KAIS activities.

The products of any research project are in the form of technical reports, patents and publication of papers in recognized journals, and trained students. As important as getting research funds is the successful completion of the task, and the involvement of students in the activity. Technical reports are especially suitable for industry sponsored research which is usually applied research. An invention of practical value coming out of the research project should be patented in order to be protected. Unless the research contract specifies otherwise, KAIS should receive all patent rights which are the result of research efforts by KAIS faculty members and students. Such a provision can be written into the faculty contract. Publication of papers in recognized journals is a major means of obtaining scholarly recognition. The quality of KAIS scholarship would be reflected in these papers. It is fitting that KAIS maintain an office of publication to aid faculty members in

publishing papers. The office can render assistance in preparing the manuscript, following up the publication of the treatise, and distributing the papers, as necessary. This office would also assist students in preparing theses and dissertations. Although the examination of the contents of theses and dissertations is the responsibility of the faculty members, the office of publication can render great help in the physical production of theses and dissertations.

In summary, research should be considered an important activity at KAIS and must receive close attention. By establishing the offices of Research Coordinator and of Publication, KAIS can save substantial time for professors and also enhance the value of the research work. Research is also a part of graduate training and, therefore, its relevance with respect to KAIS education must be continuously considered.

G. Student Selection and Support

Presented with the attractions offered by KAIS, a large number of students will apply for admission. In the main report, it was recommended that the student selection method at KAIS should be different from the mechanical all-or-nothing entrance examinations widely practiced in Korea at present. A possible departure from the traditional system of student selection is described here.

First, prior to the formal student selection process, KAIS would announce detailed selection mechanisms and examination subjects well in advance. This announcement may be made in September with continuous follow-up announcements to inform all candidates properly. Included in the announcement should be the admission quota in each field, and the emphasis of KAIS goals and principles in selecting students. Each student also is required to state his choice for his field of study for a MS degree and a brief statement of his plan of study.

Second, the KAIS staff would examine the application documents and receive undergraduate transcripts. If any student is going to be supported by an industrial firm, KAIS should receive a formal statement of the financial offer. An important group of students would be from the group of engineers already employed by industry and returning to school. A well-documented case history of each applicant's background should be a major point of consideration.

Third, every candidate will take a KAIS qualifying examination designed and administered by KAIS. This examination is not a competitive examination but a test of the qualifications of students as to whether they are ready and qualified to take training at KAIS. The examination would stress mathematics, a foreign language commonly employed in instruction and in publication, and preparation in the candidate's major field. Through this examination, a number of candidates approximately equal to twice the intended quota can be selected. However, it could be perfectly feasible to select more than the suggested number of "qualifiers" for those particular years when students are exceptionally well prepared. The examination should be made such that no particular undergraduate institution is favored. An ideal examination will not unreasonably favor recent graduates over the candidates who have been working for several years.

The fourth process is the most important phase of the student selection at KAIS. The qualified students would be evaluated on the basis of their previous performance as students, evidence of commitment to a professional career, special skills, leadership qualities, personal qualifications, recommendations and any other factors that would help to define a student's qualification. A personal interview would be recommended. Also the student's interests should be matched to the internal quotas. An effort should be given to form a student body with a balanced representation with respect to the birthplace of the candidates and their undergraduate schools. KAIS should avoid selecting all or nearly all of its entering students from only a few leading universities. In order to implement

these suggestions, KAIS may set up a committee composed of leading professors of KAIS, some visiting professors from abroad and members of the advisory councils. This committee would periodically review the fairness in the selection mechanism and strengthen the authority of those actually making the detailed decision in the student selection process. Since the competition is likely to be severe, there will always be criticisms and attacks on the selection schemes and results by unsuccessful candidates and their sympathizers. KAIS must be prepared to defend its selection by well-prepared documentation and evidence.

The successful candidates who pass both the qualifying examination and the evaluation of merit (the fourth step) would be required to go through several phases of preparation before actually enrolling at KAIS. One is the basic ten-week military training for students who are subject to the compulsory military service. Successful completion of the basic training is required. Those students who are advised to take "refresher" courses must take and pass these courses before the opening of school in September. Industry sponsored students who enter directly from their undergraduate schools would be advised to take short tours of duty at their sponsoring companies. There may also be other activities in which the entering students might have to participate.

The student selection process should be modified in some respects for applicants for part-time studies. In principle, such applicants should pass the qualifying examinations and be expected to remove weaknesses by taking appropriate "refresher" courses. In other words, at the beginning of the formal training in September, the entering class of KAIS must be well qualified regardless of whether they are studying full time or part time.

All students at KAIS will receive financial support from either KAIS or their sponsors. It is recommended that student support at KAIS should be comparable with the support a graduate student can receive abroad. The Survey Team recommends three different grades of student support. The first one is a

Scholarship Grant or Scholarship Loan. A Scholarship would cover the tuition and part of the dormitory cost. A large number of KAIS students (approximately 50%) might receive scholarship aid. In order to guide the industrial support for students and maintain the financial flexibility, the recommended tuition level is between ₩100,000 and ₩250,000 per semester. The dormitory expense may run between ₩20,000 and ₩30,000. Recognizing that dormitory life will be an essential ingredient in KAIS training, all unmarried students would be expected to live in the dormitory. A partial grant (~ ₩10,000) of the dormitory expense will compel students to live at the dormitory. Such scholarships would be granted to the entering students, and could be supplemented when necessary by loans that students would be required to repay after graduation.

The second type of student support is Fellowships. A fellowship would cover the tuition and the total dormitory cost. Fellowships would be granted primarily to the second-year students and some doctoral students. These students will have satisfactorily finished at least one year of KAIS training and will almost certainly receive a KAIS degree.

The highest grade of student aid is an Assistantship. Some excellent second year master students, and also doctoral students may be appointed as teaching or research assistants and receive tuition, dormitory expenses and allowances. The allowance could range from ₩10,000 to ₩30,000 depending upon the duty and qualifications. A teaching assistant would assist a professor in grading papers or in the teaching laboratory. A teaching assistantship represents experience especially helpful in preparing students to become professors. A research assistant is assigned to a research group or a professor to carry out work related to research activities.

It is expected that there will be some married students attending KAIS. To handle married students KAIS may maintain housing facilities for married students and try to hire their wives (or husbands). This will be in accordance with the

principle that all KAIS students receive some experience living in a community where learning and intellectual excellence are savored.

In addition to the aid described above, there are other benefits it would be desirable to provide. Thus, a school clinic is almost a necessity and could also serve all other members of the KAIS family. Also not to be deemphasized are cultural activities for students living at the dormitory. Concerts, open forums with philosophers, poets or religious leaders, art exhibitions and plays can be offered to students through an organized year-long program. KAIS would find some faculty wives willing to organize these activities. The main point here is that an intellectual community just cannot live on a steady diet of science only.

H. Facilities

In designing the academic building, library equipment, library and computer center, a very important consideration should be their "utilization". For example, a class room should be used at least 30 hours per week; a fine inactive building is the last thing one should see at KAIS. KAIS is to be a place where active and intelligent people work together. Equipment should not be purchased for the sake of showroom value.

An area of 100 acres is set aside for KAIS in the Science Park. This area would be sufficient for the projected number of students within the first decade. Adjacent to the 100 acres set aside for KAIS is an uncommitted area of 60 ~ 70 acres. In view of the possible expansion of KAIS and the housing requirement for the Science Park families, it is desirable that the area remain available for future KAIS expansion and related usage by the Science Park. Undoubtedly this will be handled by the government in close consultation with the Science Park administration.

Functional and flexible buildings can best serve KAIS. In close collaboration with educational consultants, who may be KAIS administrators, a master plan for buildings and landscape is to be drawn. The design standards and general quality of the buildings should be equivalent to comparable structures in the United States. This relates not only to basic structural integrity but also the outfitting and equipping of the structure. Especially, the laboratory buildings must be equipped with more complete service including power, water and gas, greater floor-loading capacity, higher air-conditioning loads, special venting provisions, special material-handling equipment., etc. Construction of such facilities in Korea requires a substantial importation of equipment including power distributing systems, elevators, fire-protecting systems, etc., which are not available in Korea. The interior should be flexible to permit the many changes that will be necessary as KAIS grows, as its curricula change and as professors succeed one another. Special built-in features, as often requested by professors, are generally not absolutely necessary and tend to reduce flexibility while adding unnecessary expense. Even some of the utility and service distribution systems can be left uncompleted. Later, the completion can be done to the extent and in ways that will best serve future needs. An estimate of the minimum building requirement is given on the next page. This estimate does not include faculty and student housing, which would be easily estimated by Korean planners.

It is more difficult to make estimates concerning equipment, since equipment requirements will hinge on the details of the research work to be undertaken at KAIS. Also, it is recommended that equipment be ordered only after the intended use has been determined and well justified. If one studies a catalog before developing specific plans for using the equipment, there can be many costly mistakes in placing orders for items which will receive little use. On the other hand, some equipment that will receive heavy usage is often neglected.

Building Estimates

Offices and Working rooms

50 Professors	at	140 ft ²	7000 ft ²
3 Principal Administrators	at	200 ft ²	600 ft ²
5 Adjunct Professors' offices	at	140 ft ²	700 ft ²
350 Students	at	40 ft ²	14000 ft ²
3 Key Administrators	at	150 ft ²	450 ft ²
other Administration offices			4000 ft ²
50 Secretaries, Receptionist	at	80 ft ²	4000 ft ²

Classrooms; 10 lecture rooms of various size
(Use large auditorium at KIST) 4000 ft²

Laboratories:

25 Experimental Professors	at	400 ft ²	10000 ft ²
100 MS students on laboratory work			20000 ft ²
100 D.Sc students on laboratory work			20000 ft ²

Special Facilities:

Telephone Switchboard		100 ft ²
Stockrooms		1000 ft ²
Shops		4000 ft ²
Computer Center		1000 ft ²
Library		Unspecified

Total Net Area	90,850 ft ²
Recommended Gross Area	150,000 ft ²

Much of the equipment fund will require scarce foreign exchange. Therefore, the fund set aside for equipment should be spent very cautiously, taking time. Even tentative lists of equipment needed can best be prepared only after an intensive study by KAIS key members in thorough consultation with foreign experts. Another important point in ordering equipment is that KIST and other research institutions may have some equipment which can be shared with KAIS members. Another possibility is that KAIS can make purchases with other research institutions cooperatively. The Survey Team recommends that KAIS set up an internal committee on equipment purchasing and that the committee hold meetings with representatives of adjacent research institutions and consult with experts in and outside Korea to draw up the equipment purchase plan.

This equipment should properly equip the following suggested laboratories:

- Electronics laboratory (mainly teaching)
- Material testing laboratory (mainly teaching)
- Chemistry laboratory
- Machine shop (including welding facilities)
- Solid State laboratory (mainly testing and research)
- Material processing laboratories
- Computer Center
- Reproduction room
- Library

The computer center will require the most expensive equipment. However, computers are essential in education and research at a modern engineering school. It is expected that there will be continuing demands for computer technology in solving complex engineering problems and utilizing modern management techniques. To meet this trend, KAIS must train students in computer techniques and actively encourage the use of computers in real problems.

Besides the student training, KAIS computers will perform computations for research work and administrative chores. It is also expected that KAIS computers will be utilized by external users at nominal fees. For this type of usage, a general purpose third generation computer will be most appropriate. Such a computer is versatile, can be used in time sharing modes and take multi-programming. Also, it is reliable and has good software available. Initially, an individual system, e. g. IBM 360/50, may be appropriate. Because of the rapid progress in computer hardware during the past decade, KAIS may be better off by purchasing the system instead of renting it. It is unlikely to gain substantially by changing the computer within the next decade and a system like IBM 360/50 will give satisfactory service during its lifetime. The system would include CPU, two selector channels, one adaptor, one console keyboard, one card control, one card read/punch, one printer, one train, three disk drives, one tape control and two tape drives. The cost will be close to one million dollars.

Library facilities include reading rooms, stacks, copying rooms and study areas. Often used books should be open-shelved so that students and faculty can freely consult those books. Recent journals should be available in reading rooms. For the convenience of copying articles, copying machines would be available in copying rooms. In order to induce students to spend more time at the library, quiet study rooms are to be provided. The study rooms can be partitioned into small areas by movable walls. An important feature of a functional library is a good reference service. In view of exponentially expanding literature, the ordinary researcher may find it impossible or uneconomical to search all available references for his work. Well-trained reference librarians can be most useful. At KAIS some students can be employed for such activities and this would benefit both the students and the Institute.

I. Sc.D. and Engineer Programs

KAIS will be devoting its primary effort to the establishment of strong Master's programs in applied science and engineering during the initial few years. However, as a leader of graduate schools, the Institute should expand into other advanced and diversified areas to function as a truly great graduate school in science and engineering. KAIS thus must build up strong Sc.D. and Engineer programs.

Each department in the initial fields should start the planning of Sc.D. programs as early as 1971 and a few doctoral students will be admitted in 1973. Building up the Sc.D. student body should be much slower than the master's program, but the pace of the growth would pick up fast after 1975, when the first MS class will graduate. Such a growth schedule is necessary not only to build strong programs but also to place graduates properly. Overproduction with less than satisfactory training can ruin KAIS's reputation. In any educational program, there should be more applicants than the available quota for admission and less graduates than the demand.

Normally, a student entering the Sc.D. program holds a master's degree or should have received equivalent graduate study. He will undertake three years of full-time study and research in the Sc.D. program. He will be tested for his reading and conversational ability in one or two foreign languages commonly used for published technical and scientific papers and books. He will also be required to pass a comprehensive examination that demonstrates mastery of principles of applied science and engineering in his area of specialization. He will be required to submit a thesis presenting results of independent research conducted under the direction of faculty member(s), demonstrating proficiency in the application of science and engineering, and containing an original contribution to knowledge. The result of the dissertation should be publishable in a recognized technical journal. The Sc.D. degree, which must

receive worldwide acceptance, is awarded for creative competence rather than for the completion of any fixed program of lectures and years of study. The selection of Sc.D. candidates would require more emphasis on the individual's qualities for advanced study. Interviews and past records would reveal these qualities better than written examinations of a few hours duration.

KAIS should start the Engineer's degree program only after the successful operation of the master's programs is firmly established. A student working for the engineer's degree will get a much "broader" education than a Sc.D. candidate. He is not required to carry out the intensive research work necessary for the Sc.D. dissertation.

The Engineer's program is designed for people who wish to become practical advanced engineers and innovators of new discoveries and knowledge. This program will be ideal for practicing engineers who have already received MS degrees, have been away from school and wish further education that will increase their competence in creative engineering work. It might be desirable to grant a professional engineer's license automatically to people receiving Engineer's degrees. This will be useful for the placement of graduates and in the further practice of engineering.

II. METHODS of INTERACTIONS with OTHER SCIENTIFIC and TECHNOLOGICAL COMMUNITIES

In the main report, the Survey Team strongly recommended that KAIS maintain mutually beneficial relations with other scientific and technological communities inside and outside Korea. Here we present some functional methods to implement this recommendation:

- a) Joint Research Programs
- b) Joint Lecture Programs
- c) Visiting Professorships
- d) Adjunct Professorships
- e) Industrial Consulting
- f) Cooperative Students
- g) Placement Services
- h) Government Committees
- i) Library Exchange
- j) Industrial and Academic Visiting Committees

These programs would be directed by the Vice President for Development. The industrial liaison officer is especially concerned with the promotion of the relation between KAIS and industrial firms.

Joint Research Programs can be set up between KAIS faculty members and industrial scientists, professors at other Korean universities, professors at foreign universities or research scientists abroad. The degree of joint effort will vary from case to case. An industry supported project can be performed at KAIS with the participation of an engineer from the supporting company. A student might start a project at KAIS and then complete it while employed by a company which has a great interest in the project. A new faculty member might join a research team at another institution in the Science Park and work on a joint project. A KAIS research group might carry on a research project in collaboration with a research team in the U.S.

Joint research programs would be outgrowths of the common research interest among scientists and engineers. KAIS should support meaningful projects and provide promising contacts between its members and external communities. In this connection, a master listing of research groups and laboratories active in Korea could be very useful. Whenever a new faculty member arrives at KAIS, he should be introduced to research scientists or engineers with common interests. Through industrial advisory councils and visiting committees, KAIS will receive some advance information with respect to industrial research and development. This information should be transmitted to its faculty members and could lead to a mutually stimulating joint effort.

KAIS faculty members are expected to make regular field trips to industrial plants as visitors or consultants. This would not only aid professors' involvement in practical engineering but would also provide opportunities to initiate joint research programs. Similar relations could be profitably developed with other universities and government agencies. For example, the Atomic Energy Research Institute might welcome collaboration with KAIS. Because of the relatively small number of scientists available in Korea, joint research programs should receive more support, and funding agencies should conscientiously promote joint programs to create critical masses through interinstitutional cooperation.

Joint research programs with foreign research teams may turn out to be profitable. A prospective visiting professor should start contact with KAIS faculty members in the same field and initiate preliminary preparations of a joint research project. When the visiting professor arrives at KAIS, he would be able to actively interact with his counterpart immediately. Even after the tenure of the visiting professor is over, their joint effort may continue. In some cases, the KAIS member will make a return visit, taking a leave to do so. During the formative years of KAIS, there will be many possibilities of visiting

professorships at KAIS and thus opportunities for joint research programs. Being a graduate school of high quality, KAIS will be able to draw competent foreign scientists and engineers as visiting professors. For them, tenure at KAIS will not be lost periods in view of their professional careers.

Joint Lecture Programs with other Korean graduate schools have practical value to everybody involved. KAIS must adopt an open-minded policy toward other graduate schools in Korea, since one of KAIS's missions is to stimulate and improve the overall Korean higher educational system. Initially, a few lectures by visiting scholars can be arranged for an audience consisting of graduate students from KAIS and from other schools. These lectures would be on introductory and broad subjects, and should be distinguished from more advanced seminar-like lectures. Then, jointly with several leading graduate schools, KAIS might run credit-carrying joint lectures. These are like regular courses at KAIS, but registered students at other schools could take these courses for credit. There would be many students auditing these courses, too. The main idea of joint lecture programs is that the spirit of KAIS graduate training reaches over the fence of the Science Park.

It is conceivable that KAIS might develop a joint lecture program with graduate schools in arts and social science. For example, a course in the technology transfer from developed nations to developing nations can best be put together with the cooperation of the faculty of the School of Public Administration of Seoul National University. Interdisciplinary programs, particularly, will benefit from the joint effort.

Visiting Professorships from other educational institutions would be useful in opening channels of interaction with educational communities in Korea and abroad. There will be, initially, a number of foreign visiting professors who will assist in the introduction of new lecture and laboratory courses that extend beyond Korean experience, and also help in the development of laboratories and research facilities at KAIS. There will also be some visiting professors from

Korean universities who can render valuable service to KAIS which KAIS faculty are unable to fulfill, and these visiting professors will participate in research work in collaboration with KAIS professors. The usual tenure of a visiting professor from abroad will be one semester or one year. In some cases, the visiting professor may extend his stay up to another year; it is not recommended that the tenure of a visiting professor extend beyond the maximum two years. A visiting professor staying more than two years is seldom able to provide salient features of the visiting professorship. It is expected that a substantial number of visiting professors will be Korean professors working at foreign universities. Although it is nice to invite many of them back to their fatherland, KAIS should award visiting professorships solely on the basis of a KAIS need which the visiting professor can successfully fill at KAIS. If a scientist is to be invited to honor his distinguished scientific achievements, a visiting professorship should not be used for the invitation.

It is very important that KAIS faculty members cherish their work and become proud of their work. The unique and important roles played by KAIS faculty members will be respected by visiting professors. Mutual respect between KAIS faculty members and visiting professors is essential for profitable cooperation between them.

Adjunct Professorships will be mainly filled by competent scientists and engineers working at the Science Park. An adjunct professor would possess credentials that would qualify him as a regular KAIS faculty member. An adjunct professor will typically teach at least one course for one term each year and/or will be involved in the supervision of student theses. Initially, KAIS might wish to appoint many adjunct professors among scientists working at KIST and the Defense Research Institute. This arrangement will be beneficial to KAIS and the other institutions. Some qualified scientists would consider these opportunities highly, since they provide valuable experience and, in addition, contribute in

training the next generation of scientists and engineers. So far as KAIS is concerned, competent adjunct professors will relieve a lot of the pressure from the regular faculty members during the formative years when everything is new and being worked out for the first time. Typically, an adjunct professor will be appointed for a period of two or three years and may be reappointed.

Industrial Consulting, as discussed in the main text and the previous chapter, is a desirable practice for KAIS faculty members. Not only does this job enable them to serve the industry, but also gives them the important insight of the practical knowhow and thus valuable information in improving the curricula at KAIS.

Cooperative Students with industry can be classified into two groups. One group of students are fresh BS graduates who would receive industrial support for their training at KAIS. These students do not have on-the-job experience. Most probably, they will be employed by their sponsoring industrial firms after graduation. The Survey Team recommends that this group of students work at industry during the summer periods. Before starting the first year training at KAIS, they should have a tour of duties at the sponsoring firm and gain some practical views. During the summer period before the start of the second year training, they would work on a specific project at the industrial firm. Some students will be able to find practical and excellent thesis topics through the summer work. Such cooperative students will be well equipped for their future jobs, since they could immediately find the practical application of the formal training at KAIS.

The other group of cooperative students are practicing engineers who are sent for training at KAIS by their employers. In general, these students should have some practical experience and know what to look for at KAIS. We suggested "refresher" courses for these students during the summer period before starting formal training. During the summer period after the first year training, these students should return to their employers and work on industrial problems which may develop into significant research and development projects.

Through such flows of cooperative students closer collaboration would develop between KAIS and industry. Furthermore, students will be better prepared for their jobs and industry will gain confidence in KAIS training. Mutual respect will generate mutual assistance morally and financially.

Placement Service at KAIS will seek available positions in industries, universities and government agencies suitable for the prospective KAIS graduates. It is desirable that the placement officer or KAIS faculty members build up the list of available positions through formal and informal contacts. Then the placement service can arrange for the employers to contact interested students for employment negotiations. To protect the student's interests, the placement service should set guidelines including the initial salary level and advancement provisions.

At present, MS holders do not receive preferential treatment over BS holders in Korea. The reason for the practice is discussed in the main report. However, if KAIS operates properly and produces superior graduate manpower, KAIS graduates should receive significantly favorable treatment. KAIS should actively participate in setting the desirable employment conditions for its graduates. Under systematic support from KAIS, its graduates will gain their bargaining power.

The KAIS Placement Service should also take the initiative in educating industry as to what KAIS graduates are like and how they can be of good service to industry. After a KAIS graduate has been placed with an employer, KAIS should, during the formative years, keep in close touch with both the employee and employer to ascertain how things are working out for both the employee and the employer. This practice will provide feedback mechanism in improving KAIS programs.

KAIS faculty members will participate on many government committees. This would enhance the interaction between the Institute and the government

agencies. Active participation of KAIS faculty members in government projects and problems is to be welcomed. This policy is in line with the recent trend in Korea. Professors are assuming more active roles in public affairs, and the traditional negative attitude toward public participation is disappearing among Korean academic people. In addition to participating in committee work, some KAIS professors may assume public positions. When the circumstances are right, KAIS should grant leaves of absence to tenured faculty members who are asked to work in the government for predetermined finite periods. Similar provisions, which must follow the general rules on leaves of absence, should be applied for those professors who wish to work with a major industrial firm as technical advisors.

The library at KAIS may not have enough literature needed by KAIS faculty members and students during the first few years. The KAIS library must utilize all available channels to provide the necessary technical literature to KAIS members. It can have exchange programs with other Korean libraries and, possibly, libraries of foreign universities. With the proper arrangement, any library material can be made available within a week. The library at the "sister institution" can be linked to the KAIS library and a special arrangement should be set up. Among libraries of universities in Korea there also can be a unified agreement for exchanging library material.

In the main report, the Survey Team recommended visiting committees from industry and academic circles. These visiting committees would be composed of active scientists and engineers rather than top executives or administrators. Each department would have its own visiting committee to work with its faculty members. Visiting committees would be kept informed about personnel changes, curriculum developments and student status. In return, visiting committees would make suggestions and offer independent opinions and evaluations on various technical matters. While advisory councils are useful in delivering

outside relevant opinions on policy matters, visiting committees provide useful consultation on detailed technical matters. Visiting committees can make excellent suggestions on prospective adjunct faculty members and visiting faculty members. Practical information of value in the placement of KAIS graduates can also be obtained through visiting committees. These committees will be continuously useful to the KAIS development. Members of visiting committees are not compensated for their service, since their function will be mutually beneficial to KAIS and their own base institutions. Terms of appointment and selection of visiting committee members would be individually determined by the KAIS administration through departmental recommendations.

III. DEVELOPMENTAL SCHEDULE AND FUNDING

A. Phased Development

Since the KAIS law and the enforcement presidential decrees are effective as of December, 1970, it is now possible to propose a realistic development plan. In the informal report on the establishment of KAIS, it is suggested that the initial developmental phase also include 1) the promulgation of the Articles, 2) the selection of trustees and the top administrators of KAIS 3) the formal agreement with an aid agency on the foreign exchange aid, 4) the formation of a U.S. Coordinating Office of KAIS and 5) adaptation of a long term developmental plan. The draft version of the Articles was given in Appendix A of the main report.

With the promulgation of the Articles, the initial trustees and the president of KAIS will be appointed. The selection of a vice president will be made at the same time as the selection of the president. With the appropriation of the budget for FY 1971, KAIS actually will be able to start its operation in January, 1971.

There will need to be an intensive negotiation and review with respect to possible commitment by an international aid agency on the establishment of KAIS. Assuming that the Korean government is successful in securing a long term aid commitment on the KAIS project, an immediate effort should be made to establish the proposed U.S. Coordinating Office. Finalization of the foreign aid and formation of the U.S. Coordinating Office may not be realized as late as July, 1971 due to the calendar of the fiscal year. In view of such a foreseeable delay, KAIS must be prepared to find the necessary assistance from an interim coordinating team of scientists-educators most preferably in the U.S. More discussion on this aspect is given in the following section. As soon as the top administrators are appointed, they will draw up a tentative long range master plan, and also an immediate operational plan on the development of the Institute.

It should be pointed out that the long range master plan will have to be continuously modified as matters get clearer.

The second phase of the development would start as early as the appointment of the president of KAIS. Necessarily the second phase would overlap the first phase, which should terminate by the end of July, 1971. There are many tasks to be carried out during the second phase. Some of them are to be carried out in Korea and others are to be performed overseas. Some of the activities to be completed in the second phase are suggested below. The duration and completion dates of these activities are also estimated.

- | | |
|---|--------------------------|
| 1. Establishment of the tentative office of KAIS | Jan. 1971 |
| 2. Legal transfer of the land designated to KAIS | Jan. 1971 |
| 3. Appointment of some key administrators and supporting staff including the business manager, director of construction and maintenance, and the master-planner | Jan. 1971 -
Feb. 1971 |
| 4. Selection of architectural firm(s) and engineering firm(s) | Feb. 1971 |
| 5. Adaptation of basic principles in buildings and landscaping | Feb. 1971-
Mar. 1971 |
| 6. Completion of the design of buildings and campus | June 1971 |
| 7. Selection of the contractor and groundbreaking | July 1971 |
| 8. Completion of the development plan | May 1971 |
| 9. Preparation of budget for FY 1972 | Apr. 1971 |
| 10. Preparation of the long term budget including building cost and endowment fund programs | Apr. 1971 |
| 11. First survey of available faculty members | Feb. 1971-
July 1971 |
| 12. Selection of a few key faculty members including the library director, directors of teaching laboratories, department chairmen | Apr. 1971-
Aug. 1971 |
| 13. Selection of charter faculty members | June 1971-
Nov. 1971 |
| 14. Appointment of other charter faculty members | June 1971-
Sept. 1971 |

15. Retraining of some charter faculty members	Sept. 1971 - June 1972
16. Full assembly of the charter faculty	Sept. 1972
17. Initial orders of library books	July 1971
Completion of functional library	Sept. 1972
18. Initial orders of teaching laboratory equipment	Sept. 1971
Completion of teaching laboratories	Mar. 1973
19. Initial orders of research laboratory equipment	Sept. 1971
20. Determination of initial curricula	Nov. 1971
21. Preparation of budget for FY 1973	Apr. 1972
22. Preparation of lecture notes	Sept. 1972 - June 1973
23. Proposals of research activities	Sept. 1971
24. Announcement of the selection of the first class	Sept. 1972
25. Selection process of the first class completed	Feb. 1973
26. First offering of "refresher" courses	Jun. 1973
27. First offering of regular graduate courses	Sept. 1973

With the first offering of regular graduate courses in September 1973, KAIS assumes formal graduate education. A substantial part of the building construction would have been completed by this time, and the government would have donated the proposed endowment fund. Furthermore, the charter faculty members would already have been at KAIS more than one year during which time they would have prepared their own research activities and prepared both lecture notes and teaching laboratories. Unless there is undue difficulty, even the computer center will be in normal operation by June, 1973. During the summer of 1973, there will be "refresher" courses offered at KAIS. In other words, it is desirable to have a fully functioning KAIS at the opening of the first graduate

training program so that the first class will not receive a substandard education. It is important that KAIS give a distinctively superior training starting with the beginning students. Hasty preparation will result in problems which may persist for a long time.

The third phase commences with the initiation of the regular degree courses in September, 1973. Based on lecture notes already prepared in the previous year, classroom lectures will be given and also laboratory training will be offered. More books will be added to the library and research laboratories would have begun to produce significant results. During this phase, new activities will be carried out. They are:

1. Collection of theses topics
2. Preparation of the remaining initial fields not started in 1973
(faculty recruitment and preparation of teaching materials)
3. Placement service
4. Enhanced faculty activities with respect to interactions with other scientific and technical societies in and outside Korea
5. Initiation of cooperative projects so that the students of the first class spend the summer of 1974 at industrial firms
6. Carrying out research work for theses
7. Preparation of Sc.D. programs

The third phase will end with the graduation of the first MS degree students and selection of the Sc.D. candidates. This will be in Spring 1975. Starting in September 1972, KAIS faculty will be steadily increasing and the number of fields and the existing programs will be expanding. The Korean economic situation would have improved sufficiently to be ready to absorb the input from KAIS faculty members and graduates. It is feasible that a contribution of KAIS to the Korean economic development can be made by its faculty members during the initial years 1971-1975 through services they render.

They may function as valuable consultants to industry and become active in the government. In fact, KAIS may be used as a magnet to draw competent scientists and engineers from abroad.

The fourth phase starts with the admission of Sc.D. candidates in large numbers. The Institute now admits 100 entering MS students. The proposed six fields of study are fully operative and expanding in enrollment. In this phase, which may last another three or four years, KAIS will mature and all programs will be productive. Some faculty members will leave the Institute and others may receive sabbatical leaves. The initial foreign aid program will cease its activities during this period and interactions in other forms would take place between KAIS and foreign institutions. There should be an upward movement among other Korean higher educational institutions which may attract some KAIS faculty members and KAIS graduates. This phase will be the consolidation period of gains obtained in the third phase, and would be slowly succeeded by the fifth phase which is the final phase of the development.

With the beginning of a new decade in 1980, KAIS will go into the second decade of its own life. As an educational system, it should be firmly established and producing a steady supply of excellent graduates to the Korean academic and industrial communities. Part-time studies should be well established and modern technological techniques, e.g. TV, would be in use to expand audiences of the KAIS educational system. KAIS may initiate many meaningful projects such as publishing a series of monographs and holding important technical meetings. Also, new fields of study can be added.

Some additional remarks may be useful in connection with the recruitment of the initial faculty members. The Survey Team has recommended that KAIS make extensive use of visiting professors and adjunct professors during the initial years. Senior people can first be invited as visiting professors rather than tenured professors. If they perform as expected and their interest lies in KAIS's

goal, they could be invited to become regular tenured faculty members. In the initial period, KAIS would recruit many rather young faculty members who would be at KAIS without tenure. Growing with KAIS, these young faculty members will be ready to take senior positions several years later either at KAIS or other institutions. There are many scientists and engineers abroad who are well qualified to take positions at KAIS. (In the case of the School of Public Administration, the situation was different. There were not enough trained people who were able to take professorial positions.) As early as possible, KAIS should make a survey among scientists living abroad to collect data and learn of their interest in KAIS. Many will respond with their own plans of teaching and research; KAIS can match the applicants to the needs of KAIS. In some cases, reorientation training up to one year would be extremely useful. In such cases, the U.S. Coordinating Office might be able to arrange the training program.

B. Finance

In Chapter 5 of the main report, the Survey Team gave a general description of the financial matters of KAIS. The importance of sufficient income cannot be overstated. KAIS is an independent institution, whose income is mainly from government support. Thus, KAIS will be constantly competing for funds with national defense, national compulsory education, national universities and even some member institutions of the Science Park. Being an educational institution at the graduate level, KAIS will have a tougher time selling itself to outside people. Benefits from KAIS to the national economic development are visible only after its graduates assume active roles. Facing severe political pressure to employ available funds where their results are most evident, the government will be hardpressed in providing annual appropriations to KAIS. Therefore, the major part of the operating budget of KAIS must be derived from the endowment fund as recommended in the main report.

The basic endowment fund should be appropriated during the first three years, 1971-1973, as planned by the Korean government. The endowment fund should be large enough to produce an interest income of \$1.5 to \$2.0 million per year. In the Korean financial market, where the annual interest rate is approximately 22%, a minimum endowment of \$10 million dollars is necessary to guarantee an income of \$1.5 million dollars in 1971 due to a 7-10% inflation rate per year. The government and KAIS should be careful to maintain the net worth of the endowment fund in the presence of inflation. There should be either additional government appropriations to match the loss of the value due to inflation, or a part of the interest income should be put back into the endowment. The Survey Team believes that the latter scheme is decidedly preferable to the former method. There are two reasons for this; first, an annual appropriation to the endowment fund requires yearly action which will involve difficult maneuvers, and the other is that KAIS will need yearly government appropriations for expansion of its programs and for new construction.

Reasonable flexibility in the use of available funds should be maintained. Thus, the board of trustees should try to formulate the operational budget every year. A rough estimate of operating expenditures is given on the next page. This estimate is based on the preliminary MOST plan, which includes the budget request for FY 1971. The faculty salary scale is comparable to the KIST salary scale for their professional staff members. The salary scale of other supporting staff members is easily set by following the KIST pay scale which is considered adequate in Korea. The president and vice presidents should be considered as faculty members and their compensation should basically consist of their faculty salaries plus an additional remuneration to reflect their very great responsibilities for the success of KAIS.

All students at KAIS will get substantial financial aid from the endowment fund. Scholarships covering tuition and part of the dormitory expenses, fellowships covering tuition and full dormitory expenses, and assistantships

An Estimate of Operating Expenditures
(in U. S. Dollars)

1.	Faculty Salaries (include key administrators)		~ \$500,000
	Full Professors including President and Vice-Presidents	avg. \$12,000	
	Associate Professors and Business Manager	avg. 9,000	
	Assistant Professors and Comptroller and Director of Const. and Maint.	avg. 6,500	
	Instructors	avg. 5,500	
	Fringe Benefits excluding housing at 10% of salary		
2.	Supporting Staff Salaries		~ 100,000
	Senior staff members	avg. \$ 4,500	
	Junior staff members	avg. 3,000	
	Fringe Benefits at 10% of salary		
3.	Adjunct Faculty Members and Lecturers (10 FTE at \$6,000) and Visiting Professors (5 FTE at \$8,000)		~ 100,000
4.	Administrative Expenses		~200,000
	Extra compensation for top administrators		
	Overtime duty by supporting staff		
	Temporary help		
	Expense allowance (offices of top administrators)		
	Transportation		
	Communication, publication, auditing, supplies, etc.		
5.	Library Acquisition		~ 50,000
6.	Plant Maintenance and Operation (including housing)		~ 150,000
7.	Maintenance and Improvement of Teaching Laboratories including Computer Center		~ 150,000
8.	Student Aid		~ 250,000
	50 Assistantships (Tuition, Room & Board + allowance of \$1000)		
	100 Fellowships (Tuition plus Room & Board)		
	200 Scholarships (Tuition only plus partial Room & Board)		
9.	KAIS Research Fund		~ 100,000
10.	Special Items: Contingent and Reserve		~ 100,000
		Total	~ \$1,700,000

covering tuition, full dormitory expenses and allowance will be offered. The level of tuition also sets the guidelines for the industrial support for students. If the suggested tuition is considered too high, the board of trustees can always adjust it appropriately. In any event, the Survey Team believes that there should be a significant tuition level set up at KAIS which is at least comparable to the tuition in private universities in Korea.

The substantial sum for special items provides for the uncertainties, since unexpected items of cost are inherent in any new venture.

C. U.S. Coordinating Office

In this section, the organization and function of the U.S. Coordinating Office are described in connection with the phased development plan described above. As soon as the source of foreign exchange for KAIS is determined, the U.S. Coordinating Office for KAIS is to be formed.

The concept of the U.S. Coordinating Office is somewhat different from the traditional "sister" institutions usually assigned to monitor an overseas program in the area of education as discussed in the main report. The U.S. Coordinating Office will be located at a sister institution and manned by a director, a full-time assistant and a secretary. The director of the coordinating office, rather than the sister institution, must be selected first. The inherent weakness in selecting the institution first and then selecting the personnel to handle the prescribed duty has been clearly demonstrated by past experiences. KAIS should not pick a sister institution without knowing the people who will handle matters of KAIS's interest.

It is recommended that KAIS, with the help of the assisting foreign agency, select several desirable candidates and contact them informally, describing the situation and the nature of the job and the responsibility associated with the job. If any of them shows an interest in

the job, KAIS may request a short proposal for the task, just like a research proposal, through the assisting foreign agency. From an evaluation of such proposals, KAIS and the assisting foreign agency can find the best available candidates. It should be noted that nobody can perform superbly on a job for which he does not have enthusiasm. Also, the directorship of the U.S. Coordinating Office is not a trivial job, and the commitment is for five years. The institution, with which the director is associated, becomes the sister institution for KAIS.

During the first year, the U.S. Coordinating Office may have to carry out many tasks including the following:

- 1) Review the implementation plan and advise the KAIS administration regarding improvement of the plan.
- 2) Locate a competent architect specializing in technical university buildings and arrange for him to assist a Korean architectural firm in drawing up the design.
- 3) Assist the KAIS administration in making decisions on the design of the buildings and on the campus layout.
- 4) Assist KAIS in making a survey of candidates for faculty who now reside in the U.S. and Western Europe, and maintain a file.
- 5) On behalf of KAIS, contact the better prospects for regular faculty positions at KAIS. Discuss their teaching and research plans. Check their qualifications. Convey this information to KAIS.
- 6) Contact those selected for KAIS faculty positions and assist them in finalizing their teaching and research plans. If necessary, arrange for retraining, visits, interviews, etc. Make a list of the library materials and research equipment they need. Convey this information back to KAIS.
- 7) Collect and supply materials needed in the initiation of new lectures and laboratory courses that do not exist in Korea.
- 8) Locate potential visiting professors who might fill in the teaching and research capacities that extend beyond Korean resources.

- 9) Establish contact with the selected visiting professors to arrange for their needs at KAIS in advance and request KAIS to furnish "counterpart" KAIS professors and other requirements. A "counterpart" KAIS professor to a visiting professor should be cooperating with the visiting professor in teaching and research and should act as the KAIS contact point for the visiting professor before, during and after his stay at KAIS.
- 10) Examine KAIS's request for laboratory equipment and help KAIS to select and procure the best laboratory equipment.
- 11) Provide coupling arrangements between KAIS faculty and non-Korean industry, including cooperation on research projects and visits to plant facilities.
- 12) Assist KAIS faculty members in seeking research grants and visiting opportunities financed from non-Korean sources. This also includes the participation in international professional meetings and activities.
- 13) Assist in the establishment of relations between KAIS and U.S. foundations interested in the development of emerging nations.
- 14) Promote exchange of professors, students, publications and relevant information between KAIS and other graduate schools.
- 15) Furnish information to foreign students who are interested in studying at KAIS.
- 16) Carry out public relations for KAIS in international scientific and technical communities.
- 17) If the need arises, represent KAIS in resolving administrative matters with the assisting foreign aid agency.
- 18) Scout for new technical developments which should receive early attention by KAIS.
- 19) Scout for new financial resources and equipment for which KAIS might be qualified to apply.
- 20) Supply expert views on the KAIS development by membership on the Board of Trustees. The director of the U.S. Coordinating Office will be one of the ex-officio trustees according to the basic law.

Since the coordinating office is established at a sister institution and persons working at the coordinating office are regular faculty and staff members of the sister institution, the expenses to carry out the above-listed tasks should be included in the entire contract. The expenses associated with such an office are estimated to be of the order of \$80,000-100,000 per year. This cost is included in Item I of Table 5-1 of the main report as the cost of faculty and program development. The item for faculty and program development also includes the cost for visiting professors, retraining of some faculty members, moving expenses of repatriating regular faculty members and expenses of temporary faculty consultants.

During the first two or three years, the activity of the U. S. Coordinating Office is most critical. Close collaboration of the U. S. Coordinating Office and KAIS is very essential, and it is probably desirable that one of KAIS's administrators be stationed at the sister institution to facilitate the close liaison. A reasonable candidate to be dispatched from KAIS would be a man who enjoys the confidence of the president and vice presidents of KAIS and understands the goals and operational plans of KAIS thoroughly.

The function of the U. S. Coordinating Office is to assist and advise KAIS. The office should not make final decisions for KAIS. Furthermore, every effort should be made to economize the expenses paid in foreign exchange, since the foreign exchange is extremely scarce in Korea and there does not exist any margin for waste.

The selection of reputable, able and sympathetic scientists-educators for the U. S. Coordinating Office would be a most profitable event for the development of KAIS. Therefore, every effort should be made to search for the right people.