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STATUS AND FUNCTIONS OF AID ENGINEERS

A Report to SAA/S&T and A/AID
by
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PREFACE

In October 1982, the AID S&T Bureau Directorate of Energy and Natural Resources, in consultation with SAA/S&T, determined that it was necessary to examine the status and functions of direct-hire engineering staff within S&T/EN, because the staff reductions over the past years in this central function raised questions about its continued effectiveness. It was decided that such a study should not be done in isolation and thus a broader review to examine the status and functions of all AID direct-hire engineers would be desirable. The purpose was to ascertain whether the Agency was effectively staffed and organized to enhance science and technology within AID programs and projects through efficient application of engineering and related disciplines.

It was decided to obtain a senior career AID officer on the Reassignment Complement to review AID engineers' functions and status, and to recommend Agency actions to meet current needs. (See Scope of Work in Part III, Appendix K.)

As a first step, it was agreed that current Agency use of direct-hire professional engineering skills would be reviewed by sector and category of activity, that an assessment would be made of services available to AID through contract mechanisms and the means by which these are accessed and managed, and the possible mechanisms for improving AID's utilization of direct-hire engineers would be suggested. It was also agreed to address a number of concerns expressed by the Engineering Sector Council (composed of the Chief Engineers of the Regional Bureaus and representatives of the S&T Engineering Staff and of PPC/DPRE): development of an historical perspective of the role of engineers in AID; consideration of short-and medium-term recruitment/retention requirements for engineers; and possible recommendations for functional changes in a Central Engineering Staff or revised AID/W staffing to meet Agency needs, including the most cost-effective bureaucratic placement.

In order to make this study and report more objective, a questionnaire was sent to all field posts and to selected AID/W officers familiar with AID use of direct-hire engineers. (A list of the recipients is in Part II,

Appendix O.) In-depth interviews were conducted with some of the key career staff in AID/W, representatives of the private sector, and a few retired senior AID officers (Appendix P). In addition, a quick survey was made of other U.S. Government agencies using engineers for domestic activities broadly similar to AID projects and with some of the other donors in foreign economic development assistance (Appendix F).

The report is organized in three parts. Part I is a summary of findings and conclusions, including a discussion of recruitment and retention of engineers in AID, and recommendations to SAA/S&T and A/AID. Part II is fairly detailed back-up narrative. Part III is some seventeen factual appendices.

Although a considerable number of off-the-cuff memorandum reports recommending organization and utilization of engineers in AID have been prepared over the past ten years, this is apparently the first in-depth analysis which has attempted to examine all aspects of the subject. For most of the observations and conclusions of this study, the author has drawn on his own 24 years of employment by AID and predecessor agencies, including field experience in Asia and Africa, service in AID/W, and seven years as Principal AID Officer at field posts.

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STATUS AND FUNCTIONS OF AID ENGINEERS

PART I

SUMMARY AND RECOMMENDATIONS

A. The Problem and Alternative Solutions.

I. The Problem.

It is clear that AID must have direct-hire engineers. There is the statutory requirement in Section 624(a)(3) of the FAA that one statutory officer ought to be qualified as a professional engineer -- this is the only requirement in the Act that the agency implementing the provisision of the legislation include persons with any particular training or qualifications: no attorneys, no economists, no sociologists, no agriculturists, no scientists, no physicians, and no CPAs, just an engineer. Furthermore, determinations that certain engineering plans, cost estimates, benefit/cost analyses, and capabilities of host government agencies to maintain and utilize facilities must be made as required by Section 611 of the FAA. The Agency needs direct-hire capacity to certify to the officials making these determinations that such efforts have been made and that the efforts are sufficient to warrant certain conclusions.

Finally, it is simply common sense and prudent in the expenditure of large amounts of public funds for engineering activities to make sure that the agency obligating those funds and monitoring their expenditure has the capability to evaluate the work and recommendations of consultants and contractors for whom such funds were obligated. The Agency also must be capable of drafting scopes of work or reviewing such scopes for approval if it is to utilize private sector firms to accomplish major engineering undertakings.

The review of present capability of AID in regard to direct-hire engineering has revealed:

-- apparent non-compliance with the provisions of Section 624(a)(3) of the FAA, an effort by Congress to maintain engineering overview at the decision-making level of program planning, obligations, and expenditure of public funds. (See Appendix C., Part III.)

-- inadequate engineering input to program and project formulation, review, implementation monitoring, and evaluation in Washington to effectively and prudently meet the requirements of Section 611 of the FAA or even to request proposals for professional engineering work. (See Part II.E.I.)

-- continuing poor performance by direct-hire engineers in Washington because of improper mix of skills and lack of experience in the field in the socio-economic formulation of development policy and project negotiation. This, in turn, has produced a distain for using engineers in the decision-making process by Agency program management. (See Part II.E. and F.)

-- progressive downgrading of the bureaucratic status of engineers in Washington and the resulting lack of contact with engineers by the policy-level management of the Agency has brought about a situation in which the highest levels of AID do not know what engineers are trained to do, and in which the role of engineers and scientists are confused, so these two disciplines are used interchangeably in research and development and in developing and transferring skills and technologies. (See Part II. B. and C.)

-- the Washington headquarters of AID does not include sufficient engineering staff with the skills to prepare all of the required scopes of work or review scopes prepared by others for various professional engineering undertakings needed by the Agency. A principal problem the professional engineering organizations have had with AID has been inadequate scopes of work for preparation of responsive and reasonably priced proposals. (See Part II. D. and F.I.)

-- with a portfolio of over $8-2/3 billion of projects with significant engineering components, AID must have stronger direct-hire engineering staff in Washington and in the field to monitor the consultants and contractors retained to accomplish this work. If this is not provided, and there are not senior engineers included in the highest level of policy and program management, we can anticipate increasingly less effective utilization of funds and growing numbers of failed projects and scandals about imprudent use of appropriated funds. (See Part II.F.II.)

II. Solutions.

a. Return to Centralized Engineering Office for AID/W.

There are a number of attractions to the previous organization of engineers under one Central Engineering Office with the Chief reporting to A/AID, DA/AID or an AA. This office could provide efficient and effective services to the central bureaus in Washington: PPC, M/SER, LEG, OPA, S&T, OFDA, FVA, and PRE. It must be kept in mind, however, that AID is basically a project-oriented agency and the key to projects is the four Regional Bureaus plus S&T.

These Bureaus have learned from previous problems that projectized programs go best when the entire project design, approval and evaluation processes are under the authority of the Bureau responsible for authorizing the project. (Project implementation is almost entirely in the hands of the Field Mission, drawing upon the Regional Bureau and all concerned Central Bureaus.)

Although it is possible to organize engineers similarly to General Counsel and have the Chief Engineer assign engineers by detail to other Bureaus with personnel performance appraisals prepared by the Bureau and reviewed by the Chief Engineer, this system was not satisfactory during its use by AID predecessor agencies. The Regional Bureau (or S&T) must have full freedom to staff engineers in positions that the Bureau feels best fit its mix of projects and its operating style. This is consistent with the general AID policy of decentralization of responsibility for program implementation.

b. Improve on Present Organization.

The Regional Bureaus are staffed for their present mix of activities and normal workloads, but all of the engineering staffs and offices responsible for projects felt that they must have a central reservoir of direct-hire engineers to draw upon for peak workloads and for skills for which they had much less than a full-time need. Most commonly mentioned were electrical and power engineers, telecommunications, municipal/sanitary engineers, and industrial engineers. Other areas that come to mind are earthquake-resistant building design, value engineering, hydrology/water resources.

The present organizational structure in the S&T Bureau cannot provide these services to the Regional Bureaus, although the functional statement of both the S&T Bureau and its Engineering Staff includes responsibility for this. More important, the S&T Bureau has less engineering input in

its project formulation, design, review and approvals, and monitoring than do the Regional Bureaus. Despite its responsibility for increasing technological content of AID activities, S&T is dominated by research scientists and projects which are efforts to obtain new knowledge, rather than to apply technology to resolve problems identified in the Field Missions. S&T project design seldom has the input from engineers in Field Missions that are usually part and parcel of projects in Regional Bureaus, nor does Engineering Staff participate in Bureau project review, monitoring and evaluation of the projects of the functioal offices, as happens in most of the Regional Bureaus.

S&T needs to strengthen the role of its Engineering Staff in its own project process.

The expressed needs of central supporting offices in AID/W for direct-hire engineering is not being met at all by the current emaciated S&T Engineering Staff. Both SER/MO/OM and SER/COM have a regular, recurring, but less than full-time need for engineers, that can only be provided by direct-hire employees -- primarily scope of work preparation, review of telegraphic requests from the field, and comments on products of consulting contractors. PPC has no engineering input to its policy development and program review functions, nor in its evaluation, planning and budgeting, or international affairs operations. The IG can no longer draw on engineering staff to assist in inspection of major engineering activities as part of his audit function. OFDA has no other Bureau to look to for direct-hire engineer professional help in preparing work scopes for major engineering contracts. The Procurement Policy Advisory Panel, one of AID's critical inter-Bureau working groups, has no formal tie to obtain professional engineering participation at a policy level. ASHA has no place to turn for peak-load assistance in Section 611 reviews. PRE/SDB has no office to speak for the Agency on engineering and construction contract technical policy. TDP has no office in AID to ask for professional engineering assistance. The private sector (consulting engineers, architects, the construction industry) has no clear technical point of contact within AID for information, guidance, or policy discussion. This situation is critical and requires S&T to fulfill the responsibilities seemingly inherent in its functional description.

The first step -- and this is a crucial priority -- is to provide the present Engineering Staff with a full-time secretary to regain order from the chaos in the files, the library, and in responding to correspondence.

While even to maintain the poor performance of AID in the past four years in meeting its requirements under the Foreign Assistance Act of 1961, as amended, for engineering input and management of projects with major engineering components would require some additional professional manpower for the Regional Bureau and S&T Engineering Staffs, it would still leave unaddressed several important areas of need.

Most important of these is engineering policy. From the earliest period, the foreign assistance legislation has specified that one of the officers of the Agency responsible for carrying out the purposes of the Act should be a professional engineer. Despite lip service and popular wisdom among the uninformed to the contrary, a substantial majority of AID funding is committed to activities that are predominantly engineering in nature. This requires, as Congress intended, a professional engineer among the Agency's top policymakers.

As long as the S&T Bureau is predominantly one for basic scientific research, it will not be a congenial base for addressing policy in engineering and technology, nor for determining policies concerning field Mission programs and the day-to-day problems of project formulation and implementation involving the state-of-the-art in engineering technologies. This situation could be ameliorated if the Senior Assistant Administrator or his Deputy for Technical Cooperation were required to be a professional engineer, or if there were a senior engineer for policy in engineering and technology reporting to the Deputy Administrator or the Assistant Administrator for Program and Policy Coordination.

c. Organize to Meet the Need.

1. S&T Bureau Engineering Staff.

For several years now, the traditional functions of the old central Office of Engineering have largely been transferred elsewhere. The standard project management function in both S&T and the Regional Bureaus rests principally with generalist project officers or with technicians who have been trained in various aspects of the functional areas of Agriculture, Rural Development and Nutrition; Education and Human Resources Development; Population and Health; Energy; Natural Resources and Environment; and the various social sciences.

Engineering inputs for review of projects submitted from the field for approval and support to the field Missions during project implementation is now provided by the Regional Bureau Engineering Divisions. S&T has no

process specifically requiring direct-hire engineering review or involvement in monitoring implementation. S&T includes engineers with largely non-engineering job titles in most of its functional offices. The present Engineering Staff of two persons is so thin that it cannot provide backup to the Regional Bureaus or S&T functional staffs when they do not have direct-hire engineers with a needed specialization or are encountering unusually heavy workloads.

The residual functions remaining with the Engineering Staff by default, because Agency management was largely unaware of the existence of such functions, are:

-- administration of 12 IQC contracts for various specialized fields of engineering to assist field Missions, Regional Bureaus, and Central Bureaus (although use by these is negligible) in project design, project formulation, implementation problem solving, etc. Well over a million dollars a year of work orders are issued.

-- liaison with the representatives of the private sector engineering, architectural, and construction community, including the American Consulting Engineers' Council, the Associated General Contractors of America, the American Institute of Architects, the National Society of Professional Engineers, the National Constructors Association, the National Academy of Engineering, and the Inter-Society Committee on Federal Construction.

-- participation in the deliberations of the A.I.D. Procurement Policy Advisory Panel, under the chairmanship of DAA/SER.

-- occasional field TDY in industry and civil engineering projects.

-- maintenance of the old Office of Engineering files, specification catalog, and fairly inclusive library.

-- manage a contract for preparation and distribution of Engineering News Letter, and prepare the annual "Yellow"and "Green" books which list on-going engineering construction contracts and provide information to potential contractors. (Not done in 1982.)

It can easily be seen that it is difficult to justify retaining positions for these functions in the S&T Directorate for Energy and Natural Resources where none of these residual functions relate directly to the work assignments, despite their significance to the Agency. It is equally clear, though, after examining the engineering requirements of the Agency and the functional statement for the S&T Bureau that there are many more responsibilities that ought to be assigned to an S&T Engineering Staff. These functions warrant a high Agency priority for positions -- and probably some new recruitment.

The S&T Bureau is charged with service as the Agency's focal point to continually update and strengthen scientific and technical capacities of all Bureaus and Offices in Washington and overseas. A major technical discipline necessary for the Agency's operations is engineering.

S&T is the Agency's primary liaison with the scientific and technical communities of the United States and the developing and more developed countries. The engineering, architecture, and construction professional and technical organizations here and abroad are among the oldest, largest, and most active in the scientific and technical fields.

S&T is named the AID focal point for development of sectoral strategies requiring significant science and technology inputs and is charged with developing appropriate methodology to ensure that these strategies are responsive to LDC needs. This is the dictionary definition of engineering. (See Part II.C.)

The Bureau administers the Agency's centrally-funded research and development program and coordinates all AID research and development. While pure research for new knowledge is a function of scientists, development of new methods and products and evaluation of technologies is an engineering function.

The Bureau is responsible for the Councils representing the various technical specialties in AID, and thereby coordinates career development, professional in-service training, and performance of professional duties outside the immediate organizational responsibilities of all engineers in AID.

S&T also has the responsibility for facilitating engineering operations of AID and aiding in the development of policies, procedures, standards, practices and internal guidance for the architectural, engineering, and related technologies and construction services. To date, largely because of the bureaucratic isolation of the engineering staff, this function has been observed in the breach.

In order to fulfill the S&T Bureau's mandate, at least equal attention must be devoted to technology (engineering) as to science. The National Academy of Science reported the major finding in their Project Hindsight was that new technology arises in response to need and not because new scientific knowledge becomes available. It can certainly be argued that AID's mission is one of applying technology to solve the problems of economic development in the LDCs -- and this is a basic engineering undertaking of applying scientific knowledge, economics, and socio-political realities to select the appropriate technology for each specific problem addressed. Accordingly, it is recommended that the Engineering Staff be reorganized and report directly to the Senior Assistant Administrator for Science and Technology.

Following is a brief enumeration of the special functions of an S&T Engineering Staff. (It is fully feasible, although less logical, that this office with all of its functions, be located in the Management Bureau and report to M/DAA/SER.)

1. Director.

The Director of the S&T Engineering Staff should be a senior direct-hire engineer with broad experience in both AID and non-AID engineering projects. Considerable AID experience is needed for him to provide the Senior Assistant Administrator with advice on his broad responsibilities to A/AID and the other Bureaus and Field Missions, and to understand the needs of the S&T functional Directorates and the Regional Bureau Missions. The Director should be a Foreign Service Officer so there is a regular change of incumbents and each will be freshly aware of needs in the operating Field Missions.

2. Engineering Support Services Branch.

This branch should consist of two middle to senior grade engineers, one civil service and one foreign service, to give a balanced view of requirements and continuity, to provide essential office-engineer services required by the entire Agency.

a. Periodic advertising and award of new or renewed IQCs. By regularly examining the portfolio of on-going and planned projects, a full stable of 10-12 specialized IQCs can provide the quick-response engineering contract services needed by Field Missions, Regional Bureaus, and S&T functional Directorates. The results of each annual assessment must be fed into the Agency's workforce planning system so standby contracts are provided the core funding and are available for users.

b. A PSC or other contract should be on-going for the regular preparation and distribution of the Engineering Newsletter, which is highly valued by all who now receive it. This publication must make available useful information

on state-of-the-art technology developments, as well as notices of training course availabilities and other personnel items to build esprit-de-corps. Technical material should be developed in close relationship with S&T/T and distribution should be considerably expanded from just personnel with Engineer back-stop code to include all project managers and both field and AID/W officers in project design, project management, and technical resources positions. (Such a distribution would also significantly reduce the unit cost of the Newsletter.)

c. This branch should develop and prepare handbook material and work with the Procurement Policy Advisory Panel.

d. For many years, cost estimates of AID projects have fallen far short of ideally meeting Section 611(a) requirements. This branch should establish or manage the establishment of a cost data bank whereby basic costs for various unit work items are established and maintained with adjustment by applicable factors developed for each area or country, as appropriate. These unit costs and factors must be continuously updated.

e. AID management and Field Missions are seriously concerned by the increasingly poor performance of many engineering consultants and construction contractors. The current "word-of-mouth" system for considering poor performance is inadequate, ineffective, and improper. A central coordinated system to evaluate, maintain, and invoke punitive measures is necessary. The procedure for this should be approved by the Procurement Policy Advisory Panel and maintained by this branch of S&T Engineering Staff. All host country, Mission, and AID/W contractor selection panels should be required to consult this central record.

f. The questionnaire distributed as part of this study indicated a modest need for some engineering research projects: low-cost building construction materials and methods for use in various regions of LDCs, use of some common tropical soils in construction (similar to the earlier AID-funded laterite studies), development of a low-cost and simple irrigation pump for local fabrication, prototype self-help latrines to cost under $25, low-cost urban water and sewer systems for self-help, and low-cost, durable photovoltaic electric power systems for remote health and education facilities. An appropriate annual budget should be provided for this branch to contract for such research efforts.

g. A final function of this branch should be to develop and administer one or two in-service training courses each year for direct-hire engineers. Such courses

ought to address specific problem areas or new technologies with inter-regional interest. They could cover such areas as low-cost building materials and methods, earthquake-resistant buildings, solar energy uses, environmental protection, appropriate technologies for municipal engineering, cost-effective land preparation for small-scale irrigation, and/or application of value engineering to major project design.

3. Project Engineering Branch.

This branch would consist of about five engineers (mostly FS on rotation) to provide direct-hire staff for support of project formulation, design, approval review, implementation monitoring, and selection and review of the work of consulting engineers and equipment suppliers. The clients would be the S&T Bureau Directorate functional offices and, on request, the Regional Bureaus for supplementing their staffs and for short-term TDY to the field. Based on present staffing in S&T and the Regional Bureau Engineering Divisions, specific skills are needed in electric power, telecommunications, sanitary engineering, structural engineering, and industrial/mechanical or chemical engineering. This staff would be able to respond on an as-requested basis to provide advice to the Overseas Management Division of the Directorate for Program and Management Services in the Bureau of Management, and should develop and maintain a current file of specifications for materials and equipment used in engineering activities to assist the Office of Commodity Management.

Assistance by this branch to the Bureau of Private Enterprise Office of Housing, the Bureau of Food for Peace and Voluntary Assistance Office of American Schools and Hospitals Abroad, the Office of U.S. Foreign Disaster Assistance, and the Trade and Development Program should be on a reimbursable basis because these offices' programs operate on separate appropriations or earmarkings. (See Appendix I. Part III, for suggested functional statement.)

2. Engineering and Technology Policy.

An agency with a portfolio such as AID's (see Appendix A. Part III.) which includes over $8.7 billion of projects with significant engineering, architectural or construction components must have clear and rational policy concerning engineering. Moreover, an agency whose primary mission includes enhancement of foreign policy through the use of technology in fostering economic development of the LDCs must have understandable and useable policy concerning development and use of technology.

AID is neither staffed nor organized to meet these requirements. In the inclusion of Section 624(a) of the Foreign Assistance Act of 1961, Congress clearly intended for AID to be so organized and staffed by the inclusion of a statutory officer who is a professional engineer. (The accepted definition of a professional engineer in the United States is one who has been licensed by one or more States to practice as a professional engineer and has passed an examination in both general engineering knowledge and a specific field of specialization. In order to qualify for such an examination, an individual must have an engineering degree from an accredited university-level institution or be a recognized practitioner in a professional engineering field with many years of practical experience under a licensed engineer.)

Interestingly, while the legislation mentions only the engineering discipline as a field in which AID should have a senior policymaker, and while the Agency has not complied with this strongly suggested criterion, the Bureau for Program and Policy Coordination does include a Chief Economist, an Energy Policy Advisor (non-engineer), and an Environmental Affairs Coordinator. AID also has an Inspector General (by statute), a chief attorney (General Counsel), and a chief accountant (Controller), as well as the eleven statutory officers, without due consideration having been given to persons qualified as professional engineers.

As a first step to rectifying this state of affairs, AID should establish an Office of Engineering and Technology Policy within the Program and Policy Coordination Bureau. This office should be small and involved solely in program and policy considerations rather than the day-to-day problems of project design and implementation, which should be handled by the Regional Bureaus and S&T Bureau engineering staffs.

This office, which should be headed by an engineer with an international reputation with staff assistance from senior civil, electrical, and mechanical engineers, will provide A/AID and AA/PPC with a source of expertise, information and policy advice on engineering as related to appropriate technologies for economic development of LDCs. It will assess the prospects of success for AID programs and projects.

It should assist AA/PPC and A/AID in evaluating alternatives for AID policy in participation in multilateral programs for development such as river basin development, UN-sponsored international decades, Columbo Plan, CDA, etc. Such evaluations should be based upon the comparative advantages of utilizing appropriate U.S. technologies.

The office should work closely with PPC/PDPR/ED to provide policy judgments based on sound technical analysis of alternatives in regional development, employment, urban development, housing (including guaranty programs), scientific research, industrial developments, and energy programs. It would help both PPC/PDPR and PPC/PB in evaluating programs and projects for budgetary impact and in determining soundness of design and implementation plans in terms of technologies selected, cost, and time frames. Utilization of value engineering for all capital projects would be evaluated.

The office would consider under what conditions the AID objective would be the design and contruction of a facility and when the transfer of design and construction skills for local development of the facility should be our objective. It would review the extent of AID's obligations for maintenance of facilities and equipment it funds, and the extent of AID's involvement necessary in recurent cost issues associated with AID-funded institutions and technology projects.

This office would oversee performance of in-depth analyses of worldwide trends in cost of essential categories of engineering professional services and engineering construction, and preparation of an estimate of the comparative advantage of U.S. technologies in major areas of economic development, so recommendations can be made concerning procurement policies for goods and services. It would work with the Procurement Policy Advisory Panel; represent PPC on the Engineering Sector Council; and represent AID at the appropriate level in inter-agency, international, and professional meetings on engineering and technology policy matters. The office would also maintain liaison with counterparts in other USG agencies, other donor agencies, international and academic institutions for the exchange of information and viewpoints on policy and trends in engineering and technology development.

Finally, this office would provide assistance, as needed, to other offices of the PPC Bureau and, as requested, to other Bureaus and Field Missions.

Clearly, it is possible to place this office as a division of PPC/DPRE. That, too, would be a first step in a most necessary right direction.

(See Appendix J. of Part III. for suggested functional statement.)

B. Recruitment and Retention of Engineers in AID.

In 1974, the Office of Engineering prepared a listing of 154 direct-hire engineers in AID. This included only professional staff in engineering-titled positions with "25" backstop code (in both GS and FS). Of these, 60 were eligible to retire by the end of 1974, 71 by the end of 1975, and 81 by the end of 1976. Of the 154 engineers on the rolls, 93 or 60% were over the minimum FS retirement age of 50, and another 34 or 22% were within five years of that age. Moreover, 46 or 30% had 20 years service, enough for an immediate FS annuity at age 50, and 40 more or 26% were within five years of that number of years service. (See Part III. E. III. C.)

Actual experience since 1979, which has included the RIFs after the Vietnam war ended and the transition to the Agency management's belief that most new activities did not require as much engineering inputs, saw an average of 12 engineers per year retire or resign from AID. This means a loss of 96 engineers in eight years.

At present, there are 110 direct-hire employees in AID who are in or have served in positions with 25 backstop code. Of these, 82 are currently in positions with 25 backstop and five are in agricultural engineering positions that are in 10 (agriculture) backstop code. (The remainder are in managerial or project positions.) There are an additional 39 direct-hire employees in AID who have college degrees in engineering but have never worked for AID in an engineering position designated as 25 backstop code.

Part III. E. II. indicates that 37 engineers or 34% of the total working in engineering positions or program management are eligible to retire now and that 74 or 68% will be eligible by 1 January 1985. With the present low morale of engineering staff, after 15 years of steadily reduced status in the Agency and one of the lowest percentages of promotions of any professional cadre, it is not unrealistic to assume that 90% of those eligible, or 65 engineers, will retire by 1 January 1985.

In addition, the plight of the younger, more junior engineers is serious. These younger officers see that engineering in AID is not the route to promotion or success. It is reasonable to assume that 25% of the 21 engineers under 40 will either resign or move to non-engineering positions in AID by 1 January 1985. Another 5 engineers lost to the Agency. But the analysis of AID's requirements for engineers in Part III. E. I. shows that 131 engineers are needed over the fiscal year 1983-1985 period -- some 21 more than are now on board. Thus, by 1 January 1985, AID must recruit 93 engineers to meet Agency requirements.

If AID is to meet its needs, a crash program to recruit and retain competent engineering staff with the correct mix of skills is necessary. The last three to five years have seen a very low level of engineer recruitment in the Agency, but the quality and skills have been much more appropriate than in the past. If a committee of M/PM and the Engineer Council meets regularly and seriously to deal with this problem, it can be solved. There must be a careful screening of Agency needs by category of specialty and grade level --some provision must be made for new hires at rather senior levels, say FS-1, and even some at GS-16 or Counselor grades. It is essential that AID have a few more senior engineers with broad experience in working with foreign cultures and on multi-disciplinary teams. On the other hand, special efforts should be made to obtain younger engineers with 5-8 years experience in developing countries, even a few who have not yet obtained their full professional license.

Consultation should take place with some of the professional organizations and technical societies to obtain short-term assignment of very experienced engineers from the private sector on leave from their employers, as has been successfully used by NASA, DOD, and other Federal Government Agencies. This would permit appointment of engineers to several of the statutory positions and at high levels in the Bureaus and Missions as AD or other temporary appointments, as well as attract younger engineers for career employment.

In order to encourage younger, more adaptable engineers to stay with AID in engineering positions, the Agency should make more use of engineers as project managers and as principal officers in the field, and upgrade the status of engineering staffs in the Bureaus in Washington. It would be appropriate to have an engineer comment on the technical performance of FS engineers, in addition to the supervisor preparing PERs and reviewing officer comments. The employee selection panels annually reviewing personnel files for promotion and selection-out recommendations should include at least one engineer if backstop code 25 personnel are to be reviewed. Clearly, AID should encourage its engineers to attend in-service and other short courses to upgrade and modernize their skills, and make funding available for DH engineers to attend professional conferences.

It is worth reiterating that AID has over $8.7 billion of projects with signficiant engineering content in the FY 1984 ABS; therefore, it behooves the Agency to expend some time and effort to obtain and retain staff appropriate to prudent administration of public funds involved in this portfolio.

B. <u>Recommendations</u>.

Based on the findings of this report with the accompanying appendices, it is recommended that the Senior

Assistant Administrator of the Science and Technology Bureau take the following actions or recommend the action, as appropriate, to the Administrator of AID.

1. S&T Engineering Staff be reorganized within the Bureau and report directly to the Senior Assistant Administrator for Science and Technology.

The Staff should consist of an FS Director, with a secretary, and two branches: one with an FS and a GS engineer to provide IQC contracts, Engineering Newsletter and annual information publications, Handbook material for the Procurement Policy Advisory Panel, contractor evaluation files, cost estimate data bank, and to adminster research and training activities; the other to provide project engineering for S&T Directorates and, on request, to other Bureaus, with at least five engineers, mostly FS on rotation, with an assortment of specialties. Each Branch should have a secretary.

Approved _____

Disapproved _____

Date _____

2. An Office of Engineering and Technology Policy be established in the Bureau for Program and Policy with a Director supported by a civil, an electrical, a mechanical engineer, and a secretary.

Approved _____

Disapproved _____

Date _____

3. A/AID appoint a committee of senior staff to recommend the best way for early appointment of a licensed professional engineer to fill one of the statutory positions, per Section 624(a)(3) of the FAA.

Approved _____

Disapproved _____

Date _____

4. A/AID appoint a committee of representatives of the Regional Bureaus, S&T, GC, and any other appropriate Bureaus to draft suitable wording for the AID Handbooks to insure adequate direct-hire professional engineering input and

certification prior to the making of Section 611(a), (b), and (e) determinations. Consideration should be given to requiring that for Sections 611(a) and (b) that a licensed professional engineer on AID direct-hire rolls certify to the officer making the determination. This would particularly apply to 611(a) determination of the adequacy of engineering plans and a reasonably firm estimate of the cost to the USG, and to 611(b) determination that a computation of benefits and costs has been made insofar as practicable in accordance with the procedures set forth in the Principles and Standards for Planning water and Related Land Resources of October 25, 1973, using the Guidelines and Procedures for Planning and Analysis of Water and Related Land Resources Projects, issued by AID on 8 January 1982..

Approved _____

Disapproved _____

Date _____

5. The Engineering Newsletter, prepared and distributed under contract, should be distributed to not only engineers in AID, but also to all project managers and all AID staff involved in project design and monitoring project implementation.

Approved _____

Disapproved _____

Date _____

6. The AID Engineering Council and M/PM should immediately develop and initiate a program to recruit engineering staff with the specialities and skills needed for the AID program through FY 1984, by taking into consideration the probable retirement schedules of the current AID DH engineering complement. Consideration should be given to any need for recruitment at the Super-grade or SFS levels or special salary increments, if necessary, to obtain the caliber of engineer required.

Approved _____

Disapproved _____

Date _____

7. The S&T Bureau budget funds for its Engineering Staff to implement the following functions essential to enhancing the quality of technology within AID programs:

-- publication and distribution of the bi-monthly Engineering Newsletter, the annual "Yellow Book" of Engineering and construction contracts, and the annual "Green Book" of information for A/E firms and construction contractors.

-- base funding of twelve IQC contracts.

-- assembly and up-date of contractor evaluation files for engineering, architectural, construction, and related fields of contracting.

-- preparation and continuous up-date of a computerized engineering and construction cost estimate unit price model, including data for as many regions and countries as is practicable. (This should be implemented by contract initially.)

-- up to two engineering research and development projects per year.

-- up to two in-service training courses per calendar year for DH engineers.

-- travel for staff engineers to assist in monitoring S&T Bureau projects and to assist the IG in internal audit functions as requested.

Approved _____

Disapproved _____

Date _____

STATUS AND FUNCTIONS OF AID ENGINEERS

PART II

BACK-UP NARRATIVE

A. Current AID Activities: Implications for Engineering Staffing.

The life of project (LOP) cost of projects in the pipeline on 30 September 1982, plus new projects planned for FY 1983 and FY 1984, as revealed in the Annual Budget Submissions (ABS) for FY 1984 prepared by all field Missions and AID/W, includes $8.734 billion of projects with engineering components. These projects are tabulated in Part III.A. (It should be noted that this total does not include projects in Sri Lanka, the Philippines, or Sudan because these ABSs were not made available.) This does not mean that each of these projects has its full LOP cost involved in engineering design, construction, fabrication, or other form of implementation, but that a significant element of the activity involves the need for engineering inputs that require AID approval or authorization prior to the next phase of implementation; moreover, without adequate U.S. direct-hire engineer overview, one can anticipate flaws in design, implementation, or estimated cost that could endanger the success of the project.

The breakdown of the fields of engineering specialization involved in this portfolio of projects is shown in Part III.E.I.

It is clear from this analysis of AID's portfolio of project activities that there has been no reduction in AID requirements for in-house engineering capability since the enactment of the International Development and Food Assistance Act of 1978. Since the enactment of this legislation, which included new Congressional policy initiatives to alleviate the worst physical manifestations of poverty among the world's poor majority, there has, indeed, been a number of major shifts in the types of projects funded by AID's Development Assistance functional accounts. These shifts have changed the mix of engineers required for AID's U.S. direct-hire employees; however, in all probability these changes increased the number of engineers needed to provide sound planning and project management for the portfolio.

In complying with the Congressional mandate, AID has moved to concentrate its assistance in the following areas:

-- agriculture and rural development, with the objectives of increased agricultural production per unit of land through small-farmer, labor-intensive agriculture and greater equality of income distribution through more equitable returns to small farmers. This initiative has spawned a wide variety of small irrigation projects, farming system projects, and decentralized government institutions requiring new buildings in remote areas. All of these types of activities are engineering-intensive, requiring water resources engineers, agricultural engineers, civil engineers, and contruction engineers, plus engineer involvement in technical assistance for institution-building.

-- reduction of infant mortality and control of poplation growth through improved rural health delivery systems (more buildings, among other needs) and improved availability of potable water and sanitation facilities (intensive need for sanitary, civil, mechanical, water resource and electrical engineers). Technical assistance by engineers for maintenance and creation of operating organizations is a high priority in this sector.

-- increase in literacy through primary education, non-formal adult education, and vocational training. In order to provide necessary buildings, equipment, etc., all of these types of activities need structural and civil engineers, electronic engineers and architects for concept analysis, design review, writing scopes of work, and implementation monitoring, as well as technical assistance for institution-building.

-- reduction of rates of unemployment and underemployment. Techniques used have been in agriculture and rural development (discussed above), increased small industry and commercial activities (requiring all types of engineers for analysis, review, scopes of work, and monitoring), loans to fund local development banks (necessitating engineer involvement in loan reviews), and promotion of U.S. investment (another engineering-intensive operation to evaluate proposals). Again, involvement of engineers for technical assistance in institution building is critical.

-- improving host government capacity in planning, technical, and administrative undertakings. Because most of these projects are either capital projects or ones involved in various areas of public infrastructure, these are heavily engineering functions requiring

direct-hire capability in the project design, review for project approval, and monitoring the project implementation. Engineers should be directly involved in project management and monitoring institution-building technical assistance.

-- environment and natural resources. Almost all of the activities undertaken in this sector primarily involve engineering skills and cannot have hope of success without substantial involvement of direct-hire engineers in project formulation, design, and implementation, as well as project management, contracts and technical assistance.

-- energy development and production. Since substantially all such activities undertaken involve major allocation of limited resources and selection of alternative technologies, the process of project analysis, approval, and implementation is largely engineering. In virtually any other organization involved in such decision-making, engineers would play a major role, if not the leading role, in managing energy development and production projects. Most of these projects could benefit from engineer project managers.

-- multilateral undertaking of large-scale capital transfers. These are primarily river basin development, transportation projects (rural roads, railways, ports, etc.), telecommunications, water and related land projects requiring (per Section 611(b) of FAA of 1961, as amended) the application of the Principles and Standards for Planning Water and Related Land Resources (October 25, 1973) in computing benefits and costs, and major regional institution development. These activities are complex engineering undertakings which should involve very senior engineers in negotiations with other donors and recipients, and in approving strategies, programs, and projects, as well as monitoring inputs from multi-disciplinary specialized agencies, experienced in these kinds of undertakings: Bureau of Reclamation, TVA, Bonneville Power Authority, Corps of Engineers Civil Works, U.S. Department of Agriculture, the Department of Energy, the Department of Transportation, and the Department of Education. Almost all such projects ought to have engineer project managers guiding both contracts and technical assistance.

-- appropriate technology to find SMALLER, cost-saving, labor-intensive technologies that are generally most

appropriate for small farms, small business and small incomes of the poor. This is almost a classic definition of engineering (see Part II.C.). Analysis of technological alternatives for technical and economic feasibility is substantially an engineering study, drawing on inputs from sociologists and craftsmen, and micro-economists. An engineer is ideally qualified to manage such projects.

-- Economic Support Fund. This is the largest appropriation that funds AID activities. While a steadily increasing share of this appropriation is for projects and non-project activities that meet the criteria applied to Development Assistance (DA) functional accounts projects, the bulk of the funds -- and the bulk of AID direct-hire employees' time -- are still devoted to capital-intensive undertakings which, if the funds are to be managed prudently, necessitates major inputs of direct-hire engineering effort. Under this funding category are billions of dollars (including the entire Egypt program) in power plants, dams, canals, sewerage systems, water distribution systems, sewage treatment plants, rural roads and highways, port facilities, electric power grids, etc.

Tightly managed agencies of the U.S. Government, State governments, and international development donors which handle comparable portfolios of capital projects and technical assistance programs are much stronger in engineering direct-hire staff than is AID. The Corps of Engineers Civil Works Division, the Naval Facilities Engineering Command Civilian Service Unit, the Bureau of Reclamation, units of the Department of Agriculture, HUD, DOT, TVA -- all of which rely, just as AID does, for project implementation by consulting firms and contractors -- have approximately 20 times the number of engineers per million dollars of project expenditure as does AID on comparable projects. (See Part III.F.) A State Highway Department monitoring work done by consulting engineers and construction contractors will utilize about 10 times the direct-hire engineering person-years per million dollars of construction cost that AID uses for roads it finances. The World Bank, with annual project expenditures one and one half times those of AID, has two and one half times as many direct-hire engineers as AID. And virtually all of the Bank's projects are loan with host-country contracts. Even the regional development banks in Asia, Africa, and Latin America find it prudent to use two to five times the engineers that AID does per million dollars of project portfolio. The European Development Fund implementing Lome II for the EEC has twice the direct-hire engineering staff of AID for a program only a little over one-half of AID's. (Section III.F.) The Export-Import Bank has recently made its Chief Engineer a Vice-President in order to upgrade engineering influence on lending policy.

The major problem of engineering in AID, however, is not the number of direct-hire engineers, but a combination of insufficient engineering input at important policy levels and lack of the right mix of direct-hire engineering skills in the right place at the right time.

While the present low esteem and low utilization of engineers in AID has largely been earned by AID engineers (see Part II.E.), the policy-making levels of the Agency do not appear to have implemented the statutory requirement that in the selection of officers to be appointed by the President "by and with the advice and consent of the Senate . . . in the selection of one such person due consideration shall be given to persons qualified as professional engineers." (See Part III.C.) Nor has prudence always been duly executed in assuring that qualified engineers are involved in the conceptionalization, design, approval, and implementation of projects involving engineering technology. Such projects taking place in the United States would be required by statute to have engineering certification of adequacy to protect the public safety.

Often there have been few, if any, of the statutory officers of AID who understand what an engineer does, how he is trained, or how to distinguish an engineer who is skilled in the disciplines required in various aspects of AID's mission. There has been a tendency in recent years to confuse engineers with scientists, and to use them interchangeably without awareness of the difference in the training and the approach to the problems of development. (See Part II.C.)

B. Bureaucratic History of Engineering in AID and Predecessor Agencies.

The history of engineering in AID and predecessor agencies appears to be one of steady erosion of status and functions, despite a clear Congressional intention to the contrary.

Prior to the Second World War, the only established U.S. foreign assistance program was a small agency within the State Department to provide technical assistance to Latin America under the Good Neighbor Policy. Shortly after the hostilities ended, the United States embarked on the Marshall Plan of reconstruction in Europe, followed by President Truman's Point IV program of technical assistance to the Lesser Developed Countries (LDCs) and both capital and technical assistance to Turkey and Greece.

These post-war reconstruction programs and our initial efforts toward providing economic development and security assistance to the LDCs were administered by a series of agencies created by Congress within or associated with the Department of State: the Economic Cooperation Administration (ECA), the Technical Cooperation Administration (TCA), the Mutual Security Agency (MSA), and the Foreign Operations Agency (FOA). Each of these were relatively small temporary agencies established with semi-formal and flexible bureaucracies, but each had a small engineering department headed by a Chief Engineer who served as advisor to the Administrator or Director. In all cases, the Chief Engineer's Office was administratively part of the Office of Transportation, which had responsibilities concerned with procuring commodities and services and delivering them to the projects or using agencies in the field.

In July 1955, the International Cooperation Agency (ICA) was created by Executive Order 10610. ICA financed grant capital projects (about 60 percent) and technical assistance projects (about 40 percent). While still a temporary agency, ICA established special field missions -- called U.S. Operations Missions -- and began building an extensive bureaucracy to administer the program and the growing legislative requirements, restrictions, and prohibitions. In ICA/W, about 20 professional engineers were employed. The Chief Engineer, a consultant, served as a policy advisor to the Administrator, and the Deputy Chief Engineer was the head of the Office of Development Resources (ODR). ODR was responsible for design, review, and approval of all projects requiring architectural or engineering design or containing a construction element. Such projects involved more than half of the Agency's funds and were managed by about 10 percent of ICA's staff.

In 1957, the Development Loan Fund (DLF) was established as a lending arm to compliment ICA's grant activities. In 1958, the DLF was reorganized as a separate entity and a government corporation. DLF loans were virtually exclusively for capital projects. Capital projects were designed by a cadre under the Deputy Managing Director, which included 12-15 engineers who participted in the design and approval of all projects. Most DLF loans went to middle-income countries such as Yugoslavia, Turkey, Greece, Spain, Taiwan, Iran, Argentina, and Brazil.

ICA and DLF were abolished and the organizations combined by the FAA of 1961. All functions and most personnel were transferred to the new Agency for International Development (AID) by E.O. 10973 on 3 November 1961.

The FAA of 1961 (P.L. 87-195) in Section 624(a) provided that the President could apppoint, by and with the advice and consent of the Senate, twelve officers in the Agency primarily responsible for administering Part I, of whom one should have the rank of Under Secretary of State, one should have the rank of Deputy Under Secretary of State, and ten should have the rank of Assistant Secretaries of State, "and in the selection of one such person due consideration shall be given to persons qualified as professional engineers."

This portion of Section 624(a) of the FAA was repealed by Section 205(42) of the Government Employees Salary Reform Act of 1964 (P.L. 88-246), except for the provisions for 12 persons (later reduced to 11) and for due consideration that one of them shall be a professional engineer. (See Part III.C.) It is clear that Congress intended for engineering judgments to play a significant role at the highest management levels of AID. Accordingly, Administrators maintained a professional engineer as Chief Engineer reporting directly to the Administrator and responsible for assuring appropriate engineering judgment and advice on matters before the Administrator. Such a position was filled from 1962 until 1972. While the statutory requirement stands, no professional engineer now serves as one of the 11 statutory officials.

As DLF and ICA staffs were merged, along with the merger of loan and grant activities, AID established and staffed Geographic Bureaus -- roughly paralleling those of State -- to carry out bilateral and multilateral economic assistance activities. In 1962, four geographic bureaus (LAC, FE, NESA and AFR) were each assigned a Director of Engineering with staff. The Director, in turn, reported to the Director of the Capital Development Office of each Bureau. The relationship of the AID Chief Engineer to engineers assigned to USAIDs and bureaus varied (with Administrator) from informal to none.

Effective in July 1972, AID centralized many functions, including personnel management, contract management, and engineering. These functions became part of a Service (SER) Bureau housed in Rosslyn and the Chief Engineer reported to AA/SER. The engineering staff covered most disciplines represented by field projects and the Office of Engineering provided engineers to Bureaus and USAIDs on request. While the Office had a budget to conduct applied research on critical engineering problems faced by AID and to retain requirement and IQC contractors, the separation of the engineering staff from the geographic bureaus' and Technical Assistance Bureau staffs who were responsible for preparing project documents proved to be a disincentive to fully including AID/W engineers in project design and even implementation; moreover, very few projects had an engineer as Washington project manager.

By 1975, there were over 200 direct-hire engineers under the Chief Engineer's oversight, of whom more than 60 were in AID/W.

With the end of the war in Indo-China and the formulation of the Congressional New Directions for foreign assistance in 1977, there was a reduction-in-force (RIF) that reduced, among others, the number of engineers. The concentration of new starts in rural development and technical assistance rather than capitl projects was believed by many to obviate the need for much of the engineering staff. Accordingly, the Office of Engineering was reduced to forty, then thirty and transferred to the Development Support Bureau (DSB). Major new initiatives in engineering activities such as energy, water and sanitation for health, remote sensing, and protection of the environment were put under the jurisdiction of other offices without engineering supervision.

The reorganization of DSB into the Bureau for Science and Technology (S&T) in 1981 included a division of responsibility by sector of activity. Since AID has never included an engineering sector, the Office of Engineering was abolished, and as its successor was left an Engineering Staff of five engineers headed by a Senior Engineer in the Directorate of Energy and Natural Resources. The remainder of the engineers were divided into new geographic Bureau engineering divisions -- Africa's Engineering Division is in the Office of Technical Resources with a Chief and three engineers; Asia's is in the Office of Project Development and has a Chief and two engineers; Latin America and the Caribbean has a Chief only in the Office of Development Resources; and Near East's is in the Office of Project Development with a Chief and five engineers. The Regional Bureau engineering staffs are spread so thinly that, except for the NE Bureau, there is almost no time available for these engineers to serve as project managers -- even for projects that are almost entirely engineering or construction.

In mid-1982, when S&T began placing engineers in each of its functional sector offices as required, it became questionable whether any centrally-located engineering staff was necessary for AID. At the time of this study, S&T/EN's Engineering Staff consists of one general engineer specializing in civil and construction engineering and one industrial/chemical engineer. The former is principally involved in administering the Agency's IQC contracts, liaison with the consulting engineer and construction contractor professional organizations, and participation on procurement policy and handbook revision committees, while the latter is primarily spending his time on TDY to USAIDs with major industrial projects that have problems.

C. What an Engineer Does: How he Differs from a Scientist.

Engineering is the profession or art of applying science to the optimum conversion of natural resources to benefit man.

Associated with engineering is a great body of special knowledge; preparation for professional practice involves extensive training in the application of that knowledge. Standards of engineering practice are through the efforts of professional societies, usually organized on a national or regional basis, with each member acknowledging a responsibility to the public over and above responsibilities to his employer or to other members of his profession.

Engineering is an art requiring the judgment necessary to adapt knowledge to practical purposes, the imagination to concern original solutions to problems, and the ability to predict performance and cost of new devices and processes.

While the function of the scientist is to know, that of the engineer is to do. The scientist adds to the store of verified, systematic knowledge of the physical world, and the engineer brings this knowledge to bear on practical problems.

Unlike the scientist, the engineer is not free to select the problems that interest him; he must solve problems as they arise; his solutions must satisfy conflicting requirements. Usually, efficiency costs money; safety adds complexity; improved performance increases weight. The engineering solution is the optimum solution, the end result that, taking many factors into account, is most desirable. It may be the cheapest for a specified level of performance, the most reliable within a given weight limit, the simplest that will satisfy certain safety requirements, or the most efficient for a given cost. In many engineering problems, the social costs are significant.

The results of engineering activities contribute to the welfare of many by furnishing food, shelter and comfort; by making work, transportation, and communication easier and safer; and by prolonging life and making it pleasant and satisfactory.

ENGINEER RESPONSIBILITIES

One activity common to all engineering work is problem solution. The problem may involve quantitative or qualitative factors; it may be physical or economic; it may require abstract mathematics or common sense. Of great

importance is the process of creative synthesis or design -- putting ideas together to create a new and optimum solution for the problem. Since the engineer functions at the socio-technological interface (with science on one side and individuals and communities on the other), he bears a unique responsibility to decide on priorities, to establish performance criteria, to select materials and processes, and to specify procedures.

(Based on the entry under engineering in the 15th Ed. of Encyclopedia Brittanica.)

Engineering - the planning, designing, construction, or management of machinery, roads, bridges, buildings, fortifications, waterways, etc.; science, profession or work of an engineer. (Webster's New World Dictionary of the American Language, Coll. Ed. 1968.)

The words "science" and "engineering" label activities basic to the nature of man throughout his entire recorded history. The objective purpose of the first activity, "science," is simply learning. Its goal is new knowledge, new understanding and new data about the static and dynamic characteristics of that universe of which man is part. Its modus operandi is "research." It is essentially esthetic in character, limited primarily by the mind, and its reach knows no frontier.

"Engineering" on the other hand, is that pervasive and precursor activity concerned with change in the socio-economic living environment of man and with the solution or amelioration of problem situations which conflict with his comfort, his safety, or with activities of individuals or groups of individuals. The process of problem solving in the real world forces confrontation with all the multiple complicated, non-linear, non-rational, economically and politically dominated boundary conditions and constraints within which man lives and with which he deals on a day-to-day basis. Such is "engineering."

"Technology" is the formal or informal by-product of engineering, and provides the means for doing what is thought desirable. It sometimes is embodied in a physical reality, in a piece or a collection of physical things -- then known as "hardware." Equally, it may be a method, a technique or a collection of techniques, a methodology or know-how -- then referred to as "software."

(H.E. Hoelscher in Technology and Man's Changing World, AUB 1980.)

There are striking differences between the human processes leading an engineer to a new technology and those which are used to produce a new discovery in science. Development of a new technology virtually always is a response to a felt need -- an individual in his own home may search for and find a better way to open a tin of food, or a major industry may finance the search for a more stable or higher strength plastic in which to wrap its products.

Discoveries in science are ususally made by a single or a few individuals, often backed by a staff of students or technicians; whereas a significant new engineering effort is most often accomplished through the effort of many professionals with different teams having responsibility for different segments of the undertaking.

As noted by Dr. Hoelscher, the objective of science is new knowledge or understandings, while the objectives of efforts by engineers, while frequently utilizing the findings of science, are most often commercial and directly utilized in the market place or by the intended beneficiaries. Hence, when objectives of each are met, the money value (economic return) of the new element of knowledge or understanding (science) may be difficult to assess, but the money value of the new technology (engineering) is one important consideration in its evaluation.

Finally, it is important to realize the differences between science policy and technology policy. There is a frequent assumption that setting science policy is a step toward the setting of technology policy and the guiding or driving of development. Nothing could be more remote from the truth. Science policy is used to emphasize or to implement the development of capabilities in particular areas of science and has no direct relationship, except, perhaps, an inadvertent relationship, to the development, through engineering, of the appropriate technology which relates to that branch of science. Science policy for nuclear physics has nothing to do with the development of nuclear power or nuclear weapons. Science policy relating to electrochemistry has little or nothing to do with the development of electrochemical generators or any power storage system. Science policy for biology has little or nothing to do with the development of a pharmaceutical industry or an irrigated agriculture system. Nor does science policy for physics, zoology, physiology, or organic chemistry have much to do with the utilization of renewable energy sources in Kenya, crop protection in West Africa, improving family planning programs in Bolivia, or building a fertilizer plant in Bangladesh. Hence, none of these types of "science policy" can be considered as direct inputs to the resource utilization or consumption or allocation process, which involves engineering and economics.

Engineering policy, unlike science policy, is always necessarily focused on the development problem to be solved and is directly related to the process of resource allocation and of resource consumption. The major problem in the field of energy, for example, is in the recurring confusion between the effort to generate policy relating to the energy sciences and the need for policy relating to the development of new energy technologies. The latter, an engineering function, relates to the allocation and utilization of resources and is a fundamental issue in the process of decision making -- a basic concern of management and the political arena.

Science planning is intrinsically a long-range process; several decades may be needed to see viable results. Engineering planning for new technologies can be a much shorter process; the traditional five-year framework is entirely feasible if the will to implement and if the mechanisms for implementation are recognized and established.

Clearly, AID's activities are largely in the broad field of "engineering," and AID probably should allocate very little of its limited budget for "science."

Engineering, as taught in American universities and practiced in this country, involves assessing the problem; evaluating alternative solutions and by employing knowledge from the physical and social sciences, developing the most economic and technically feasible solution; then implementing this solution to the problem -- always making mid-course corrections as indicated by evaluation and experience. Engineering might by shorthand be termed the applied science of solving problems of human comfort, safety, convenience, and life quality by using the most feasible means -- economically feasible, technically feasible, socially feasible, and environmentally feasible. This implies the use by the engineer of inputs from many disciplines and the careful evaluation of trade-offs, because it is evident that one man's comfort, safety, convenience or improved life quality may sacrifice one of his other wants or be another man's discomfort, danger, inconvenience or life degrader.

D. Where Should AID Look for Engineering?

For many years, AID and its predecessor agencies in the bilateral economic assistance field retained a large staff of direct-hire American engineers. This staff, although largely Civil Engineers experienced in design and construction supervision of roads, bridges, buildings, and

airfields, included a good cross-section of engineering disciplines: highways, sanitary, railroad, mechanical, industrial, architects, electrical, water resources, telecommunications, agricultural, ports and harbors, heavy equipment specialists, and city planners. Through most of this period, the project portfolio was predominantly capital projects involved with basic infrastructure and the related technical assistance, institution building, and training.

Of course, even during this period, virtually all feasibility studies, design, and construction supervision, as well as technical assistance teams and training, was performed by consulting engineering firms or individuals from the private sector under contract. The U.S. direct-hire staff, however, was much more intimately involved in engineering monitoring of the contractors, review of their work, and (because of the rule of the Chief Engineer in Washington who reported directly to the Administrator) in policy-making and program and project review. Engineers as a percentage of total U.S. direct-hire employees may have on occasion reached ten percent.

Foreign Service Nationals.

As AID developed years of experience in some countries and dealt with the many returned participants and other indigenous engineers, it became possible for field Missions in several countries with relatively large cadres of trained citizens to hire competent FSN engineers. This is particularly true in Latin America. Now, with engineering inputs required only for subsidiary buildings, heavy equipment specification and maintenance, and limited need for civil, irrigation, sanitary, and agricultural engineers and energy and environmental engineers, most of the Latin American Missions can find fully adequate FSNs for staff engineering monitoring of contractors and review of project proposals -- provided the pay-scale for FSNs at the post is competitive for professional employees. The same is probably true at selected South and Southeast Asia posts. U.S. direct-hire engineers are only required at these posts for routine inputs when large, complex engineering works or projects are undertaken.

It should be noted, however, that among the primary goals of AID are technology transfer, introduction of American technology and promotion of U.S. goods and services. If we are sincere in these goals, it seems reasonable that they are best pursued by providing American staff engineers to pursue them.

The quirks of our foreign affairs bureaucracy are such that there is very little incentive for Missions to seek FSN staff engineers because all positions are equal, with FSN and U.S. direct-hire each counting as one body on-board, even though the American may require 4-6 times the operating expense funding that the FSN does.

An additional and extremely important reason that even in Latin America and South Asia our Missions may need an American direct-hire engineer, is that Section 611(a) certifications, negotiations with the host government, strong criticism of host government performance, adverse comment on work or submissions of U.S. private constructors, and similar activities can only be undertaken by U.S. direct-hire employees. Closely related to this is the intangible -- but very definite -- benefit to our programs of the Foreign Service career sequence of field tours and periodic home leave and rotation assignments in Washington. The key role of principle engineering advisor to an AID Mission Director should not be played by a non-American.

Contracting.

In recent years, AID has increasingly turned to contracts with private consulting firms and non-profit institutions or universities for many of the engineering functions formerly performed by U.S. direct-hire staff. Much of this has been a move in the right direction and should have been used to permit the direct-hire engineering staff to devote more time to up-dated training and to drafting think-pieces on policy and programs. Unfortunately instead, the increased use of contracts was because the direct-hire engineering staff was being reduced and removed from participation in policy-making and program development.

There is virtually no scope left for increasing AID's utilization of consulting engineers under contract, unless AID plans to turn over its decision-making function concerning policies and day-to-day operations to contractors. In the view of most of the engineering and construction community in the private sector that deals with AID and of senior engineers in the non-profit institutions and universities with whom we work, AID has reduced its institutional engineering competence to the point that, with increasingly rare exceptions, the agency is unable to judge when it receives a good or bad proposal to accomplish its work and is unable to evaluate advice and recommendations received from engineering and construction contractors. These contractors have noted increasing inability of AID -- in both Washington and the field -- to prepare a scope of work for engineering activities or engineering components of broader activities that is accurately designed to obtain responsive proposals from the private sector.

In short, it appears that AID as an agency has reached the point of no return at which it must seek to strengthen its in-house engineering competence with American engineers. This does not mean releasing the competent FSN engineers or having no more. This does not mean reduced utilization of consulting engineers, private firms, and non-profit institutions. Nor does it mean any change is

necessary in the functional sectors or types of project assistance. Simply, AID must obtain -- by using on-board staff and new hires -- a sensible mix of engineering skills and station them where they are of most value.

This probably means that some of the older engineers should be encouraged to retire. Even some of the younger engineers who have no particular area of specialty and are not so trained or so experienced as to be able to apply engineering skills in analysis; in evaluation of alternatives, including economic, sociologic, and environmental factors; and in the review of contractor work with the capability of documenting both good and unacceptable performance, are going to have to forgo advancement and the better assignments.

It is clear that in order to effectively utilize engineering staff, some changes are required in the Washington organization.

There is certainly no reason that the Geographic Bureaus and the Science and Technology Bureau should not have available to them the engineering skills they need. Those Bureaus are clearly satisfied with the decentralization of engineering assignment in Washington, and strong arguments are available to support this. Though, with a small staff of 2-8 engineers in the Development Resources, Project Development, or Technical Resources Office, there will be a number of specialities that these Bureaus must call upon, but for which they do not have full-time staff. The Bureaus have noted electric power, telecommunications, industrial, sanitary, water resources, and safety as disciplines they need available on a TDY or part-time basis from a central office.

In addition, there is a surprisingly strong requirement for regular, but not full-time, engineering input expressed by a large number of central bureau offices.

-- The IG often used to utilize an engineer as part of audit teams, and would prefer that it be possible to do so in the future. They also occasionally need an engineer to review a specific problem.

-- OFDA uses contract engineers very often, and would value being able to call upon direct-hire engineers for help in drafting work scopes and reviewing proposals and reports.

-- M/PM depends upon a panel made up of engineers from the Geographic Bureaus and the central engineering staff for review of engineering job applications. This could be simplified and improved if a central office provided the continuity of secretariat services.

-- SER/MO and SER/OM would utilize several person years per year of engineering services from the following disciplines of specialty, if they could be made available: electrical, sanitary, structural, mechanical, safety, equipment. Such an addition to SER/OM's resources would vastly improve their capability to service the field posts.

-- M/DAA/SER needs an engineer from a central staff for continuing participation in the Procurement Policy Advisory Panel, one of the Agency's key committees.

-- SER/CM needs continuing participation of engineers in reviewing scopes of work, evaluation of proposals and bids, evaluation of performance, etc.

-- SER/COM would utilize a few person years of central engineer time in preparing and reviewing specifications and evaluating bids in a dozen fields.

-- PRE/H, while not required to apply Section 611a, would occasionally draw on engineers in house for advice on plans and project proposals.

-- PRE/SDB has always worked with a central engineer staff in obtaining equitable utilization of minority firms in IQC and other requirements contracts.

-- TDP has a continuing need for direct-hire engineers, but not on a full-time basis, for review of proposals and reports and for helping to prepare scopes of work for studies.

-- ASHA must have direct-hire engineering input for Section 611a determinations. It currently has one staff architect/engineer for site inspections and to participate in project reviews; however, from time to time this office can use engineers, if available, from a central staff.

-- PPC, with responsibility for program and policy coordination, has never included engineering input in their reviews. Clearly, with the Environmental Affairs Coordinator and Energy Policy Advisor on the AA/PPC staff, an Office of Policy Development and Program Review, and another with planning and budgeting coordination, this bureau should have access to engineers to properly execute its functions.

The Bureau for Science and Technology is a special case. With a significant slice of the Agency budget, it is organized on a functional Directorate basis (Food and

Agriculture, Energy and Natural Resources, Human Resources, Health and Population), and its only staff function offices are Program and Management. Since each of the functional directorates and constitutent offices (Agriculture, Nutrition, Forestry, Environment, Natural Resources, Energy, Multisectoral, Education, Training, Health, and Population) has need for its own specialists, including engineers, the Engineering Staff is without clear service to the Bureau. The Energy Office is largely staffed by engineers who do not have engineering titles or personnel backstopping and, therefore, no relationship to any engineering direction. All are supervised and evaluated by non-engineers. There are one or more engineers in the Offices of Health, Forestry, Environment, Natural Resources, and Agriculture. In a number of cases, this Bureau utilizes scientists to perform engineering work, despite the differences in training and experience needed. (See Part II.C.)

While a very large percentage of the S&T Bureau's activities are involved in pure scientific research (the acquisition of new knowledge without direct relationship to specific problems to be solved), there is a considerable volume of engineering (developing or selecting a technology to solve a specific problem), too. While it would be preferable for engineers to manage these efforts in order to utilize their training in seeking the most economic solution and their experience in problem solving, the present trend is to appoint scientists who are experienced in research and tend to turn to universities rather than the private sector. Perhaps this is what the Agency desires -- and S&T appears to be much more responsive to field mission needs than predecessor bureaus in this same general field. There does, however, seem to be a sound case for the functional offices to be able to draw upon a small S&T Bureau Engineering Staff headed by an experienced AID engineer. Such a staff, reporting to the SAA/S&T could supplement the skills based in the functional offices with ones not required full-time, i.e., building construction, mechanical/electrical, and perhaps hydrologic/water resources. This Office would also participate in the S&T Bureau review of ABS, Development Strategies, and project papers from field Missions and AID/W, as well as be available to supplement the Regional Bureau engineers.

I. <u>Direct-Hire Engineers and AID Procurement Policies</u>.

As stated in section 12A2 of AID Handbook 12, "AID has always recognized that it can best succeed in its role by mobilizing outside resources as they are needed, rather than by attempting to maintain a direct-hire staff adequate to carry out all of its programs in the developing countries."

Accordingly, the Agency must keep its direct-hire engineering staff -- as all others -- to only the size required by legal and policy considerations to perform functions that can only be done by direct-hire personnel, such as policy, planning, budgeting, and programming decisions; conducting negotiations with the governments of cooperating countries; and procuring outside technical services.

It must be kept in mind, nevertheless, that these legal and compelling policy reasons require direct-hire staff for a number of essential activities. (Per PD-37, Supp. A to HB 1, Part III.D.)

-- negotiating with host governments on behalf of the United States.

-- decision-making concerning the allocation of resources available to AID.

-- evaluating and overseeing the execution of functions assigned (through contract or interagency agreement) to other government agencies or the private sector.

-- locating, judging the competence of, selecting, and negotiating with external sources of needed skills.

-- performance of essentially internal management functions.

Engineers have significant roles to play in the first two and the last item; however, the third and fourth are essentially roles for engineers for all activities relating to engineering, architecture, construction and related disciplines. Accordingly, it would be rational to staff direct-hire engineers to manage activities in these fields.

PD-37 guidelines also note certain administrative considerations which make it desirable, sometimes, to utilize direct-hire AID personnel even though it is not legally necessary to do so. Such reasons include:

-- acute need for speed, when direct-hire staff are processed, cleared, and immediately available.

-- non-existence of requisite skills in other government agencies or the private sector. Such a situation is most likely when the needed persons must have, in addition to technical skills, the ability to (1) adapt American skills and techniques to unique foreign conditions, (2) impart special skills to a very different culture or educational level, or (3) create a specific institution for retention or dissemination of such skills.

-- prohibitive cost differential between direct-hire and outside resources. Before conceding any such differential, care must be taken to accurately determine the cost of direct-hire.

-- the occasional need for complete Agency control of the project or function being considered.

For these rather rare situations, too, AID must have adequate direct-hire engineering staff.

It is clear that AID must have competent engineering direct-hire staff with the needed skills in the fields of activity in which AID is actively working and in numbers sufficient to select and monitor the work of private sector firms and cooperating USG agencies.

Based on the programs set forth in the FY 1984 ABS submissions, the numbers in the various areas of specialization for engineers that the author has extrapolated from project activity is shown in Part III.E.I. This indicates a total of 131 engineers in the Agency, as compared with a present strength of 100 (30 November 1982). But it not only means 31 additional engineer positions and bodies are needed, but the area of specialty distribution is considerably different. A comparison is shown in the following table:

Specialty	On-Board	Required
Agricultural	5	23
Water Res./Hydr.	5	16
Civil	16	49
Electrical (Power)	5	18
Telecom	1	2
Mechanical	0	2
Equipment	0	2
Industrial	1	4
Sanitary	2	11
General Engineer	57	0
Environmental	8	0
Mining/petroleum	0	2
Chemical	0	2

General engineer is purely a civil service job description, because there is no degree in this field, no licensing examination and -- for all purposes -- no such beast. Both this position description and that of environmental engineer/environmental protection officer are subfields of civil engineering. Therefore, they are listed as separate fields under "required." If the full number of required engineers were stationed in the field (102 in lieu of the present 73), then even if, as recommended, S&T Engineering Staff were expanded

from 2 to 8 and the four-engineer Engineering and Technology Policy Office were established in PPC, there would be only 29 engineer positions in AID/W, as compared with the present 27. The two additional positions would both be for further rotational assignment of FS in Washington.

E. The Role of the Engineer in AID Today.

Since the creation of AID in 1961, the bureaucratic status of engineers has been downgraded steadily. There has, moreover, been great confusion among the non-engineer Statutory Officers concerning what an engineer does, his training, and the role he should play in policy establishment; in design, authorization, implementation, and evaluation of projects; in dealing with the private sector, particularly consulting engineers and construction contractors. In fact, many of AID's managers confuse engineers and scientists, and do not understand the difference in their training and skills. (Part II.C.)

A large part of this confusion is the direct result of the engineers themselves. The profession, always a part of management in the private sector and in the major Federal Government developmental agencies (Defense, Interior, HUD, Transportation, Agriculture), has not been careful to monitor AID internal organization of engineers and to protect the interest of the profession through political lobbying, as have the other major professions --lawyers, physicians, accountants, academics -- nor has the profession made certain that AID management has understood what an engineer does.

Much of the management of AID is unaware that engineers, regardless of their branch of specialization, have completed an extremely rigorous academic program to obtain a B.S. This includes many academic hours of economics, sociology, mathematics, statistics, English, and science in addition to the normal curriculum of applied science. In fact, the average B.S. engineer has nearly 50% more undergraduate credit hours than the average B.A. graduate, and in many universities engineering is a five or six year program. In order to practice engineering as a profession in any area effecting the public, an engineer must complete several years of on-the-job experience under a licenses engineer and then pass a rigorous written examination of a minimum of eight hours, often sixteen hours. Then he is granted a license to practice, including signing plans, specifications, and project designs.

The engineer can lose his license to practice any time that he certifies plans, drawings, specifications, cost estimates or completed construction as correct and proves to be in error. Thus, the engineer must know his limitations.

This is one of the reasons engineers are often quick to turn to consultants expert in specialized fields, and also is a reason that AID is often unwise to assign an engineer trained in, say, civil engineering as a general engineer to supervise projects in electrical engineering, mechanical engineering, metalurgical engineering, and marine engineering.

Many of AID's executive staff have had unhappy experiences with engineers working with or for them, because it was not understood that engineers are as specialized as physicians. Frequently, the engineer or the physician will refer you to a specialist in the area of your problems. If you insist on diagnosis from a specialist in another field, it will often be wrong.

Over the years, AID has given too little attention to both the mix of specialization of its engineering staff and to the continuing education of its staff concerning the state-of-the-art developments. This has resulted in a low overall competence level for AID direct-hire engineering. All of these factors: misunderstanding, misutilization, poor competence level have helped to produce the low esteem in which AID's engineers are held within the Agency -- but it has also led to AID's poor reputation as an employer, as a hard-headed reviewer of projects, and as an agency with the capability to develop new technologies for the LDCs.

The net result of the steady reduction in experienced engineering staff, coupled with a poor mix of specialties within the remaining staff has, indeed, left AID with little capability to evaluate the recommendations, plans, cost estimates, and implementation methods prepared by consultants, contractors, and grantees for AID approval. Several years of this situation has already produced a number of horror stories of the failure of projects largely because AID lacked direct-hire engineering competence (See Part II.F.II). More scandals are there, just waiting for the light of publicity -- cast by a passing journalist or a GAO team -- to fall on AID and bring down public and Congressional penalties for the Agency simply not understanding the need for in-house engineering competence when it is involved in spending billions of dollars in public funds for projects with major engineering components.

It is evident that over a relatively long period since the end of the war in Southeast Asia, a combination of factors has led to the current situation. There has been an incorrect mix of engineering specialties. Retention of large numbers of carry-over engineers who were primarily construction superintendents and procurement expeditors rather than conceptualizers and trained in the creativity of

modern multi-disciplinary engineering led to a growing frustration among these engineers as their access to the key decision-makers disappeared. Much of the responsibility for AID not knowing what engineers do, how they do it, and why they should be key actors in the process of change lies with the engineers that the Agency has had on its rolls over the past 20 years or more.

Unfortunately, as the result of engineers who wear narrow blinders that limit their vision and interest to their own technical area of expertise, engineers who have had inferior educations or limited experience so they are unable to consider all of the parameters of a problem situation and distain economics, sociology, environmental sciences, cultural mores, and/or the realities of the political arena, the AID engineers have often served their clients badly. There have been too many Mission Directors, Assistant Administrators, Program Officers, and Capital Project Officers who have received incomplete, inept, self-serving, or plain incorrect advice from their engineers. True, there should have been a senior professional engineer among the Assistant Administrators or higher to make sure that the Agency could distinguish good engineering from bad -- that is what Congress intended -- but that does not excuse the performance of AID engineers as a group over the last two decades.

The non-engineer decision-makers have drawn on these experiences and relegated the direct-hire engineers to the lowest level of the bureaucratic Siberia: staff technical advisor, with no project management authority (except in NE Bureau) and no executive management responsibility.

Now, when the engineer roster in AID and the engineer's status in AID has reached nadir, is the time to recognize that this Agency needs engineers in order to properly execute its business. Now is the time to place engineering in its proper role in the decision-making process and to staff AID with the specialties and quality of engineer that foreign assistance for economic development requires.

I. Engineers and Section 611 of the FAA of 1961.

Prior to the creation of AID by the Foreign Assistance Act of 1961, the requirements that were included in Section 611 of that Act (see Part III.B.) were substantially stated in Section 517 of the Mutual Security Act of 1954, as amended. Thus, there has been a statutory requirement for some time to ensure that engineering and other plans necessary to carry out a project and a reasonably firm cost estimate of the cost to the U.S. Government for providing the assistance be completed prior to obligating funds for the project.

Until very recently, AID and predecessor agencies made sure that the Mission Director or other officials making the Section 611(a) determination concerning plans and cost estimates had received certification to that effect from a direct-hire engineer. In recent years, however, with the passing of adherence to the statutory admonition that one statutory official be a professional engineer, and the general downgrading of the bureaucratic position of engineers, such has not been the case. Many large engineering activities such as river basin developments, irrigation projects, power schemes, and highways have had Section 611(a) determinations made by Mission Directors or Assistant Administrators on the basis of contract consulting firm or contract institution reports -- even with no involvement of an engineer in certification at all.

The situation in regard to Section 611(b) is even more reprehensible. Hundreds of millions of dollars for water and related land resource construction projects have been authorized and obligated without any effort to compute benefits and costs as provided for in the FAA. Nor has there been any rational engineering determination of the flow of benefits and costs to yield an economic internal rate of return. This, of course, violates the statute and the Guidelines and Procedures for Planning and Analysis of Water and Related Land Resources Projects issued by AID on 8 January 1982.

Finally, the application of Section 611(e) has less and less often relied upon the experience and judgment of AID engineers to advise the principle AID officer in a country that the Highway Department, the Ministry of Works, the Irrigation Department, the Electric Power Agency, the Ministry of Education, the Ministry of Health, the Regional Development Agency, or any other host government agency has the financial and human resources to effectively maintain and utilize a project for which obligations in excess of $1 million are being considered.

In effect, current AID practice of not having available engineers or not drawing upon those that are available to comply with statutory requirements of Section 611 is not only imprudent and sloppy practice, but is noncompliance with the repeatedly expressed will of the Congress. It should also be noted that for domestic projects administered by a Federal, State, or local government agency, the certifications required under Section 611 of the Foreign Assistance Act would be required by law to be certified by a licensed professional engineer. This is a measure designed purely to protect the public -- AID can surely do no less.

II. Environmental Activities.

In almost all cases of preparation of the Initial Environmental Examination of a project by a Field Mission, the recommendation is prepared by an engineer. In Washington, engineers are seldom the primary AID officer involved in preparing such reviews. To involve persons not trained in environmental engineering or to use a scientist researcher for pure knowledge, instead of an engineer problem solver to evaluate trade-offs and to recommend if further environmental examination is needed is inappropriate, ill-advised, and not consistent with the AID assurances to the environmental community.

The physical environmental effects must be considered along with the economic, sociologic, and political effects, and the various alternative ways of solving a specific problem evaluated before a recommendation is made whether to proceed with a certain solution or to have further environmental or other studies before making a decision.

III. Energy Activities.

Throughout AID -- in both Washington and the field -- most of the technical work on energy activities is actually managed by direct-hire engineers. Most of them, however, have non-engineering titles and few are known to actually be engineers by Agency management. On the other hand, few of the officials making decisions or final recommendations on energy policy are engineers with the training, experience, or academic credentials to evaluate the technical alternatives or be familiar with the various technologies involved.

This situation does not exist in other U.S. Government agencies with major involvement in conventional or renewable energy technologies, nor would it be tolerated in private sector entities. As noted elsewhere, despite millions of dollars in energy activities, AID does not have a single electric power engineer on its rolls in Washington.

AID monitors and approves the work of consultants on hydroelectric projects with neither water resources engineers nor electrical or mechanical engineers involved. Even where engineers are involved -- usually in Field Missions or the project approval process in Washington -- they are so far removed from the actual AID approval of projects, consultant's reports and recommendations, plans, or payments that they play only a minor role.

Such a state of affairs in energy activities is unique among public and private sector organizations in the U.S., and is not only imprudent monitoring of the use of public funds, but is also a completely irrational approach to dealing with energy problems of the LDCs.

IV. Water Projects.

Appalling as the situation is in other areas of technical undertakings in AID, the utilization of direct-hire engineers in water and water-related activities is by far the worst of any sector.

Where once AID and its predecessors had a reasonable number of hydrologists, ground water and surface water engineer specialists, sanitary engineers, and even well-drilling technicians on its direct-hire rolls, now that water and water-related projects are a much larger percentage of the total budget, there are only five hydraulic/water resources engineers on M/PM rosters and two sanitary engineers. Of these, five are in Field Missions and none are reporting directly to the principle AID officer in-country or to an Assistant Administrator in Washington.

Yet, in the largest functional category of AID project activity -- Agriculture, Rural Development, and Nutrition -- there are literally billions of dollars involved in irrigation; structures and works to utilize ground water, surface water, and rainfall; complex river basis development; and watershed management. Various agriculture specialists without technical engineering training or qualification are managing these projects, along with an occasional economist or generalist, but with marginal or no direct-hire engineering backup.

In the health field, the largest single use of funds (with the possible exception of population planning) is for water activities. Under the aegis of the UN Decade for Water and Sanitation, AID is funding hundreds of millions of dollars in water supply activities from underground and surface sources, and is involved in all kinds of urban and rural activities in sewerage and sewage treatment, as well as relatively simple sanitation projects involving non-water waste disposal. All of these activities are high technology civil or sanitary engineering undertakings being managed by health technicians, who have no training or experience in understanding the design, operation, or economics of the alternative technologies available. Poorly designed structures and inappropriate technologies abound, and improperly mixed concrete under AID monitoring is common. Despite an intensive effort by the engineering staff in

Washington to urge that engineers be placed in responsible positions for these activities, non-technical decision-makers have used engineers only in a supporting role with little influence on the major directions of the efforts. As a result, the U.S. commitment has been dissipated and will likely realize only a small fraction of the goal set when the funds were earmarked.

During the 1960s and 1970s, AID developed a huge reservoir of in-house capability in river basin development planning and project implementation through the expenditure of well over a half billion dollars on the programs of the UN-sponsored Mekong Committee in Southeast Asia. Today, AID is involved -- usually with other donors, as we were in the Mekong -- in the development of river basins in West Africa (Senegal, Niger, Gambia, Lake Chad), Philippines (Bichol) East Africa (Great Lakes, Zambezi, and smaller single-country rivers), and in the Near East and Latin America. None of the experienced direct-hire staff who worked on the Mekong -- including at least three engineers -- are being utilized. (It should be noted that at least for the Gambia River Basin, many of the contract personnel trained by AID on the Mekong studies are again employed.)

F. The Study Questionnaire.

I. Summary of Replies.

An identical questionnaire was distributed to the AID Principle Officer at each of the field posts (75 copies) and to selected AID/W officers familiar with AID use of direct-hire, PASA, RSSA, and contract engineers (58 copies). A slightly different covering memorandum was used to transmit the questionnaires to field personnel and to those in Washington. Copies of the questionnaires with the covering memoranda are in Appendices M and N.

A fairly good return of questionnaires was received, particularly since they were received during the year-end holiday season. Thirty-five were returned from the field posts, or 46.7%, and 24 from AID/W, or 45.2%.

Considering that this subject has been the topic of various studies and reports over the past ten years, the engineers who were included in the survey had a surprising unity of responses -- being almost unanimous in the belief that there is a clear role for a central engineering office, but that the Regional Bureaus must have control of their engineering staffs. Among the non-engineers and the field Principle Officers there were less strongly-held views and more diversity of suggestions. As indicated elsewhere in this report, many senior officials in AID who should have

regular engineering in-put into work under their supervision are unaware of what engineers do, their training, and the difference in approach to problem-solving of scientists and engineers: this was amply demonstrated by their answers to the questions. Several of the more senior managers also demonstrated evidence of previous disappointment in the performance of AID direct-hire engineers working with or for them which has left a distrust or dislike for engineers.

Interestingly, none of the comments or points made during in-depth interviews mentioned implications of Sections 611 or 624(a) of the FAA until they were raised by the author of this report -- then consensus was that AID did, indeed, need to strengthen its direct-hire engineering capability. None of the comments returned with the questionnaire referred to Section 611 requirements. As a matter of fact, several field posts stated that they relied totally on FSN and contractors' engineers.

In order to underline the difference in perception of the need for direct-hire engineering involvement in AID's project process by the Field Missions involved in the day-to-day project implementation, as well as conceptualization and design, and the headquarters staff (many civil service rather than foreign service) who are under the gun of continuing OMB, Congressional, and State Department pressure concerning budget cuts, obligation rates, and contract delays, the results from the field responses and those from AID/W are listed separately under each question.

1. Does AID provide adequate in-house professional engineering capability to give you the necessary techical backstopping in program and project identification, design, implementation, and evaluation?

Field:	Yes - 13 (37.1%)	No - 22 (62.9)
AID/W:	Yes - 9 (37.5%)	No - 15 (62.5)

Some comments from the field cited specific recent problems of inability to provide staff, TDY, or contracts.

2. If you answered "no" above, are present mechanisms adequate for you to obtain such technical expertise by contract in an expeditious manner:

Field:	Yes - 9 (39.8%)	No - 14 (60.9%)
AID/W:	Yes - 4 (28.6%)	No - 10 (71.4%)

3. Are direct-hire engineers readily available to you to provide you with reliable evaluation of engineering

recommendations, designs, cost estimates, and specifications provided by consultants, contractors, or other outside specialists?

Field:	Yes - 17 (48.6%)	No - 18 (51.4%)
AID/W:	Yes - 8 (40%)	No - 12 (60%)

Two LAC Missions, India, and Portugal noted that they rely on FSN engineers and contractors.

4. Do you believe that AID needs more in-house direct-hire engineers to provide you with full-time or prompt on-request capability to deal with engineering problems in your programs or projects?

Field:	Yes - 17 (48.6%)	No - 18 (51.4%)
AID/W:	Yes - 10 (45.5%)	No - 12 (54.5%)

Surprisingly, only one comment sent with the completed questionnaire raised any questions or commented upon the role of direct-hire as distinguished from contract engineers. Is there general belief that their functions for AID are the same? Four respondents noted the need for engineers in the policy area and six urged more engineer design team leaders and project managers.

5. If you answered "yes" in 4. above, do you believe that some of those specialized technical personnel could most efficiently be provided on an Agency-wide basis through a Central Office of Engineering rather than assigning such experts in each geographic area?

Field:	Yes - 9 (52.9%)	No - 8 (47.1%)
AID/W:	Yes - 10 (76.9%)	No - 3 (23.1%)

Several respondents expressed concern that with responses from the Geographic Bureaus slow, it would only be worse with reliance on a central office.

6. If you answered "yes" in 5. above, list two or more examples of the kind of experts who could be fully utilized only through Agency-wide assignment in a central office.

The following specialities were mentioned: electrical/electronic engineers - 7; water resources/hydrologic engineers - 11; structural - 2; tansportation - 2; sanitary/municipal - 5; telecommunications - 5; esoteric fields only - 1; industrial - 6; water pollution -3; safety - 2; equipment - 2; agriculture engineers - 3; environmental - 1; chemical - 1; oceanography - 1; remote sensing - 1; civil/construction 1; value engineering - 1; and urban planning - 1. Several

field posts differed from the concensus against any kind of central staff by noting that it was not nearly as important where the skills were based as that they should be available to the Missions when requested, and one Mission Director thought that all specialized engineers should be centrally-assigned for most efficient utilization.

7. List examples of Requirements or Indefinite Quantity Contracts (IQC) that you believe could be more economically contracted and administered by a central office of engineering than through various user Bureaus.

The AID/W concensus was that the present arrangements were fully satisfactory and the only additional suggestions were: telecommunications - 2; municipal engineering - 1; industrial waste - 1; oceanography - 1; water resources - 3; and industry - 2. The field posts had a much more varied response (and apparently were much more familiar with the present list of IQCs): one liked the present system; two suggested only R&D contracts through a central office and all other IQCs with user Bureaus; two favored all IQCs through the user Bureaus; new additional IQCs suggested were equipment and contract specifications - 3; water resources - 5; energy technologies - 7; small buildings -2; electric power - 4; keep list of world-wide strategy for TDY - 1; industry - 2; sanitary/health - 1..

8. Do you or your staff find that the Engineering Newsletter provides a useful flow of information materials and announcements of new and updated technology for professional engineers and architects that helps AID to perform better in its mission of economic and social development?

Field:	Yes - 18 '94.7%)	No - 1 (5.3%)
	Not aware - 16 (45.7%)	
AID/W:	Yes - 5 (71.4%)	No - 2 (28.6%)
	Not aware - 13 (65%)	

The endorsement of the Newsletter by both the field and AID/W personnel who were familiar with it was almost unanimous. The overwhelming endorsement of the Newsletter from those for whom it is now published and the large number of officers intimately involved in project design and management who are unaware of its existence argues that this publication should have a much broader circulation.

9. Does AID need standardized contracts, designs, and specifications for routine engineering and contruction that could be formulated and kept current by a central engineering office?

Field: Yes - 18 (51.4%) No - 6 (17.1%)
Not Certain - 11 (31.4%)
AID/W: Yes - 4 (19.0%) No - 9 (42.9%)
Not Certain - 8 (38.1%)

Several respondents pointed out that each country and site had so many unique variables that no standard document would be useful. One AID/W officer opined that there was not much routine construction being funded in AID, anymore. Five respondents noted that what was needed were model contract clauses and specifications.

10. Would your operations be improved or simplified if consulting engineers, contractors, and trade associations had a central engineering office to contact as a clearing house for information on engineering and engineering construction projects, contracts, proceedings, etc.?

Field: Yes - 17 (53.1%) No - 15 (46.9%)
AID/W: Yes - 8 (38.1%) No - 13 (61.9%

It is interesting to note that the private sector in the U.S. cited the need for this as one of the highest priority. Two respondents noted that the most need was for a central contact point for the private sector on engineering and construction policy.

11. In your view, should engineering -- that is, the application of science, economics, and sociology to planning, designing, construction, or management of machinery, buildings, roads, bridges, utilities, waterworks, manufacturing processes, etc. -- be considered as a technical functional field of AID activities, such as food and agriculture, energy, environment and natural resources, education and training, and health and population?

Field: Yes -12 (35.3%) No - 22 (64.7%)
AID/W: Yes - 3 (14.3%) No - 18 (85.7%)

One Mission Director commented that AID should involve engineers in policy and project development to obtain the full benefit of their skills and insights. He thought this better than segregating them into a separate and not necessarily relevant function.

12. If you answered "no" on 11. above, do you believe that engineering within AID should be regarded as a management support service for the functional fields in a manner related to those of the Offices of GC, Controller, Personnel, Management Plannng and Operations, Contracts, and Commodities?

Field: Yes - 22 (78.6%) No - 6 (21.4%)
AID/W: Yes - 15 (83.3%) No - 3 (16.7%)

The very strong support for this view would seem to be an argument for the return of the Central Engineering Office to SER from the S&T Bureau. One Mission Director noted that engineers need to be an integral part of the technical team or leaders of the team when appropriate. Two AID/W respondents commented that engineers should often be project managers.

13. If you answered "no" to both 11 and 12 above, do you see engineering as a separate function that should be centrally operated in the manner of PPC, Housing, Food for Peace, American Schools and Hospitals Abroad, and Trade and Development Program?

Field: Yes - 2 (20%) No - 8 (80%)
AID/W: Yes - 0 (0%) No - 4 (100%)

Questions 11-13 stimulated a number of philosophic comments that indicate there still are on-going controversies about development theory at both macro-and micro-levels. The three respondents who answered "no" to all three questions apparently do not believe that there should be any engineering employees in AID.

14. Would your programs and projects be strengthened by AID-funded research projects in engineering or centrally-funded training courses for engineers?

Field: Yes - 17 (50%) No - 17 (50%)
AID/W: Yes - 10 (52.7%) No - 9 (47.3%)

In AID/W, two respondents voted research "yes," training "no," while three were for training and against research. From the field, there were six Missions for training but not research -- one even noting that research was not properly the area in which to expend any AID funds.

15. If you answered "yes" in 14 above, give some examples.

The following areas were cited for research: low-cost building materials and methods - 6; earthquake-resistant construction - 2; manually-operated irrigation pumps - 1; mechanical versus traditional natural embankment compaction - 1; ex-factory prestressed trusses - 1; oil seed extraction by appropriate process - 1; tropical soils for construction - 3; minimum-cost sanitation - 2; lower-cost irrigation systems - 1; and more practical research projects like the NAS low-cost road study - 2. Training course suggestions:

appropriate technologies - 3; solar heat - 1; low-cost generators - 1; wireless energy - 1; project manager techniques - 5; contracting - 3; low-cost roads - 2; energy - 3; irrigation - 4; civil works/minicipal engineering - 2; computers - 2; cost estimating - 2; environmental issues - 2; natural resources - 2; economics - 2; projct financing - 1; other donors' technology - 1; management principles - 1; rural potable water - 1; sanitation - 1.

II. Typical Problems Caused by Improper Use of Engineers or No Engineers.

It is very difficult to specifically pinpoint projects that are in difficulties because there has been little or no direct-hire engineering input, or because engineer advice from direct-hire staff was ignored by generalist managers. There are several reasons for this: (1) Geographic Bureaus, desk officers, and field Missions are reluctant to identify major projects that are in trouble because it can attract audit and newspaper attention; (2) many generalist Mission managers are not technically qualified to recognize the cause of project implementation problems; (3) some managers have been so turned off by experiences with AID direct-hire engineers that they refuse to identify the lack of such input as the source of their problems and point their fingers at any other scapegoat they can find or invent.

Nevertheless, in the past few years, it has been possible (using audits, free-lance reporter's stories, and reports from returned Mission staff or AID/W visitors) to identify some of the difficulties that AID's shortage of engineers and systematic ignoring of their advice can produce. Some recent examples are noted.

Arab Potash Project (Jordan), Loan 278-K-021.

This loan project aimed to help Jordan's government develop and exploit a significant potash resource. The consultant's original cost estimate of $300,000 for a harvester (mining) dredge escalated to over $2.7 million. The equipment specified and eventually procured was an untested prototype model with highly sophisticated and sensitive instrumentation, including lasers. In addition to continuing operational problems, substantial degradation of the equipment is now anticipated because of the corrosive nature of potash and the salt-laden atmosphere at the site. Selection and approval of this equipment was made without the advice of AID direct-hire engineers, although there was an in-house evaluation by an experienced engineer (not accepted) that noted a much less costly and less sophisticated conventional dredge would adequately perform the task.

Grain Storage and Marketing Facilities (Panama).

This $9.56 million project included $6.2 million of AID funds. Bids for construction were taken three times because the design had to be scaled down to keep construction costs within available funds. The failure to award a contract after the initial bidding (all bids excessively over the budget) have been ascribed to Mission management by-passing its direct-hire engineers, whose cost-conscious recommendations were ignored by the non-technically trained project manager. This type of failure to proceed with projects expeditiously frustrates the host government and produces distrust of USAID and U.S. advice.

Rice Processing Facilities (Guyana).

In 1978, $16.5 million in AID funds were approved to build and rehabilitate rice processing facilities. Deadlines set for the obligation of funds did not allow time for the recommended and essential engineering analysis of available power resources (as required for Section 611a certification).

The project is now hopelessly behind schedule, vastly curtailed in scope, and many installations can not be built because there is a lack of electric power, thus dashing the host government's expectations created by the AID Mission.

Lesotho Southern Perimeter Road (Lesotho), Grant 690-0076.

Although there was some AID engineering input during the feasibility and design stage, the scope of the project and many of its parameters were decided upon by the Ambassador and the Regional Development Officer over the objections and protest of the REDSO Director, who was a highway engineer. Then, almost exclusive reliance was made on the recommendations of an architect-engineer firm without detailed review by direct-hire engineers knowledgeable about the country and about road construction.

Because AID was short of experienced engineers, initial engineering inputs to the project were sporatic and lacked continuity. The consultant's original construction cost estimate at completion of the feasibility study was $30 million, while the REDSO Director had already estimated $130 million. Eighteen months later and after a design contract by the consultant for several million dollars, his construction cost estimate had escalated to an unacceptable $125 million.

Then the project was redesigned with a greatly reduced scope of work and standards to stay within available AID funding. Later, with a resident AID direct-hire engineer, who was not a highway specialist, the project continued to experience implementation problems because of lowered standards. Only now is a qualified AID direct-hire engineer in-country after more than four years of project activity.

Country assignment of a full-time experienced road engineer at the outset probably would have prevented delays, embarrassments, budgetary problems, and loss of U.S. prestige.

Guinea Agriculture Production (Guinea), Grant 675-020.

This project was authorized in August 1977 with the AID contribution estimated at about $7.4 million. This cost was based on an estimate by a contract consulting firm which had been retained to prepare final designs and an up-dated cost estimate after questions were raised on the initial project paper estimate of $4.9 million prepared without engineers. Bids were opened in February 1979 for labor contracts only, and ranged from $14.7 million to $16.7 million. Commodities, engineering supervision, and other costs increased probable dollar components to $16-19 million.

The consulting firm lacked skills, experience in working in LDCs, and familiarity with international construction contracting and the potential implementation problems in Guinea. Because of a shortage of AID engineers in West Africa, there was no engineering involvement in the completed report, except to confirm that the contractor had addressed all items in his scope of work. Pressure from the Ambassador and USAID on the consultant to meet obligation deadlines resulted in incomplete final drawings going out for bid -- an apparent violation of Section 611a. An inexperienced consultant without AID direct-hire engineering management or review, deadline pressures from AID managers not familiar with the reasons for getting project documents completed before taking construction bids, and AID/W review without effort to point out Section 611a certification problems, all helped set the scene for this fiasco.

The fiasco was completed when the inexperienced consultant supervised construction by an inept or unscrupulous construction organization. Now, AID investigators have discovered concrete without cement, inadequate reinforcing steel, buildings that are collapsing, and the full ingredients of a front-page scandal.

Sal Desalting Plant (Cape Verde) 655-0005.

When funding was approved in 1978, this grant had an estimated construction cost of $6.3 million (made without AID direct-hire engineer involvement). The consulting firm selected for design and preparation of bid documents produced a cost estimate of $15.1 million in late 1979. No AID officer involved in the project had any technical training or experience in similar undertakings. The AID engineering staff in Washington expressed strong objections to proceeding with the project because of weak technical design, particularly the projected water and electric power requirements and their respective costs. The necessary Section 611a determination was made without an engineering certification and the project was approved.

The project has run into cost escalations and some implementation problems that can be directly attributed to over-ruling the engineering advice without technical evaluation of the consequences. It appears, however, that the project will be completed on the revised time schedule and within the revised cost estimate.

Drydock-Zaire Water Transport Loan.

This loan project was handled as a commodity procurement, partially to avoid engineering review of designs required for regular project assistance. A small drydock section (about $1.0 million) was to be fabricated in the U.S. for shipment to Zaire for connection to another drydock. The new drydock was duly inspected and approved by AID/W engineering staff. When the drydock arrived in Zaire in September, there was no AID engineer at post, and none was called upon from elsewhere. Major problems were encountered with the ballast pumps and the available power supply. As a result, the drydock partially sank and it was not refloated for two years. The equipment is still unusable because of other technical problems, principally the lack of an adequate access channel for boats needing service.

The absence of an on-site AID engineer to monitor efforts and to resolve bureaucratic and technical problems of installation produced abnormal delays, increased costs, and failure of the entire effort.

Shire Valley Road (Malawi).

This road was completed several years ago under loan funding. At the time it was built, the construction contractor fell behind schedule and went on a two-shift operation. When the consulting firm providing inspection and engineering supervision of construction asked for

additional funding to also go on two shifts, the field AID engineers supported his request, but program and management personnel refused. Now, it has been found that inadequate sub-base compaction and improper asphalt mixes were both incorporated into the road during that period. This has resulted in premature road failures.

An additional contributing factor to pavement failure is that while the project document required the host government to install and operate a weigh station to prevent sugar-trucks from overloading the designed carrying capacity of the pavement, AID program staff waived this requirement.

The Blue Nile Project (Sudan).

This project was considered an agriculture and rural development activity; therefore, the project manager was a generalist and the contractors hired for design and implementation were specialists in social sciences, economics, and agricultural sciences with virtually no engineering input. The resulting project is a vast irrigated agriculture undertaking with complex interrelationships between the technologies selected, rural sociology, economics, and local politics. This is a disciplinary mix common to many engineering projects in the U.S. and throughout the world. Yet engineers have had only a peripheral involvement in designing and implementing this activity, which is fundamentally one of engineering.

To date, the project is a massive failure with inadequate planning for floods and peak rainfall, over-optimistic estimates of cooperation between farmers and nomads, woefully inadequate cost estimates, and a complete misreading of the political will of the host government. In retrospect, this project should have been managed by an experienced irrigation engineer on AID's staff and implemented by the Bureau of Reclamation.

Jagorawi Highway (Indonesia).

During the design phase of this road, the consulting firm made errors on their survey elevations of the centerline, but either were not aware of the mistakes, or proceeded with production of bidding documents anyway. Routine review of the plans in Jakarta and Washington did not reveal the errors -- which were as much as three meters -- and Mission management ignored staff engineers who claimed the consultant's work was shoddy..

When the construction contractor started work, he quickly spotted the mistake, which cost AID several million

dollars to rectify, instead of the few thousand that following the advice of the resident direct-hire engineer would have cost.

International Drinking Water and Sanitation Decade.

This noteworthy undertaking, organized and sponsored by the United Nations, aims to provide safe drinking water and minimal sanitation facilities for some 2.5 billion people in the developing countries by 1990. The United States is committed to support this effort through AID, and the FY 1982 budget for water supply and sanitation projects is $202.1 million, as compared with $194.1 million in FY 1981 and $117.6 million in FY 1980. But even at the $200 million obligation level, there is about $400 million annual short-fall in meeting the U.S. share in the proposed world-wide goal. Regardless of whether additional funds are allocated in the remaining years of the decade, it is probable that AID will be unable to properly formulate, design and implement sufficient projects of the quality required. This is because there simply are not enough qualified water resources and sanitary engineering professionals on-board in the agency to do the job.

The S&T Bureau-funded $10 million WASH project (931-1176) awarded a contract to a consortium of five consulting firms headed by Camp, Dresser and McKee, but this provides only minimal general technical assistance technology transfer, manpower development and training, and information services. This effort does not furnish the extensive project formulation, design, review and approval, implementation, and evaluation services that are required from, and should be provided by, AID direct-hire engineers under the normal program and administrative processes.

AID engineers' advice was unsolicited and largely ignored in the development and presentation of the U.S. commitment to the UN Water Supply and Sanitation Decade. Unless AID acquires additional direct-hire expertise (about ten more water resources or sanitary engineers in addition to the six now on-board), it can safely be predicted that AID's effort to meet the U.S. commitment will fall shamefully short and will likely result in considerable embarrassment to our government.

Energy Technical Assistance, Training and Research (S&T).

This centrally-funded, Washington-administered program includes LOP funding of three projects in individual and institutional development for $25.4 million; one in energy policy development, planning and conservation for $10.3 million; and four in technology transfer for $51.0 million through FY 1987. The office managing these projects

administers contracts with VITA; Department of Energy; Department of Defense; National Academy of Sciences; U.S. Department of Agriculture; National Rural Electric Coop Association; University of Florida; State University of New York; U.S. Geological Survey; Resources for the Future; Bechtel National Laboratories, Inc.; Institute of International Education; and other private sector profit-making and non-profit organizations. The office does not include nor have access to a single direct-hire electrical engineer, mining engineer, power engineer, water resources engineer, or hydrologist, yet the managers of this program have responsibility to assist LDCs in the gradual reduction of oil imports and the assurance of an adequate supply of energy to meet domestic needs.

It is difficult to accept that AID's Energy Office can monitor this highly technical program effectively without the in-house training or experience to evaluate alternatives, recognize technological constraints, know if cost estimates received from consultants are realistic, or judge the appropriateness of training courses and technical advice provided through its contractors. With a portfolio of nearly $100 million in approved projects (who made the Section 611a determination for these? A physical scientist trained in research?), we can only fear that AID's centrally-funded energy program with very limited engineering input or monitoring is a disaster waiting to unfold.

Egypt ESF Project Program.

The AID Mission in Egypt has more delegated authority than most field posts and has 13 U.S. direct-hire engineering positions (twelve filled) for 14 qualified U.S. direct-hire engineers on its staff. There are also three FSN engineer positions, of which only one is filled. Thus, Egypt has half as many engineers on-board as does AID/W and one-sixth of all AID engineers at field posts.

But Egypt has nearly half of the total life-of-project cost of all on-going and planned AID projects with engineering content. While little public information is available on the details of problem projects in Egypt, the FY 1984 Annual Budget Submission noted a pipeline of $2,886 million, of which $1,917 million was in seventy loan and grant projects. Part of this huge pipeline is the result of life-of-project obligation of funds, when it likely would have been more prudent to proceed with incremental obligation that would not sterilize such a large volume of USG funds for so long.

A number of projects with very high engineering content have been very slow to draw down obligated funds. While a number of factors are responsible for this slow draw-down of funds, it is clear that several more engineers are needed in the Mission to adequately monitor project formulation, design and implementation. The possibility of major blunders and further ineffective use of funds is increased by the lack of a senior AID engineer reviewing and coordinating the work of all engineers in the Mission.

Some quick examples of the types and magnitudes of engineering projects in Egypt with slow use of obligated funds:

-- Rice Research and Irrigation. Of $21.767 million obligated in FY 1977-1981, less than $1 million expended.

-- Urban Electricity Distribution System. Of $56.012 million obligated in FY 1977-1980, less than $10 million expended. (AID/W has no electrical engineer on direct-hire, although the Mission in Egypt does.)

-- Shorbra Thermal Power Plant. Of $190 million obligated in FY 1979 and 1980, about $11 million expended. (Again, it should be noted that AID/W has no electrical or power engineer on-board although USAID/Cairo does.)

-- Cairo Water System. Some $61 million was obligated by loan and grant in FY 1977-82, but less than $4 million had been expended.

-- Suez Port Development. Less than $500,000 has been expended of the $30 million loan made in FY 1978. Although expenditures have been held up by the Government of Egypt's failure to meet conditions precedent to expenditure, a delay of this long in compliance indicates gross errors in project formulation or an unwillingness to "bite the bullet" and deobligate by cancellation. (AID/W has no engineers experienced in port work.)

-- Port Said Saline Production Plant. Less than $3 million of the FY 1977 grant of $13 million has been expended. (Neither USAID nor AID/W has an engineer specialized in this field.)

-- Alexandria Sewage System Expansion. In FY 1977, a $15 million loan was made for Phase I and in FY 1979-81, $87.321 million was granted for Phase II; however, to mid-1982 only $10 million had been expended.

A related news dispatch of early December 1982, reported that the entire Giza section of Cairo, with nearly 2 million people, was innundated in raw sewage while an AID-funded feasibility study of modernization of Cairo's sewerage and sewage treatment system was a year from completion.

Seemingly, the lack of adequate direct-hire engineering staff in the Egypt USAID, coupled with little or no concern in AID/W for either providing sufficient engineering capability in-house or placing engineering overview at the Agency's highest levels to bear on AID's project process can promise little for our huge effort in Egypt except further delays, poor project design and implementation, and probable scandal.

STATUS AND FUNCTIONS OF AID ENGINEERS

PART III

APPENDICES

TOTAL AID ACTIVITIES WITH ENGINEER/ARCHITECT CONTENT

FROM FY 1984 ABS

SECTOR	EGYPT CAPITAL	OTHER CAPITAL	EGYPT TA	OTHER TA	TOTAL
ARDN	632,175,000	1,116,304,000	134,367,000	1,467,891,000	3,350,737,000
POP	150,000,000	--	--	19,200,000	169,000,000
Health	528,000,000	218,100,000	51,053,000	181,843,000	978,996,000
EHR	74,000,000	22,000,000	120,700,000	159,192,000	376,792,000
SDA/Energy	620,512,000	82,595,000	48,000,000	162,202,000	836,969,000
SDA/PRE	26,402,000	225,000,000	10,000,000	20,000,000	280,402,000
SDA/Other	360,200,000	239,385,000	105,200,000	98,752,000	1,803,537,000
Housing (HIG)	80,000,000	500,000,000	--	18,569,000	598,569,000
FDA	--	93,009,000	--	--	93,009,000
ASHA	--	114,154,000	--	--	114,154,000
PL 480 II	--	--	--	10,900,000	10,900,000
PVO/Var	--	--	--	34,400,000	34,400,000
	$3,669,887,000	$2,411,849,000	$479,320,000	$2,162,949,000	$8,734,005,000

TOTAL CAPITAL ASSISTANCE $ 6,081,736,000

TOTAL TECHNICAL ASSISTANCE 2,652,269,000

GRAND TOTAL AID 8,734,005,000 (Does not include Sri Lanka, Philippines or Sudan)

SUMMARY OF EGYPT PROGRAM (FY 1984 ABS)

WITH ENGINEERING/ARCHITECT/CONSTRUCTION CONTENT

(All funds are ESF)

Sector	Capital	TA
Agriculture	$ 632,175,000	$134,367,000
Health	528,000,000	51,053,000
POP	150,000,000	0
EHR	74,000,000	120,700,000
SDA/Energy	620,512,000	48,000,000
SDA/PRE	225,000,000	20,000,000
SDA/Other	1,360,200,000	105,200,000
HIG	80,000,000	0
Total	$3,669,887,000	$479,320,000
Program Total	$4,149,207,000	

EGYPT PROGRAM WITH ENGR/ARCHT/CONSTR COMPONENT

FROM FY 1984 ABS

Project	$LOP	Category (ESF)	Capital	TA
Ismaila Electric Power Plant	231,000,000	SDA	x	
Mehalla Textile Plant Rehab.	96,000,000	SDA	x	
Suez Cement Plant	100,000,000	SDA	x	
Alexandria Cargo Handling Equip.	31,000,000	SDA	x	
Str. Rural Health Delivery	13,800,000	Health		x
Applied S&T Research	24,400,000	AGR	x	
Water Use of Mgt.	13,000,000	AGR		x
Dev. Industrial Bank I	32,000,000	PRE	x	
PVC Pipe Drainage	31,000,000	AGR	x	
Dev. Decentralization	26,200,000	SDA		x
Natl. Energy Control Center	43,500,000	Energy	x	
Tech. Feas. Studies III	18,000,000	SDA		x
Tech. Transfer & Manpower Dev. I	35,500,000	EHR		x
Rice Research & Irrigation	21,767,000	AGR		x
Grain Storage Facilities	60,275,000	AGR	x	
Shorbra Thermal Power Plant	190,000,000	Energy	x	
Ag. Mechanization	40,000,000	AG		x
Urban Elect. Distr. Sys.	56,012,000	Energy	x	
Canal Dredging Equip.	31,200,000	SDA	x	
Food Grain/Veg. Oil Storage of Distr. Facil.	2,000,000	AGR	x	
Carro Water System	61,000,000	Health	x	
Irrigation Equipment	19,000,000	AGR	x	
Ag. Dev. Sys.	12,900,000	AGR		x
Tech. & Feas. Studies IV	31,000,000	SDA		x
Dev. Industrial Bank II	2,000,000	PRE		x
Suez Port Dev.	30,000,000	SDA	x	
Canal Cities Water & Sewer	96,000,000	Health	x	
Quattamia Cement Plant	95,000,000	SDA	x	
Telecom. Equipment	40,000,000	SDA	x	
Aquaculture Dev.	27,500,000	AGR	x	
Urban Low-cost Health Dev.	37,253,000	Health		x
Low-income Housing/Comm. Upgrading	80,000,000	HIG	x	
Port Said Saline Prod. Plant	13,000,000	AGR	x	
Telecommunications II	80,000,000	SDA	x	
Alexandria Sewage I	15,000,000	Health	x	
Mgmnt. Dev. for Productivity	8,500,000	EHR		x
Vocational Trng. for Productivity	17,500,000	EHR		x
Industrial Tech. Application	10,000,000	PRE		x
Innovative Production Activities	3,000,000	PRE		x
Cairo Sewage	129,000,000	Health	x	
Private Investment Encouragement Fund	33,000,000	PRE	x	
Alexandria Sewage Sys. Exp. II	167,000,000	Health	x	
Industrial Production	145,000,000	PRE	x	
Tech. Transf. and Feas. Studies	25,000,000	SDA		x

EGYPT PROGRAM WITH ENGR/ARCHT/CONSTR COMPONENT

FROM FY 1984 ABS

Project	$LOP	Category (ESF)	Capital	TA
Basic Village Services I	130,000,000	SDA	x	
Mineral, Petroleum &	37,200,000	AGR		x
Private Sector Feas. Study	5,000,000	PRE		x
Sinai Planning Study	5,000,000	SDA		x
Vehicle Maint. Trng.	4,500,000	AGR		x
Telecommunications III	80,000,000	SDA	x	
University Linkages	27,500,000	EHR		x
Utility Mgmnt. & Energy Policy	48,000,000	Energy		x
Workforce Planning & Dev.	17,000,000	EHR		x
Provincial Cities	89,000,000	SDA	x	
Suez Canal Univ./Fac. of Medicine	14,700,000	EHR		x
Basic Education	74,000,000	EHR	x	
Ag. Data Collection & Analysis	5,000,000	AGR		x
Decentr. Support Fund	100,000,000	SDA	x	
Family Planning II	150,000,000	POP	x	
Community Health Support	50,000,000	Health	x	
Production Credit	165,000,000	AGR	x	
Supporting Ag. Sys.	75,000,000	AGR	x	
Neighborhood Urban Services	89,000,000	SDA	x	
Water/Waste Water Sys.	10,000,000	Health	x	
Business Support & Investment	15,000,000	PRE	x	
Rehab. of Aswan Turbines	100,000,000	Energy	x	
Indust. Struct. Adjustment	100,000,000	SDA	x	
Decentralization PAAD	269,000,000	SDA	x	
Ag. Struct. Adjustment	175,000,000	AGR	x	

SUMMARY FROM FY 1984 ABS (Except Egypt)

PROJECTS WITH ENGINEER/ARCHITECT CONTENT

Sector	LOP $ (Total)	Capital	TA
ARDN	$2,584,195,000	1,116,304,000	1,467,891,000
POP	19,200,000	0	19,200,000
HEALTH	399,943,000	218,100,000	181,843,000
EHR	182,092,000	22,900,000	159,192,000
SDA/ENERGY	244,797,000	82,595,000	162,202,000
SDA/PRE	35,402,000	25,402,000	10,000,000
SDA/OTHER	338,137,000	239,385,000	98,752,000
HIG	518,569,000	500,000,000	18,569,000
FDA	93,009,000	93,009,000	0
ASHA	114,154,000	114,154,000	0
PL 480 TITLE II	10,900,000	0	10,900,000
PVO/VARIOUS	34,400,000	0	34,400,000
	$4,574,798,000	2,411,849,000	2,162,949,000

(Does not include Sri Lanka, Philippines, and Sudan.)

AID PROJECTS INVOLVING ENGINEERING

PER FY 1984 ABSs

Country	Project	LOP Amt.$	Sector	Category
Syria	Natl. Remote Sensing	3,500,000	SDP	TA
	Damascus Water I	48,000,000	Health	Capital
	Damascus Water II	14,500,000	Health	"
	Euphrates Basin Irrig.	17,600,000	Agr.	"
	Damascus-Derin Rd.	45,900,000	SDP	"
	Rural Electric	34,700,000	Rural Dev.	"
	Luttakin-Tartons Rd.	60,000,000	Rural Dev.	"
	Prov. Water Supply	17,600,000	Health	"
	Rural Rds.	26,400,000	Rural Dev.	"
	Rural Schools	11,000,000	Educ.	"
Jordan	Water Mgment. Tech.	1,300,000	Agr.	TA
	Village Dev. II	1,300,000	Rural Dev.	"
	Agaba Sewerage	7,500,000	Health	Capital
	Rural & Urban Electr.	9,000,000	Energy	"
	Potash Plan	38,000,000	Agr.	"
	Amman Water & Sewage	9,000,000	Health	"
	Village Der. III	7,000,000	Rural Dev.	"
	Tech. Serv. & Fers.	5,700,000	SDP	TA
	Rift Valley Water Res.	5,000,000	Agr.	"
	School Constr. II	6,700,000	Educ.	Capital
	Irbid Water & Sewerage	23,500,000	Health	"
	Zarya Res.	15,000,000	Health	"
	Groundwater Res. Invest.	5,000,000	Agr.	TA
	Tech. Services &	5,000,000	SDP	"
	" " "	5,000,000	SDP	"
	Water Sector	15,500,000	Agr.	Capital
	Executive Mgmnt. Inst.	5,000,000	PRE	"
Yemen	Ag. Dev. Support	195,000,000	Agr.	TA
	Water Supply Sys. Mgmt.	6,100,000	Health	"
	Taiz Water & Sewerage	16,200,000	Health	Capital
	Small Rural Water Sys.	7,000,000	Health	"
	Tihamn Prom. Health	10,000,000	Health	TA
	Water Res. Institutions	5,000,000	Agr.	TA
Oman	Agniter RecLange	16,000,000	Agr.	Capital
	Wadi Dnyjah Fers. etc.	92,000,000	Agr.	"
	Seeb Airport	42,000,000	SDP	"
Morocco	Dumkkaln Irrig.	13,000,000	Agr.	"
	Renewable Energy	6,700,000	Energy	TA
	Rainfed Agr.	24,993,000	Agr.	"
	Energy Sector Supp.	6,453,000	Energy	"

AID PROJECTS INVOLVING ENGINEERING

PER FY 1984 ABSs

Country	Project	LOP Amt.$	Sector	Category
Tunisia	Rural Dev. Rds. & Bridges	3,200,000	Rural Dev.	TA
	Central Tunisia Rural Dev.	16,555,000	Rural Dev.	"
	Rural Comm. Health	5,390,000	Health	"
	Siliana Water Impro.	3,500,000	"	Capital
	S&T Dev.	2,087,000	SDP	TA
	Technology I	1,450,000	"	"
	Renewable Energy	1,548,000	Energy	"
	Energy Planning	1,300,000	"	"
	HIGs	75,000,000	HIG	Capital
Italy	So. Italy Earthquake Reconstr.	55,700,000	OFDA	"
Thailand	LamNamOon IRD	4,100,000	Agr.	"
	Transf. of Tech.& Mgt. Skills	1,900,000	"	TA
	Land Settlements	4,200,000	"	"
	MacChaem Watershed Dev.	10,000,000	"	Capital
	Renewable Nonconv. Energy Dev.	5,000,000	Energy	"
	NE Small-scale Irrig.	8,600,000	Agr.	"
	Small-scale Hydro	8,100,000	Rural Dev.	"
	Private Sector on Dev.	3,300,000	"	TA
	Rural Primary Health Care Exp.	5,500,000	Health	"
	Remote Sensing for Dev.	290,000	SDP	"
	TIST	5,000,000	SDP	"
	HIG	27,000,000	HIG	Capital
Nepal	Inst. of Agr. & Animal Sci.	5,501,000	Agr.	"
	Integrated Cereals	7,970,000	"	TA
	Rural Area Dev.	26,700,000	Rural Dev.	Capital
	Bio-gas Research	150.000	"	TA
	Family Planning	2,000,000	POP	"
	Int. Rural Health	18,000,000	Health	Capital
	Radio Ed. of Teacher Trng.	3,635,000	Educ.	TA
	Suspension Bridges III	2,300,000	Rural Dev.	Capital
Bangladesh	Small-scale Irrigation	14,000,000	Agr.	"
	Rural Electrification I	69,300,000	Rural Dev.	"
	Fertilizer Distrib.	32,000,000	Agr.	"
	Rural Electrification II	50,000,000	Rural Dev.	"
	Zilla Rds. Mnsrnt. Hosp.	9,200,000	"	"
	Rural Energy Sector	55,000,000	Energy	"
	Water Mgmt. Sys.	15,000,000	Agr.	"
	Karnaphuli 3rd Unit	9,500,000	SDP	"

Data for Philippines and Sri Lanka not available.

AID PROJECTS INVOLVING ENGINEERING

PER FY 1984 ABSs

Country	Project	LOP Amt.$	Sector	Category
Indonesia	Aceh Rd-Betterment	10,300,000	Agr.	Capital
	Luwn Arca & Transmission Dev. I	18,700,000	Rural Dev.	"
	Citanduy River Basin Dev. I	12,500,000	"	"
	Sederhana Irrig. Dev.	25,000,000	Agr.	"
	Surakarta Pot. Water	6,800,000	Health	"
	Rural Electrification I	41,000,000	Rural Dev.	"
	Citanduy River Basin Dev. II	22,850,000	"	"
	Rural Works II	28,000,000	:	"
	Gran. Ag. School	17,500,000	Agr.	TA
	Natl. Watershed Dev.	13,750,000	"	"
	Land Mapping & Titling	2,000,000	"	"
	Water Res. Policy	6,400,000	"	"
	Rural Sanitation Manpower	6,800,000	Health	"
	Jagurrwi Rd.	26,000,000	SDP	Capital
	S&T	6,500,000	"	TA
	Approp. & Low Cost Techn.	500,000	"	"
	Energy Planning II	1,000,000	Energy	"
	Puspitek Energy Lab	15,450,000	"	Capital
	Private Sector Proj. Prep.	7,500,000	PRE	TA
Pakistan	Ag. Research	3,200,000	Agr.	"
	Irrig. Sys. Mgmt.	90,000,000	"	"
	Rural Electrification	155,000,000	Rural Dev.	Capital
	Ag. Prod., Distr. & Storage	75,000,000	Agr.	TA
	Farm to Market Rds.	50,000,000	Rural Dev.	Capital
	Energy Planning & Dev.	20,000,000	Energy	TA
	Baluchistan Area Dev.	30,000,000	Rural Dev.	Capital
Botswana	Environmental Sanitation	500,000	Health	TA
	BotZam Road	16,600,000	SDP	Capital
	BotZam Paving	2,008,000	"	"
	Transport Sector I	6,000,000	Rural Dev.	TA
	Agr. College Exp.	9,149,000	Agr.	"
	Rural Sector Grant	10,780,000	Rural Dev.	"
	Health Services Dev.	5,530,000	Health	"
	Self-help Housing Dev.	1,133,000	HIG	"
	Renewable Energy Tech.	3,304,000	Energy	"
	Agr. Tech. Impr.	9,180,000	Agr.	"
	Primary Ed. Impr.	7,293,000	Educ.	"
	Crop Prod.	1,742,000	Agr.	"
	Range & Livestock Impr.	2,803,000	Agr.	"
	Agr. Planning	4,779,000	"	"
	Small Enterprise Dev.	452,000	PRE	"
	Major Villages Dev.	10,000,000	SDP	"
	BWAST	14,558,000	Educ.	"
	NDB	5,000,000	PRE	"
	Drought Assistance	2,061,000	OFDA	Capital
	HIG	7,000,000	HIG	"

AID PROJECTS INVOLVING ENGINEERING

PER FY 1984 ABSs

Country	Project	LOP Amt.$	Sector	Category
Burundi	Rural Road	1,000,000	Rural Dev.	TA
	Rural Road II	7,900,000	"	Capital
	Peat Energy II	8,000,000	Energy	TA
Tanzania	Arusha Planning & Vill. Dev.	14,591,000	Rural Dev.	"
	Farming Sys. Research	8,000,000	Agr.	"
	Zanzibar Malaria	11,771,000	Health	"
	Ytnh. got, Tutsl. Frb. I	6,000,000	Educ.	"
	Mbugwe Div. Water Supply	150,000	OFDA	Capital
	Masai Dist. Vill. Water & Transp.	590,000	"	"
	Arusha Production	8,000,000	Rural Dev.	TA
Zaire	North Shaba Rural Dev.	15,212,000	"	"
	Rural Hydro Dev.	10,111,000	"	Capital
	Transport. Sector	10,000,000	SDP	"
Sierra Leone	Crop Research & Ext. I	7,043,000	Agr.	TA
				"
Rwanda	Food Storage and Marketing I	2,910,000	"	"
	Local Crop Storage	2,573,000	"	"
	Ag. Ed.	5,126,000	"	"
	Fish Culture	2,450,000	"	"
	Food Storage & Mktng. II	2,100,000	"	"
Liberia	Rural Roads III	5,200,000	Rural Dev.	Capital
	Hand Dry Wells	267,000	Health	TA
	Low Income Housing	5,000,000	SDP	"
	Rural Dev. Trng. II	3,875,000	Rural Dev.	"
	OK/Liberia	3,654,000	Educ.	"
Mauritania	Rural Land Reclamation	8,900,000	Agr.	"
	Rural Roads Impr.	4,000,000	Rural Dev.	Capital
	Small Irrig. Projects	457,000	Agr.	TA
Zimbabwe	S&T Coop.	700,000	SDP	"
	Low-cost Shelter	800,000	"	"
	Agr/Rural Dev. Sector Grant	45,000,000	Agr.	"
	HIG	25,000,000	HIG	Capital
Somalia	Compr. & Groundnut Dev.	6,444,000	Agr.	TA
	Bay Region Dev.	11,171,000	"	"
	Compr-Cronndo	6,556,000	Health	"
	Kurt	2,100,000	SDP	"
	Energy Mgmt. & Planning	5,000,000	Energy	"
	Kisimeyo Port Rehab.	26,000,000	SDP	Capital

Sudan data not available.

AID PROJECTS INVOLVING ENGINEERING

PER FY 1984 ABSs

Country	Project	LOP Amt.$	Sector	Category
AFR Regional	Improved Rural Tech.	6,100,000	Agr.	TA
	Accelerated Impact Prog.	9,341,000	"	"
	Reg. Remote Sensing	5,180,000	"	"
	Energy Initiatives	14,400,000	"	"
	Improved Rural Tech. II	5,000,000	"	"
	Strengthening Health Del. Sys.	20,000,000	Health	"
	Regional Univ. Centers	15,000,000	Educ.	"
	ADB	11,565,000	SDP	Capital
	ADB II	15,000,000	"	"
Mali	Operation Haute Vallee	18,400,000	Rural Dev.	TA
	Kayes - Nioro Rd.	2,400,000	Agr.	Capital
	Renewable Energy	4,300,000	Energy	TA
	Operation Mils-Mopti	9,900,000	Rural Dev.	"
	Mayantali Resettlement	10,000,000	"	"
	Mali Highway Loan	3,200,000	SDP	"
Lesotho	Farming Sys. Research	8,308,000	Agr.	"
	Land Conserv. & Range Dev.	12,000,000	"	"
	Inst. Mtls. Res. Center	3,381,000	Educ.	"
	Natl. University	5,871,000	"	"
	Rural Water & Sanitation	12,142,000	Health	"
	Renewable Energy	1,600,000	Energy	"
	Low-cost Shelter	540,000	SDP	"
				"
Kenya	Rural Rds. Sys.	14,748,000	Rural Dev.	"
	Agr. Sys. Support	49,800,000	Agr.	"
		9,100,000	"	"
	On-farm Storage	7,800,000	"	"
	ASAL Rond Networks	6,500,000	"	"
	Agr. Enterprise Dev.	10,000,000	"	"
	Community Water	4,22	Health	"
	Renewable Energy Dev.	4,800,000	Energy	"
	Small Towns	865,000	HIG	"
	HIG TA	5,000,000	"	"
Guinea	Agr. Production	14,400,000	Agr.	"
	Renewable Energy Tech.	300,000	Energy	TA
Zambia	Agr. Dev. & Research	12,515,000	Agr.	"
Gambia	Mixed Farming	9,000,000	"	"
	Rural Rds. Maint.	6,744,000	Rural Dev.	"
	Albert Market Renovation	1,000,000	"	"
Uganda	Agr. Institution Rehab.	18,000,000	Agr.	Capital
	Oil Seed Production	6,000,000	"	TA
Niger	Shelter Sector Planning	571,000	HIG	"
	Solar Energy	500,000	Energy	"
	Niger River Dev. Plng.	12,112,000	Rural Dev.	"
	Sahel Water Data & Mgt.	13,268,000	"	"
	Farm Implements	3,000,000	Agr.	"
	Irrigated Agr. Dev.	10,000,000	"	"
			"	

AID PROJECTS INVOLVING ENGINEERING

PER FY 1984 ABSs

Country	Project	LOP Amt.$	Sector	Category
Congo (B)	Smallholder Agr. Dev.	7,000,000	Agr.	TA
Guinea-Bassau	South Const. Rice Prod.	5,500,000	"	"
Senegal	Bakel Range and Livestock Dev.	2,100,000	"	"
	Casa	23,700,000	"	"
	Small Irrig. Perimeters	2,400,000	"	"
	Cereals Prod. II	7,700,000	"	"
	Fuelwood Prod. I	3,400,000	"	"
	Rural Health Serv. II	8,000,000	Health	"
	Low-Cost Energy	5,000,000	Energy	"
	Family Health Services	1,800,000	Health	"
	Food Crop Protection	8,300,000	Agr.	"
	Ground Nut Project	4,000,000	"	"
	OMVS Integ. Dev.	62,000,000	Rural/Dev.	"
				"
Malawi	Bunda College	4,097,000	"	"
	Self-help Rural Water	6,000,000	Health	"
	Polytechnic Exp.	8,319,000	Educ.	"
	Alt. Renewable Energy	9,900,000	Energy	"
	Tech. Transfer & Trng.	3,500,000	SDP	"
Upper Volta	Eastern ORD Rural Rds.	2,523,000	Rural Dev.	"
	Rural Water Supply	12,280,000	Health	"
	Rural Rds. II	6,297,000	Rural Dev.	Capital
	Agr. Sector	40,000,000	Agr.	TA
Cameroon	Mandara Mt. Water Res.	6,916,000	Rural Dev.	"
	Natl. Cereals Research & Trng.	7,697,000	Agr.	"
	Agr. Education	43,000,000	Agr.	"
	Margu. Wandala Water Supply	1,461,000	Health	"
	Reg. Food Crop Protection	760,000	Agr.	TA
	Support to Primary Educ.	30,290,000	Educ.	"
C.A.R.	Rural Dev. II	2,200,000	Rural Dev.	"
Swaziland	RDA	2,670,000	"	"
	Pilot Small-farmer Irrig.	4,000,000	Agr.	"
	Health Manpower Trng.	2,442,000	Health	"
	Univ. College of Swazi	2,059,000	Educ.	"
Brazil	S&T Dev.	14,814,000	SDP	"
Jamaica	Fish Prod. Sys. Dev.	1,367,000	Agr.	"
	Health Mgmt. Impro.	350,000	Health	"
	Rural Educ. Sector	11,200,000	Educ.	"
	Small-scale Manuf. Asst.	10,000,000	SDP	"
	Urban/Shelter Sector Dev.	11,000,000	HIG	"

AID PROJECTS INVOLVING ENGINEERING

PER FY 1984 ABSs

Country	Project	LOP Amt.$	Sector	Category
Haiti	Agr. Feeder Rds.	9,946,000	Agr.	Capital
	Rd. Maint. II	12,000,000	"	"
	Comm. Water Sys.	855,000	Rural Dev.	TA
	Secondary Rds. Dev.	18,600,000	"	Capital
	Comm. Water Sys. II	7,000,000	:	"
	Approp. Technology	1,332,000	SDP	"
	Energy Dev.	1,000,000	Energy	"
LAC Regional	S&T Transfer	5,480,000	SDP	"
	Energy Res. Sys. Dev.	2,145,000	Energy	"
Honduras	Rural Reconstr. II	7,500,000	Rural Dev.	Capital
	Rural Electrification	11,000,000	"	"
	Access Rd. & Rural Trails	11,200,000	"	TA
	Rural Housing Impr.	2,500,000	"	"
	Energy for Rural Dev.	9,000,000	"	Capital
	Small Farmer Impr.	9,550,000	Agr.	TA
	Rural Rds. II	8,900,000	Rural Dev.	Capital
	Rural Water & Sanitation	10,500,000	Health	"
	Rural Water Sys. & Latrines	9,000,000	"	"
	Urban Upgrading	200,000	SDP	TA
ROCAP	Fuelwood and Alternative Energy	8,900,000	Rural Dev.	"
	Reg. Rural Agribusiness II	12,000,000	"	"
	Industrial Energy Efficiency	6,000,000	Energy	TA
Mexico	No Projects			
Guatemala	Small Farmer Dev.	14,875,000	Agr.	"
	Small Farmer Mktg. Sys.	4,200,000	"	"
	Rural Electrification	8,600,000	Rural Dev.	Capital
	Access to Potable Water/Sant.	8,400,000	Health	TA
	Rural Primary Ed.	7,000,000	Educ.	"
	Primary School Reconstr.	5,200,000	"	Capital
	Municipal Earthquake Recovery	8,000,000	SDP	"
Guyana	Rural Rds.	7,900,000	Agr.	TA
	Rice Modernization II	16,500,000	"	Capital
	Small Farm Dev.	8,900,000	"	TA
Bolivia	Rural Access Rds. II	13,300,000	Rural Dev.	Capital
	Rural Sanitation	4,300,000	Health	TA
	Rural Potable Water	300,000	"	"
	Rural Ed. I & II	18,600,000	Educ	"
	HIG	10,200,000	HIG	Capital
Ecuador	IRD	11,800,000	Rural Dev.	TA
	Rural Health, Nut. & Pot.Water	7,000,000	Health	"
	Int. Shelter/Urban Sector	330,000	SDP	"
	Alt. Energy Sources	2,700,000	Energy	"

AID PROJECTS INVOLVING ENGINEERING

PER FY 1984 ABSs

Country	Project	LOP Amt.$	Sector	Category
Dominican Rep.	Natural Resources Mgmt.	11,000,000	Rural Dev.	TA
	Rural Feeder Rds.	15,000,000	"	Capital
	On-farm Water Mgmt.	12,000,000	"	TA
	Private Enterprise Sec. Dev.	10,000,000	"	"
	Agr. Resource Mgmt.	13,000,000	"	"
	Health Sector II	8,000,000	Health	"
	Health Sector III	8,000,000	"	"
	Rural Education	7,000,000	Educ.	"
	Energy Policy Dev.	770,000	Energy	"
	Energy Conserv. & Res. Dev.	7,550,000	"	"
	Housing Tech.	478,000	SDP	"
	Disaster Asst.	9,508,000	OFDA	Capital
	HIG	15,000,000	HIG	"
FVA/FFP	PL 480 Title II Outreach	10,900,000	FFP	TA
FVA/PVC	Various PVOs	34,400,000	Various	"
OFDA	FDA	25,000,000	OFDA	Capital
PRE/H	HIGs	500,000,000	HIG	"
	Housing of Urban Poor	15,000,000	SDP	"
	Urban Development Support Serv.	2,500,000	"	TA
	Dev. of Secondary Cities	2,500,000	"	"
	PD&S	300,000	"	"
PRE/OPI	IESC	17,450,000	PRE	"
FVA/ASHA	Various Grants Abroad	114,154,000	AS A	Capital
PPC/E	Intr. Studies & Systems	3,059,000	SDP	TA
PPC/PDPR	Rural Dev. Research	1,820,000	Rural Dev.	"
	Village Health	728,000	Health	"
	Dev. Digest	431,000	SDP	"
	Energy	592,000	Energy	"
PPC/EP	Coordination of Dev. Policy w/Other Donors	25,000	SDP	"
PPC/WID	Tech. Asst. of WID Centers	847,000	Agr.	"
	"	200,000	Pop.	"
	"	357,000	Educ.	"
	"	2,108,000	SDP	"

AID PROJECTS INVOLVING ENGINEERING

PER FY 1984 ABSs

Country	Project	LOP Amt.$	Sector	Category
S&T/EY	Low-cost Tech. for Rural Poor	7,875,000	Agr.	TA
	Energy Tech.Serv.Support	200,000	"	"
	Bio-Systems & Techn.	8,710,000	"	"
	Decentralized Hydro	5,500,000	"	"
	Alt. Energy Trng.	1,303,000	"	"
	Low-cost Energy Techn.	2,114,000	Energy	"
	Photovoltaic Techn.	3,421,000	"	"
	Conv. Energy Asst.	13,150,000	"	"
	Renew. Energy Survey & Demon.	1,900,000	"	"
S&T/FNR	Remote Sensing Resource Asses.	3,659,000	Agr.	"
	" " in Agr.	1,400,000	:	"
	Envir. Nat. Res. Exp. Info. Base	2,490,000	SDP	"
	Envir. Planning & Mgmt.	3,350,000	"	"
S&T/AGR	Tropical Soils	4,902,000	Agr.	"
	Planning Asst. Water Res. Econ.	1,600,000	"	"
	NOAA Advisory Serv.	1,347,000	"	"
	Food Grain Storage & Mktng.	6,417,000	"	"
	Fertilizer TA	4,352,000	"	"
	Small-scale Irrig. Sys.	3,500,000	"	"
	Water Mgmt. Snythesis II	20,000,000	"	"
TDP	No Details	16,000,000	TDPearmark	Capital
S&T/HPOP		17,000,900	H/POP	TA
S&T/EHR		15,000,000	EHR	"

SECTION 611 OF THE FAA OF 1961, AS AMENDED

COMPLETION OF PLANS AND COST ESTIMATES

(a) No agreement or grant which constitutes an obligation of the United States Government in excess of $100,000 under Section 1311 of the Supplemental Appropriations Act of 1955, as amended (31 USC 200), shall be made for any assistance authorized under chapter I of part I (Development Activities), title II of chapter 2 of part I (ASHA), or chapter 4 of part II (ESF):

(1) if such agreement or grant requires substantive technical or financial planning, until engineering, financial, and other plans necessary to carry out such assistance, and a reasonably firm estimate of the cost to the United States Government of providing such assistance, have been completed; and

(2) if such agreement or grant requires legislative action within the recipient country, unless such legislative action may reasonably be anticipated to be completed on time to permit the orderly accomplishment of the purposes of such agreement or grant.

(b) Plans required under subsection (a) of this section for any water or related land resource construction project or program shall include a computation of benefits and costs made insofar as practicable in accordance with the procedures set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 1973, with respect to such computations.

. . . . .

(e) In addition to any other requirements of this Section, no assistance authorized under Chapter 1 of Part I., Title II of Chapter 2 of Part I, or Chapter 4 of Part I. shall be furnished with respect to any capital assistance project estimated to cost in excess of $1 million until the head of the agency primarily responsible for administering Part I of the Act has received and taken into consideration a certification from the principle officer of such agency in the country in which the project is located as to the capability of the country (both financial and human resources) to effectively maintain and utilize the project taking into account among other things the maintenance and utilization of projects in such country previously financed or assisted by the United States.

Section 624(a) of the Foreign Assistance Act of 1961, As Amended

Sec. 624 Statutory Officers - (a) The President may appoint, by and with the advice and consent of the Senate, twelve officers[1/] in the Agency primarily responsible for administering part I,

(1) *** [Repealed-1964]
(2) *** [Repealed-1964]
(3) and in the selection of one of such persons due consideration shall be given to persons qualified as professional engineers.

1/ However, Sec. 7 of Reorganization Plan No. 2 of 1979 [IDCA] stated:

"One of the positions that the President may appoint under Section 624(a) of the Foreign Assistance Act of 1961 (22 USC 2384(a), 5 USC 5315(c)) is hereby abolished." As of January 1, 1980, Sec. 7 of such Reorganization Plan had become effective.

AID Procurement Policies

12A2: a. AID has always recognized that it can best succeed in its role by mobilizing outside resources as they are needed, rather than by attempting to maintain a direct-hire staff adequate to carry out all of its programs in the developing countries.

b. Where other factors are equal, skilled program personnel by order of preference are obtained: (1) by contract with non-governmental organizations or persons; (2) by Participating Agency Service Agreements or contracts with other governmental agencies; and lastly, (3) by direct-hire.

c. However, legal and policy considerations require that many functions be performed only by direct-hire personnel, such as the making of policy, planning, budgeting, and programming decisions; conducting negotiations with the governments of cooperating countries; and procuring outside technical services. (June 17, 1977)

Attachment

Guidelines Governing the Choice Between Direct, Contract, and Participating Agency Hire to Implement AID-Financed Activities

The following guidelines are to be taken into account in reflecting -- through specific choices between direct, contract, and participating agency hire -- the policies stated in Section D of the foregoing Policy Determination. The guidelines are intended as an aid to analysis. They do not purport to be exhaustive.

I. Legal Restrictions

Many functions, for legal or compelling policy reasons, can only be performed by direct-hire personnel. They include:

A. Negotiating with host countries in behalf of the United States.

B. Making policy, planning, budgeting, and programming decisions which determine the allocation of resources available to AID.

C. Evaluating and overseeing the execution of functions assigned (through contract or interagency agreement) to other government agencies or the private community.

D. Locating, judging the competence of, selecting, and negotiating with external sources of needed skills.

E. Performance of essentially internal functions such as personnel administration, agency management, and Congressional presentation.

II. Administrative Considerations

Despite the policy preferences which have been established, it may occasionally be desirable, for reasons such as those listed below, to perform given tasks or functions through AID direct-hire personnel even though it is not legally necessary to do so. Such reasons might include:

A. The acute need for speed, in instances where the needed personnel are processed, cleared, and immediately available from the ranks of AID's direct-hire corps.

B. The non-existence of personnel in other government agencies or the private community who possess the requisite expertise. This situation is most likely when the needed skill consists, in addition to purely technical skill, of ability to (1) adapt American skills and techniques to foreign conditions, (2) impart possessed skills to others of a different culture or educational level or (3) create institutions for the retention or dissemination of such skills.

C. The possibility of a prohibitive cost differential between direct-hire and other skills. Before conceding any such differential, it will be necessary to consider the indirect costs of direct-hire (such as overhead expense, retirement benefits, etc.) as well as the significant, though intangible, benefits to AID of creating potential, through a contract with the private American community, for "by-product assistance." Also, there will be situations in which it is necessary to pay more than direct-hire salary scales will permit in order to procure the level and type of talent required.

D. The possible loss of control that might result from having a project (or function) implemented by personnel who are not direct-hire. Such a loss is by no means to be considered inevitable, for it is not necessary to perform a function in order to control the manner in which it is performed. Normally, AID should control project implementation through significant leverage points rather than through an overly intimate involvement in all the details of execution.

III. Other Factors

In addition to the stated policy preference in favor of the private community over participating agencies of government, the following criteria are among those to be considered in choosing between the two sources:

A. Where the participating agency would use AID funds to hire personnel into its own ranks from the non-government community, AID should consider whether it might be preferable to obtain the needed skills directly by contract in order to create otherwise absent potential for "by-product assistance." This consideration should be measured against the benefits that might accrue from the unique backstopping capacities and institutional environment existing in the participating agency. Generally, it will be more advantageous to obtain single experts from participating agencies and to obtain skilled personnel for the implementation of whole projects from the private community.

B. As their primary responsibilities are domestic, it may be difficult, in some instances, for participating agencies to accord the requisite priority to AID's projects.

C. Conversely, once its staff resources have been committed to a project, it may be more difficult for a participating agency to terminate its services should a shift in AID's program emphasis occur.

I. REQUIREMENTS FOR ENGINEERING SPECIALTIES IN AID AS INDICATED BY FY1984 ABS Project Lists

Specialty	in field posts NE	ASIA	AFR	LAC	AID/W	TOTAL
Agricultural	3	2	10	3	5	23
Water Res/Hydr	4	4	3	1	4	16
Civil	8	6	17	10	8	49
Electrical	5	5	2	3	3	18
Telecom	1	0	0	0	1	2
Mechanical	0	0	0	0	2	2
Equipment	1	0	0	0	1	2
Industrial	2	0	0	1	1	4
Sanitary	5	0	2	2	2	11
Mining	0	0	1	0	1	2
Chemical	1	0	0	0	1	2
TOTAL	30	17	35	20	29	131

II. AGE AND YEARS OF SERVICE OF AID DH ENGINEERS

As of 31 December 1982
Retirement Eligibility (From M/PM)

Category	Eligible 1/1/83	Eligible 1/1/84	Eligible 1/1/85
50/20 (FS)	17	25	34
57/5 (FS)	16	28	30
55/30 (GS)	2	4	5
60/20 (GS)	2	3	5
62/5 (GS)	0	0	0
	37	60	74

Of total staff who have been in engineering positions 31/12/82, age/years of service were:

Age	Total	34-30 yrs	29-25 yrs	24-20 yrs	19-15 yrs	14-10 yrs	9-5 yrs	4-0 yrs
65-70	2	-	-	-	2	-	-	-
60-64	5	-	-	3	-	1	1	-
55-59	31	2	3	2	12	1	8	3
50-54	26	-	4	6	8	1	3	4
45-49	18	-	2	4	4	2	3	3
40-44	9	-	-	-	5	2	1	1
35-39	13	-	-	-	2	5	4	2
30-34	8	-	-	-	-	-	5	3
Totals	112	2	9	15	33	12	25	16

Of additional staff with Engineering degrees, but who have never been AID engineers:

Age	Total	34-30 yrs	29-25 yrs	24-20 yrs	19-15 yrs	14-10 yrs	9-5 yrs	4-0 yrs
65-75	2	1	1	-	-	-	-	-
60-64	2	-	-	1	-	1	-	-
55-69	4	1	1	-	1	-	1	-
50-54	9	-	2	1	4	-	-	2
45-49	9	-	1	1	2	3	1	1
40-44	8	-	-	-	6	1	1	-
35-39	3	-	-	-	-	1	1	1
30-34	2	-	-	-	-	-	2	-
Totals	39	2	5	3	13	6	6	4

III. HISTORICAL LOOK AT AID ENGINEERS

A. Engineer Workforce, 30 September 1976 (from SER/ENGR)

1. Field			78
Africa	11		
Asia	19		
LAC	18		
SA Countries	30		
2. AID/W			52
Water Resources	1		
Power/Telecom	2		
Transportation	3		
Industry & Mining	2		
Sanitary	2		
Gen. Engineering	3		
Urban & Environ.	2		
Equipment	1		
Standard Proced.	2		
Supervision	3		
Bureau Coordin.	4		
Vacancies	8		
Total Professional		35	
Admin. Officer	1		
Secretary/Cler.	16		
Total Admin. Support		17	
Total AID Engineer Workforce			130

B. Breakdown of Professional Staff by Specialty, 1 March 1974 (from O/ENGR)

1. Field

General Engineer	79
Civil Engineer	8
Electrical Engineer	6
Hydraulic (Water Resources)	5
Structural	3
Architect	1
Highway	8

2. AID/W
Unavailable

C. Retirement Eligibility for Engineer Staff, 18 March 1974 (from O/ENGR)

Category	Eligible 12/31/74	Eligible 12/31/75	Eligible 12/31/76
50/20 (FS)	34	41	49
57/5 (FS)	18	17	17
55/30 (CS)	3	4	5
60/20 (CS)	3	5	6
62/5 (CS)	2	4	4
	60	71	81

Of Total Professional Staff Age/Years of Service on 1 March 1974:

Age	34-30	29-25	24-20	19-15	14-10	9-5	4-0	Total
65-70	--	00	--	3	2	1	1	7
60-64	1	7	3	3	5	1	2	22
55-59	7	8	5	8	6	1	--	35
50-54	--	2	2	9	10	4	1	29
45-49	--	1	9	9	5	10	--	34
40-44	--	--	--	8	6	4	--	18
35-39	--	--	--	--	3	4	--	7
30-34	--	--	--	--	--	2	--	2
Totals	9	18	19	40	37	27	4	154

D. Engineer Workforce, 30 November 1982 (from M/PM and S&T/ENGR)

Bureau	Field	AID/W	Total
S&T	0	5	5
SER	1	0	1
ASHA	0	1	1
ASIA	17	3	20
LAC	12	4	16
AFR	23	8	31
NE	19	7	26
	72	28	100

ENGINEER EMPLOYMENT BY OTHER AGENCIES

AGENCY	DH ENGINEERS	PROGRAM (annual)	$/ENGINEER
AID	110	$4.7 billion	42,727,272
Bureau of Reclamation	1,623	$2.2 billion[1]	1,351,201
Corps of Engineers(Civil)	8,400	$13.3billion[2]	1,583,333
NavFacEngCom	2,300	$2.5 billion[3]	1,086,957
USDAg	2,100	$6.75 billion	3,211,905
TVA	3,900	$1.8 billion	465,000
HUD	195	$1.0 billion	5,128,205
DOTransportation	4,600	$11.5 billion	2,500,000
IBRD(WorldBank)	260	$6.2 billion	23,846,000
EDF (EEC)	205	$2.8 billion	13,658,000

(1) annual appropriation for all land and water activities in Dept of Interior

(2) program includes $3 billion in civil works, $0.9 billion in family housing, $4 billion funded by Saudi Arabia, $4.1 billion in military construction, and $1.3 billion by other governments

(3) NavFacEngCom has an annual program of $2.5 billion in new starts for a $70 billion portfolio

INDEFINITE QUANTITY CONTRACTS (IQC) MANAGED BY S&T/ENGR FOR AGENCY-WIDE USE

DISCIPLINE AND FIRM	SERVICES	EXPIRATION DATE
1. Electric Utilities (EBASCO Services, Inc., New York)	Hydro & thermal power; power systems, planing; environmental planning; power transmission and distribution; substations and communications; economic studies; photogrammetric service; rural electrification; and construction management.	8/17/83
2. Water Resources (Jordan/Advent & Assoc., San Francisco)*	Water resource development; hydrology & ground water studies; irrigation & small dams & canals; basin development; flood studies & control; related environmental studies.	4/19/83
3. Water Resources (TAMS, New York)	Same as above.	6/14/83
4. Ports, Harbors & Waterways (Moffat & Nichols, Long Beach, CA)	Piers, wharfs, berthing structures; waterway design; dredging & channel widening; navigability studies & hydrologic surveys; port operation & maintenance; environmental studies; procurement of related equipment & materials & spec. preparation.	8/9/84
5. Roads, Bridges, Airfields, Railways & Pipelines (Wilbur Smith Assoc., Inc., Columbia, S.C.)	Planning services, including environmental studies; location studies; design & plans; traffic surveys; quality assessments; feasibility studies; structural design & analysis; construction management; & related environmental studies.	8/9/84
6. Value Engineering (Burns & McDonnell Engineering Co., Inc., Kansas City, Mo.)	Value engineering services for all types of projects which are complex & involve many processes and/or objectives. Objective is to reduce project costs without impairing essential functions or characteristics. Develop & analyze changes in design or construction methods; investigate testing & supply procedures & use of different materials; work with A&E, host government, & AID Mission to effectuate changes.	8/19/84
7. Sanitary Engineering (James M. Montgomery, Inc., Pasadena, CA)	Water supply & treatment; sewerage & sewage treatment; storm sewers & drainage; solid waste systems; industrial water conservation & waste treatment; related construction management, related environmental analysis; air quality control; & noise abatement.	6/30/83

DISCIPLINE AND FIRM	SERVICES	EXPIRATION DATE
8. Telecommunications (T-CAS America, Inc., Falls Church, Va.)	Traffic & feasibility studies; radio routes; radio broadcasting; location of sites for repeaters & terminals; microwave & toposcatter; satellite communications; television; central office equipment & outside plant.	11/13/83
9. Institutional & Genral Engineering (Gauthier, Alvarado & Assoc., Inc., Falls Church, Va.)*	Architecture & structural, mechanical & electrical engineering of schools, hospitals, clinics, community facilities, laboratories, university facilities, & other vertical construction; master plans; construction management; & environmental analysis.	10/31/83
10. Industrial Engineering (Stone & Webster Engineering Corp., Boston, Mass.)	Manufacturing plants from raw material processing to consumer goods production, including ore processing, petrochemicals, forest products, agro-industry, etc.; accessory facilities relating to trade & commerce; environmental studies; includes medium-scaled village-level plants as well as major facilities.	7/1/83
11. Civil Engineering (Sheladia Associates, Inc. Mt. Ranier, Md.)*	Transportation, including bridges, railroads, highways, & transit; structural engineering, including parking structures, industrial facilities, institutional & commercial buildings, utilities, subdivisions, land surveys & site development; water dupply; flood control; irrigation & drainage; environmental studies; sanitary engineering.	4/6/83
12. Architecture (Adolfo E. Miralles Assoc., Los Angeles, CA)*	Educational facilities, including vocational training; migrant workers' housing & facilities; community buildings & facilities; tribal facilities & cultural centers; housing projects; high-rise residential facilities; other vertical construction.	1/31/84

* 8(a) Minority Firms

SUMMARY FROM S&T/ENGR "YELLOW BOOK" (1981)
ENGINEERING, ARCHITECT, & CONSTRUCTION CONTRACTS

SECTOR	TOTAL LOP $	CAPITAL	TA
ARDN	$ 547,275,000	171,695,000	375,580,000
POP	1,476,000	0	1,476,000
HEALTH	355,648,000	288,810,000	66,838,000
EHR	48,013,000	35,116,000	12,897,000
SDA	37,258,000	32,806,000	4,452,000
ENERGY	66,205,000	53,574,000	12,631,000
HIG			
IFDA			
ASHA	35,505,000	35,505,000	0
PL 480, Title II			
TOTAL ENGR/ARCHT/ CONSTR.	$1,091,380,000	617,506,000	473,874,000

(Note: Does not include Egypt, with more than half of agency contract volume.)

AID PROJECTS INVOLVING ENGINEERING

Per S&T/ENGR

1981 (Sept.) "Yellow Book"

A. IQC - Worldwide.

1.	Electrical Utilities (EBASCO Services, Inc.)	to Aug. 1983
2.	Water Resources Dev. (TAMS)	to June 1983
3.	Water Resources Dev. (Jordan/Avent and Assoc.)	to April 1983
4.	Earth Sciences (Converse Ward Davis Dixon, Inc.)	(to Nov. 1981)
5.	Railway, Port, Harbor, Waterway and Pipeline (E.E. Maguire, Inc.)	(to Feb. 1982)
6.	Management, Operation, Maintenance of Admin. of Highways and Rural Roads (Roy Jorgensen & Assoc.)	(to Oct. 1982)
7.	Highway, Rural Roads, Bridge and Airfield (Louis Berger Intl. Inc.)	(to Oct. 1982)
8.	" " " (Morrison-Malerle, Inc.)	(to Jan. 1982)
9.	Sanitary, incl. water, supl. (James M. Montgomery, Inc.)	to July 1983
10.	Telecommunications (T-CAS America, Inc.)	(to Nov. 1982)
11.	Instit. & General Engr. (Ganthin, Advanced & Assoc., Inc.)	(to Oct. 1982)
12.	Industrial (Stone & Webster Engr. Corp.)	(to July 1982)
13.	Architecture (Adolfo E. Miralles & Assoc.)	(to Feb. 1982)
14.	Civil (Williams & Sheladia)	(to April 1982)

B. Engr. and Constr. Contracts.

Project	$Value	Sector	Category
AU of Cairo	2,000,000	Educ.	Capital
Athens College	1,285,000	"	"
" "	275,000	"	"
TelAviv Voc. School	1,000,000	"	"
Yad Benjamin School	750,000	"	"
OrHacnayim School	645,000	"	"
Or Somacya School	1,150,000	"	"
Presb. Medical Center	875,000	Health	"
Soyany Univ.	800,000	Educ.	"
Sun Jnn Univ.	1,300,000	"	"
Univ. of Americas	3,090,000	"	"
Adm. Bristol Hosp.	850,000	Health	"
" " "	930,000	"	"
Amer. Childrens Rehab. Center	1,100,000	"	"
Beth Miyrochi	500,000	"	"
Beirut Univ. College	375,000	Educ.	"
Cuttington Univ.	1,950,000	"	"
Cuttington Univ. Coll.	1,200,000	"	"
De LaSalle Univ.	1,200,000	"	"
EAP	600,000	"	"

AID PROJECTS INVOLVING ENGINEERING

Projects	$Value	Sector	Category
Gon Yovne	50,000	Health	"
Heri Hospital	275,000	"	"
Intl. Coll. of Beirut	500,000	Educ.	"
Hospital de la Familia	450,000	Health	"
Kanye Hosp.	1,900,000	"	"
Ludhiang Med. Coll.	--	"	"
Malamulo Hospital	--	"	"
Mt. David Crippled Children's	2,250,000	"	"
Muganero Hospital	--	"	"
Prepap College	3,055,000	Educ.	"
Satefa Mocona	650,000	"	"
Trinity College	900,000	"	"
University of the Valley	2,050,000	"	"
Xavier Univ.	1,550,000	"	"
Integ. Agr. Dev. (Antigua)	76,000	Agr.	TA
Karnainli 3rd Unit (Bangladesh)	6,177,000	Energy	Capital
" " " "	1,327,000	"	"
Rural Electrif. I (Bangladesh)	11,997,000	"	"
Small-scale Irrig. (")	859,000	Agr.	"
Fertilizer Distrib. (")	4,318,000	"	"
Botzam Rd. Paving (Botswana)	2,044,000	SDP	"
Agr. Coll. Exp. (Botswana)	3,219,000	Agr.	TA
Reg. Food Crop Protec. (Cameroon)	70,000	"	TA
Livestock of Agr. Dev. ("	155,000	"	"
Mandova Mts. Water Res. (Cameroon)	1,867,000	"	Capital
Nat. Cerren/Res. & Ext. (Cameroon)	80,000	"	TA
Accelerated Rural Learning (CAR)	40,000	Educ.	"
BHN Employment Sector (Dominica)	301,000	"	Capital
Energ. Rd. Infrast. Repair (Dominica)	123,000	SDP	"
Rural Rd. Maint. & Rehab. (DR)	1,008,000	Agr.	TA
" " " " "	908,000	"	Capital
Health Sector II (DR)	863,000	Health	TA
Rural Rd. Maint. & Rehab. (DR)	626,000	Agr.	Capital
Azua-Bani Transmission (DR)	2,800,000	Energy	"
" " " "	95,000	"	"
Health Sector II	379,000	Health	TA
Women's Small-scal Indust. Ent. (Ghana)	110,294	SDP	"
Rural Primary Ed. (Guatemala)	4,600,000	Educ.	"
Small Farmer Dev. (")	2,727,000	Agr.	"
Mini Earthquake Recov. (")	3,400,000	SDP	Capital
Primary School Reconstr. (")	288,000	Educ.	"
Small Farmer Marketing (")	587,000	Agri.	TA
Health Services II (")	716,000	Health	"
Small Farmer Dev. (")	2,692,000	Agr.	TA
Mini Earthquake Recov. (")	3,287,000	SDP	Capital
Agr. Production (Guinea)	15,099,000	Agr.	TA
Rural Rds. (Guyana)	2,580,000	Agr.	TA
Small FarmDev. (Guyana)	3,153,000	Agr.	TA

AID PROJECTS INVOLVING ENGINEERING

Projects	$Value	Sector	Category
Rice Modernization (Guyana)	2,500,000	Agr.	TA
Small Farmers Imp. (Haiti)	15,000	"	"
Ag. Feeder Rds. (Haiti)	4,091,000	"	"
Highway Maint. (Haiti)	4,717,000	SDP	Capital
Rural Health Del. (Haiti)	638,000	Health	TA
Approp. Tech. (Haiti)	1,097,000	Rural Dev.	TA
LaGonave Water Dev. (Haiti)	490,000	Health	Capital
Care Pot. Water II (Haiti)	227,000	"	"
Comm. Water & Small Irrig. (Haiti)	695,000	"	"
PL 480, Title II Onterach (Haiti)	317,000	Agr.	"
Agnan Valley Rur. El. (Honduras)	2,183,000	"	"
Access Rds. Rehab. (Honduras)	998,000	SDP	"
Rural/Trails & Access Rds. (Honduras)	2,398,000	Agr.	"
CBC/Soc. for Med. Ed. (India)	678,200	Health	"
Semernong Power Plant (India)	3,737,000	Energy	"
Wijara Transm. Dist. (India)	8,361,000	"	"
Jagorawi Hwy. (India)	8,057,000	SDP	"
W. Java II (")	7,792,000	Energy	"
" "	4,500,000	"	"
Aieh Rd. Better (India)	35,193,000	Rural Dev.	TA
Luwa Rd. Better (India)	21,852,000	"	Capital
Law a Transmiz Dev. (India)	1,105,000	"	"
Citroday River Basin Dev. (India)	1,732,000	Agr.	"
Modern Urban Dev. (India)	1,300,000	SDP	TA
Feeder Rds. Study (India)	500,000	Rural Dev.	"
Tuntang River Basin Dev. (India)	400,000	Agr.	"
Surnkarta Potable Water (India)	1,100,000	Health	Capital
Sederhaua Irrig. & Land Dev. II (Indon.)	6,000,000	Agr.	TA
Rural Electrification (")	5,997,000	Energy	"
Rural Works (")	2,100,000	Rural Dev.	"
Operation Friendship (Jamaica)	500,000	Educ.	Capital
Health Mgmnt. Impr. (")	10,610	Health	TA
Fish Prod. Sys. Dev. (")	380,000	Agr.	Capital
Rural Ed. Sector (")	919,539	Educ.	TA
Agubu Wastewater (Jordan)	12,000,000	Health	Capital
Village Dev. II (")	18,532,000	Rural Dev.	"
Amman Water & Sew. (")	15,030,000	Health	"
" " "	5,014,000	"	"
" " "	180,000,000	"	"
Rift Valley Water Res. (")	67,000,000	Agr.	TA
Potash Plant (")	5,000,000	"	Capital
Irbid Town Water (")	1,163,000	Health	TA
Zaria & Ruseifa Water (")	1,143,000	"	"
East Ghor Drainage (")	150,000	Agr.	"
Village Dev. II (")	8,427,000	Rural Dev.	Capital
School Constr. II (")	13,427 000	Educ.	"
4 Southern Cities (")	604,000	Health	TA

AID PROJECTS INVOLVING ENGINEERING

Projects	$Value	Sector	Category
Ralsingking Talal Dam (Jordan)	813,000	Agr.	Capital
Greater Amman (")	422,000	Health	TA
Roads Gravelling (Kenya)	1,248,000	Agr.	"
Rural Rds. Sys. (Kenya)	1,311,000	"	"
Ag. Sys. Support (Kenya)	16,883,000	"	"
Op. Haute Vallee (Mali)	500,000	Rural Dev.	Capital
CFAR (")	100,000	Educ.	"
Kayes-Nioro Rd. (")	2,400,000	Agr.	"
Inst. of Agr. & Animal Sci. (Nepal)	1,268,000	"	"
Aux. Health W/rs. School (Nepal)	1,287,000	Health	"
Integ. Cereals (Nepal)	15,000	Agr.	TA
Rural Area Dev. (Nepal)	165,000	Rural Dev.	"
Family Planning & MCH (Nepal)	76,000	Family Planning	"
Radio Ed. & TT (Nepal)	117,000	Educ.	"
Landslide & Soil Stabile (")	563,000	Agr.	"
Rural Rds. (Panama)	2,860,000	Rural Dev.	Capital
Alternative Energy (")			
Agr. Research (Pakistan)	2,960,484	Agr.	"
Bicol. Feeder Rds. (Philippines)	24,979,000	Rural Dev.	"
Libmanau KabusaoIAD (Philippines)	1,293,000	Agr.	Capital
Bula IAD II-Phase IVA (")	1,156,000	"	"
" - Phase IV (")	308,000	"	"
" - Phase II (")	586,000	"	"
" Phase IVB (")	1,332,000	"	"
" Phase V (")	480,000	"	"
" Phase IA (")	531,000	"	"
" Phase IB (")	657,000	"	"
Local Water Dev. (")	5,100,000	Health	"
RRP Projs. II (")	8,000,000	Rural Dev.	"
Agr. Res. II (")	2,440,000	Agr.	TA
School Constr. II (Portugal)	20,000,000	Educ.	Capital
Basic Sanitation II (Portugal)	16,000,000	Health	"
Health Sector Support (Portugal)	25,000,000	"	TA
Rural Vocational Ed. (")	4,500,000	Educ.	"
Food Storage & Marketing (Ruanda)	95,000	Agr.	"
Tech-Coop. (Salvador)	248,000	Rural Dev.	"
Ranged Livestock Dev. (Senegal)	679,000	Agr.	"
Casamance Reg. Dev. (")	23,700,000	Agr.	"
Small Irr. Perimetors (")	6,525,000	"	"
Grain Storage (")	4,900,000	"	"
Rural Health Serv. Dev. (")	3,819,000	Health	"
Family Health (")	1,400,000	Family Planning	"
SAED Trng. (")	4,530,000	Agr.	"
Fuelwood Prod. (")	3,134,000	Energy	"
SODESP Livestock (")	8,000,000	Agr.	"
Cereal Prod. II (")	7,700,000	Agr.	"
OMVS Agro Research II (")	873,000	"	"
Baila Study (")	800,000	"	"

AID PROJECTS INVOLVING ENGINEERING

Projects	$Value	Sector	Category
Reg. Crop Protection (Senegal)	25,700,000	Agr.	TA
OMVS Integr. Dev. (")	13,475,000	Rural Dev.	"
Reg. Vocational School (")	500,000	Educ.	Capital
Coop Grain Storage (")	4,000,000	Agr.	"
Decentral. of REsearch (")	9,643,000	"	TA
Rural Trng. Schools (")	2,720,000	Educ.	"
Reforestation of Dunes (")	6,900,000	Agr.	"
Reg. Crop Protection (")		"	"
Crop Research (Sierra Leone)	1,152,000	"	"
Water Mgmnt. (Sri Lanka)	2,653,000	"	"
Mahaueli Basin Dev. I (Sri Lanka)	10,000,000	Agr.	Capital
Integ. Ag. Dev. (Santa Lucia)	2,679,000	"	"
" " (St. Vincent)	101,000	"	"
St. V. Emergency Infrast. (")	73,400	SDP	TA
So. Sudan Primary Health (Sudan)	753,000	Health	"
" " Access Rd. (Sudan)	29,005,000	Rural Dev.	Capital
So. Rural Infrastr. I (")	2,728,000	"	"
So. Manpower Dev. (")	8,190,000	"	TA
Rural Dev. Pl. (")	6,432,000	"	"
Widi Halfa Comm. Dev. (")	1,106,000	"	"
Rural Health Supp. (")	29,946,000	Health	Capital
No. Sudan Primary Health Care (")	28,448,000	"	TA
W. Sudan Agr. Res. Str. (")	45,000,000	Agr.	"
Blue Nile IRD (")	15,672,000	"	"
Yambio Res. Sta. Rehab. (")	2,270,000	"	"
Port Sudan Refugee Water (")	3,116,000	Health	Capital
Damascus Water I (Syria)	1,823,000	"	"
Euphrates Basin Maint. (Syria)	2,494,000	Agr.	TA
Damascus-Dernithng (")	3,690,000	SDP	Capital
Lithakia-Tartns Hwy. (")	6,490,000	"	"
Comp. Transport Study (")	2,903,000	"	TA
Rural Elect. (")	6,788,000	Energy	Capital
Damascus Water II (")	1,471,000	Health	"
Tanz-Rwand-Bururchi Rd. (Tanx)	66,000	SDP	TA
Lim Nam Don IRB (Thai)	1,180,000	Agr.	"
Renewable Nonconv. Eng. (Thai)	3,500,000	Energy	"
Small Scale Hydro (")		"	"
Rural Dev. (Tunisia)	1,246,000	Rural Dev.	"
Siliann Rural Water (Tunisia)	3,500,000	Health	Capital
Rural Comm. Health (")	3,553,000	"	"
Central Tunisia (")	4,850,000	Agr.	"
Taiz Water & Sewerage (Yemen)	7,780,000	Health	"
Prob. Utility Tech. & Mgr. Serv. (Yemen)	2,879,000	"	TA
Water Res. Pl. & Mgt. (")	1,300,000	Agr.	"

(Egypt contracts not available)

SUGGESTED FUNCTIONAL STATEMENT FOR S&T BUREAU ENGINEERING STAFF

(Estimate total of 8 positions.)

1. Office of the Director. (1) plus a secretary

a. Directs and supervises the activities of the S&T Engineering Staff and advises the Senior Assistant Administrator, the Agency Directors, and other Bureau senior staff concerning engineering elements of Bureau activities, including selection of technology for application to solving of specific problems identified by the Bureau Directorates.

b. Provides engineering services, through direct-hire staff or by use of contract or PASA resources, for program analysis, project design and review, project implementation, and evaluation of activities in the Bureau. Also furnishes similar services to Regional Bureaus and Field Missions on request. Provides support to S&T representatives on the various Sector Councils to ascertain that AID's global strategies and proposed solutions to technical issues are technologically sound, economically viable, and socially acceptable.

c. Participates in the Sector Council for Engineering on behalf of the S&T Bureau. Provides secretariat services for the Sector Council, including maintenance of a roster of direct-hire engineers in the Agency with their areas of specialization, and complete materials on applicants for engineering direct-hire employment and personal services contracts.

d. Establishes and maintains liaison with U.S. Government agencies, international organizations, professional societies, and educational institutions in the fields of engineering, architecture, construction, and related technologies in order to keep abreast of state-of-the-art developments useful to AID.

e. Responsible for the preparation of the scope of work for technology portion of contracts for professional engineering, architecture, construction and related services in the Bureau.

2. Engineering Support Services Branch. (2) plus a secretary.

a. Assesses the Agency's overall capacity in engineering, architecture, construction monitoring, including external quick-response availability such as "requirements" and "indefinite quantity" contractors (IQC). Insures that the results of such assessment are included in the Agency work-force planning system and that standby IQCs are available for user Bureaus and Missions. Manages the portfolio of umbrella stand-by contracts for quick response.

b. Manages a contract to prepare and distribute an Engineering Newsletter that makes available information on state-of-the-art technology developments. Works closely with the Office of Technical Review and Information to assure that information materials and announcements of new or updated technology are disseminated to engineers, architects, and project managers in the Agency.

c. Develops and prepares handbook material relating to AID's engineering responsibilities, including working closely with the Procurement Policy Advisory Panel.

d. Establishes and maintains a file of performance evaluations of professional contractors for engineering, architecture, construction, and related services, and insures that such information is available to all concerned contractor selection committees in both Washington and the field.

e. Assembles data on a continuing basis to develop and maintain a current cost data computer model for use in preparing and checking cost estimates throughout the areas of AID's project activities.

f. Designs and manages a small portfolio of engineering research projects (low-cost building methods for LDCs, tropical soils, simple irrigation pump, self-help latrines under $25, low-cost urban water and sewer systems, etc.). Works with M/PM/TD to develop and administer one or two training courses per year for direct-hire engineers. Such courses will address specific problem areas with inter-regional interest.

g. Prepares and distributes the annual "Yellow Book" and "Green Book" compilation of on-going engineering and construction contracts, and information for potential contractors, respectively.

3. <u>Project Engineering Branch</u>. (5) plus a secretary

a. Provide direct-hire staff for support of project formulation, design, approval review, and implementation monitoring of projects in the S&T Bureau Directorates and, on request, to supplement the staffs of the Regional Bureau's Engineering Divisions for short-term TDY to the field or in the U.S.

b. Specific skills in electric power, telecommunications, sanitary engineering, structural engineering, and industrial/mechanical or chemical processes will be included.

c. On an as-requested basis will provide advice to the Overseas Management Division of the Directorate for Program and Management Services in the Bureau for Management, and will develop and maintain a current file of specifications of materials and commodities used in engineering activities to assist the Office of Commodity Management.

d. Assist the Bureau for Private Enterprise Office of Housing, the Bureau for Food for Peace and Voluntary Assistance Office of American Schools and Hospitals Abroad, the Office of U.S. Foreign Disaster Assistance, and the Trade and Development Program on a reimbursable basis, as requested.

SUGGESTED FUNCTIONAL STATEMENT FOR OFFICE OF ENGINEERING AND TECHNOLOGY POLICY. In PPC (Estimate total of 4 positions: chief, civil, electrical, and mechanical)

1. Provides AA/PPC and A/AID with a central source of expertise, information, and policy guidance on engineering as related to appropriate technologies for economic development of the less-developed countries and the prospects of success for AID programs and projects.

2. Assists AA/PPC and A/AID in evaluating alternatives for AID policy in participation in multi-lateral programs for development (river basin development programs, UN-sponsored international decades, Colombo Plan, CDA, etc.) based upon appraisal of the comparative advantages of using U.S. technologies.

3. Works closely with PPC/PDPR/ED to provide policy judgments in regional development, employment, urban development, housing, science and technology, and industry and energy. Helps both PPC/PDPR and PPC/PB in evaluating programs and projects for budgetary impact and in determining soundness of project design and implementation plans in terms of technologies selected, cost, and timeframe.

4. Performs or oversees the performance of in-depth analysis of world-wide trends in cost of essential categories of engineering professional services and engineering construction, and prepares an estimate of the comparative advantage of U.S. technologies in major areas of development projects, so recommendations can be made concerning procurement policy for goods and services. Assists in the deliberations of the Procurement Policy Advisory Panel.

5. Represents PPC on the Engineering Sector Council.

6. Represents AID at the appropriate level in inter-agency, international, and professional meetings on engineering policy matters. Maintains liaison with counterparts in other U.S. Government agencies, other donor agencies, international and academic institutions for the exchange of information viewpoints on policy and trends in engineering and development.

7. Provides assistance, as needed, to other offices of the Bureau for PPC and, as requested, to other AID Bureaus and Field Missions.

SCOPE OF WORK

FOR

REPORT ON STATUS AND FUNCTIONS OF AID ENGINEERS

1. Review current Agency utilization of professional engineering skills by sector (e.g., agriculture, health, energy, etc.) and category of activity (e.g., capital vs. technical assistance).

2. Assess engineering services available to AID through contract mechanisms, as well as the means by which these are accessed and managed.

3. Suggest possible mechanisms for enhancing science and technology within AID programs through the application of engineering skills and/or support for research in engineering and related disciplines (in latter case, program options for central, regional, or field management should be outlined).

APPROVED

WORK SCHEDULE

AID Engineering Study

1. Arrange AID/W and Private Sector Interviews; dispatch questionnaire to field mission and interviewees with covering letter. 26 November-3 December 1982

2. Interviews in AID/W and with Private Sector. 6 December 82 - 7 January 1983

3. Tabulate, summarize and evaluate questionnaires. 10 January- 19 January 1982

4. Draft Report preparation. 20-28 January 1983

5. Review Draft Report with Dr. Jack Vanderryn, AID Engineering Council, and any other key officers. 31 January - 10 February 1982

6. Prepare Final Report. 11-21 February 1983

7. Distribute Final Report to AID/W and Field Missions. 25 February 1983

Other tasks subsumed in first 4 major items:

a. Develop historical perspective of role of engineers in AID.

b. Determine current use of direct-hire engineering skills in AID.

c. Evaluate current contract methods to make engineering services available to AID activities.

d. Develop proposal for enhancing science and technology within AID operational programs and projects through the application of engineering skills and/or support for research in engineering disciplines.

e. Recommend functional changes of Central Engineering Office or revised staffing to meet Agency needs, and recommend its most cost-effective bureaucratic placement, if any, as well as revised functional statement.

DEC 7 1982

MEMORANDUM

TO: Selected AID/W Officers Familiar with AID Use of Direct-Hire, PASA, RSSA, and Contract Engineers

FROM: S&T/EN, Louis A. Cohen LAC

SUBJECT: Questionnaire on Status and Functions of AID Engineers

I have recently been assigned to S&T/EN to study the role of engineers in AID, particularly the functions of the Engineering Staff now consisting of two senior GS engineers in S&T/EN.

As most of you are aware, the history of AID and predecessor agencies' use and bureaucratic placement of engineers in Washington has been one marked by inconsistency. Back in ECA, MSA and ICA days, all engineers were backstopped by the Office of Transportation, which was primarily concerned with shipping commodities. The DLF had an engineering staff in its central core which helped the loan officer evaluate contractor or borrower reports in loan appraisal and which assisted in monitoring implementation reports. When AID combined ICA and DLF, all engineers were stationed in, or backstopped by, the Central Office of Engineering, which at one point reached a staff level of over 200 (60 plus in AID/W).

With the advent of the Congressional New Directions and the downgrading of capital projects as a principle vehicle for AID project funding in favor of stronger technical assistance in agriculture and rural development, education, and health and population, there was a growing move to decentralize the engineering staff. Once special emphasis was placed by all of the geographic bureaus on energy, environment, remote sensing, and water and sanitation -- all predominantly engineering activities -- decentralization became inevitable. In 1977, all but a handful of the Central Engineering Staff were transferred to the four geographic bureaus and placed in the Project Design, Technical or Development Resources Offices. This left the residual Central Office of Engineering too small to provide full range of engineering specialities to the Central Bureaus (S&T, PPC, M/SER, FVA, PRE, OFDA) and back up the Regional geographic bureaus where their staffs were weak.

Now the Engineering Staff remaining in S&T/EN is down to one general engineer specializing in civil and construction and one industrial/chemical engineer.

Before recommending any change in this staff (numbers, bureaucratic location, function), it is necessary to:

-- review current Agency utilization of professional engineering skills by sector and category of activity;

-- assess engineering services available to AID through contract mechanisms, as well as the means by which these are accessed and managed; and,

-- suggest possible mechanisms for enhancing science and technology within AID programs through the application of engineering skills and/or support for research in engineering and related disciplines (in latter case, program options for cental, regional, or field management to be outlined).

As an important part of this study, I would be most grateful if you and/or your senior staff would answer the attached questionnaire and return your replies to reach me in Room 509C SA-18 before COB 7 January 1983. Any additional comments that you care to add to the questionnaire will be welcomed and drawn upon.

Attachment
- Questionnaire

DEC 7 1982

MEMORANDUM

TO: All Principal AID Officers in Field Posts

FROM: S&T/EN, Louis A. Cohen LAC

SUBJECT: Questionnaire on Status and Functions of AID Engineers

The history of AID and its predecessor agencies in the use of direct-hire engineers has included almost every conceivable bureaucratic arrangement. In the early days, under FOA and ICA, all engineers were in, or backstopped by, the Office of Transportation, which was primarily responsible for commodity procurement and shipping. At the beginning of AID, the Director of the Office of Engineering reported directly to the Administrator and was the supervisor of all engineers in the agency. This has been gradually eroded by: (1) the establishment of a small engineering staff in each geographic bureau, usually in DR or PD, which has full charge of engineers and engineering in its bureau; (2) downgrading of the Central Engineer Office to a staff in one Directorate of the S&T Bureau; and (3) gradual erosion of the Central Engineer Staff from a high in the mid-1960s of more than 200, covering every conceivable engineering specialty, to a present stength of two -- one general civil/construction engineer and one industrial/chemical engineer.

The reasons for this decline in the attention devoted by AID to its in-house engineering capabilities and the status of senior engineer staff are clear: (1) with the shift in emphasis from capital projects to technical assistance, many generalists/managers have believed that the need for staff engineers has been greatly reduced or eliminated; (2) reduced administrative funds and ceilings have induced the Agency decision-makers to rely more and more on various contract mechanisms to obtain engineering advice and judgments; (3) a swing in development theory toward smaller concepts and intermediate technologies has produced a greater demand for social scientists and generalists rather than more sophisticated, trained technical specialists; and (4) more and more Agency decision-makers have come to view engineers as technicians who provide a service to project committees and their chairmen, rather than as chairmen, project officers, or even members of the project committee.

In view of each geographic bureau now having a small engineering staff in AID/W and the residual central engineering staff now assigned in S&T/EN, I have been asked to make a study with the following scope of work:

1. Review Agency utilization of professional engineering skills by sector, e.g., agriculture, health, energy, etc., and category of activity, e.g., capital vs. technical assistance.

2. Assess engineering services available to AID through contract mechanisms, as well as the means by which these are accessed and managed.

3. Suggest possible mechanisms for enhancing science and technology within AID programs through the application of engineering skills and/or support for research in engineering and related disciplines (in latter case, program options for central, regional, or field management should be outlined).

As an important part of this study, I would be most grateful if you and/or your senior staff would answer the attached questionnaire and pouch or cable the responses to reach me before 10 January 1983. Any additional comments you care to make will be appreciated and drawn upon.

Attachment
- Questionnaire

Distribution: Standard Mission List

QUESTIONNAIRE

AID ENGINEERING GROUP

1. Does AID provide adequate in-house professional engineering capability to give you the necessary technical backstopping in program and project identification, design, implementation and evaluation? Yes ___ No ___

2. If you answered "no" above, are present mechanisms adequate for you to obtain such technical expertise by contract in an expeditious manner? Yes ___ No ___

3. Are direct-hire engineers readily available to you to provide you with reliable evaluation of engineering recommendations, designs, cost estimates, and specifications provided by consultants, contractors, and other outside specialists? Yes ___ No ___

4. Do you believe that AID needs more in-house direct-hire engineers to provide you with full-time or prompt on-request capability to deal with engineering problems in your programs or projects? Yes ___ No ___

5. If you answered "yes" in 4. above, do you believe that some of these specialized technical personnel could most efficiently be provided on an Agency-wide basis through a Central Office of Engineering rather than assigning such experts in each geographic area? Yes ___ No ___

6. If you answered "yes" in 5. above, list two or more examples of the kind of experts who could be fully utilized only through Agency-wide assignmment in a Central Office of Engineering.

_____

_____

_____

_____

7. List examples of Requirements or Idefinite Quantity Contractors (IQCs) that you believe could be more economically contracted and administered by a Central Office of Engineering than through the various user Bureaus. _____

_____

_____

8. Do you or your staff find that the Engineering Newsletter provides a useful flow of information materials and announcemenmts of new or updated technology for professional engineers and architects that helps AID to perform better in its mission of economic and social development? Yes ___ No ___ I am not aware of the Newsletter ____

9. Does AID need standardized contracts, designs, and specifications for routine engineering and construction that could be formulated and kept current by a Central Office of Engineering? Yes ___ No ___ Not certain ____

10. Would your operations be improved or simplified if consulting engineers, contractors, and trade associations had a central Office of Engineering to contact as a clearing house for information on AID engineering and engineering construction projects, contracts, proceedings, etc.? Yes ___ No ___

11. In your view, should engineering -- that is, the application of science, economics, and sociology to planning, designing, construction, or management of machinery, buildings, roads, bridges, utilities, waterworks, manufacturing processes, etc. -- be considered as a technical functional field of AID activities, such as food and agriculture, energy, environmental and natural resources, education and training, and health and population? Yes ___ No ___

12. If you answered "no" in 11. above, do you believe that within AID, engineering should be regarded as a management support service for the functional fields, in a manner related to those of the Offices of GC, Controller, Personnel, Management Planning and Operations, Contracts and Commodities? Yes ___ No ___

13. If you answered "no" to both 11. and 12. above, do you see engineering as a separate function that should be centrally operated in the manner of PPC, Housing, Food for Peace, American Schools and Hospitals Abroad, and Trade and Development Program? Yes ___ No ___

14. Would your programs and projects be strengthened by AID-funded research projects in engineering or centrally-funded training courses for engineers? Yes ___ No ___

15. If you answered "yes" in 14. above, give some examples. _____

_____

_____

Recipients of Questionnaire:

AID/W - Bureau for Science and Technology

1. Dr. N. C. Brady, SAA/S&T
2. Leonard Yaeger, DAA/S&T
3. F. William Small, S&T/IT
4. Erven Long, S&T/UR
5. Lida Allen, Bob Gaul, S&T/DIU
6. J. Robins, S&T/FA
7. A. R. Bertrand, S&T/AGR
8. J. Vanderryn, D. Rhoad, S&T/EN
9. W. Feldman, S&T/FNR
10. A. Jacobs, S&T/EY
11. R. Zagorin, S&T/HR
12. J. French, S&T/MD
13. J. Clinton, S&T/HP

Engineering Council

1. Palmer Stearns, S&T/ENGR
2. Rod MacDonald, LAC/DRE
3. Jack Snead, AFR/TR/ENGR
4. James Habron, NE/PD/ENGR
5. Hasan Hasan, ASIA/PD/ENGR

Other Concerned Offices

1. Stephen Klein, PPC/EY
2. Albert Printz, PPC/EAC
3. John Eriksson and Richard Archi, PPC/PDPR
4. James M. Nielson, BIFAD/S/R
5. Jan W. Miller, GC/CP
6. Herbert Beckington, IG
7. Robert Perkins, GC/LE
8. Herbert Morris, GC/Asia
9. Timothy Bork, GC/AFR
10. Barton Veret, GC/LAC
11. Judd Kessler, GC/NE
12. George McCloskey, OFDA/OS
13. John F. Owens, M/SER
14. Hugh L. Dwelley, M/SER/CM
15. William C. Schmeisser, Jr., M/SER/COM
16. Anne Dotherow, M/SER/MO/OM
17. David Santos, FVA/ASHA
18. Donald Atwell, FVA/PPE/POE
19. Peter Kim, PRE/H
20. Charles Gladson, DAA/FVA

Other Concerned Offices (continued)

21. Edgar Harrell, DAA/PRE
22. Lane Holdcroft, AFR/TR
23. Don Reilly, AFR/TR
24. Norman Cohen and Bob Pratt, AFR/PD
25. G. R. Van Raalte, ASIA/PD
26. Tom Arndt, ASIA/TR
27. Dwight Johnson and Irvin Levy, LAC/DR
28. Selig Taubenblatt and Bob Bell, NE/PD
29. Ken Sherper, NE/TECH
30. Christian Holmes, TDP
31. Curtis Christianson, M/FM
32. Nedra Rowe, PRE/SDB
33. Ray Love, DAA/AFR
34. Marshal Brown, DAA/LAC
35. Princeton Lyman, State/AF
36. Gordon Pierson, PPC/IA

All AID Principle Officers in Field Posts (75)

Persons Interviewed in Depth

AID/W

1. Len Yaeger, DAA/S&T
2. J. Vanderryn, S&T/EN
3. D. Rhoad, S&T/EN
4. Alan Jacobs, S&T/EY
5. William Feldman, S&T/FNR
6. William Eilers, S&T/EY
7. Palmer Stearns, S&T/ENGR
8. Rod MacDonald, LAC/DRE
9. Jack Snead, AFR/TR/ENGR
10. James Habron, NE/PD/ENGR
11. Hasan Hasan, ASIA/PD/ENGR
12. Stephen Klein, PPC/EPA
13. Lane Holdcroft, AFR/TR
14. G. R. Van Raalte and Bob Pratt, ASIA/PD
15. Irwin Levy, LAC/DR
16. Selig Taubenblatt and Bob Bell, NE/PD
17. Ken Sherper, NE/TECH
18. David Santos, FVA/ASHA
19. William Schmeisser, Jr., M/SER/COM
20. John F. Owens, M/DAA/SER
21. Ann Dotherow, M/SER/MO/OM
22. Richard Archi, PPC/PDPR
23. John Eriksson, PPC/PDPR
24. Lyle Weiss, NE/PD/Engr
25. Wally Bowles, NE/PD/Engr
26. Don Reilly, AFR/TR

Private Sector

1. Joe Morrison, American Consulting Engineers Council
2. D. Weinert, National Society of Professional Engineers
3. James Thompson, Director of Intl. Ops.-Assoc. Gen. Contractors of America
4. International Committee of the Consulting Engineers Council
5. International Committee of the Assoc. General Contractors of America
6. International Committee of the National Constructors Association
7. W. L. Slaglon, Exec. VP, American Institute of Architects
8. Committee on Federal Construction (Inter-Society, Inter-Agency)

Former AID Senior Officers

1. Frank D. Matteo
2. Henry Gruppe
3. John Zedalis
4. Frank Collins, Jr.
5. Kenneth Rabin
6. Arther A. Wichmann
7. Thomas Niblock
8. J. Lee St. Lawrence
9. J. Karl Lee
10. Robert Nooter

Other Development Agencies

1. IBRD
2. EEC
3. UNDP