

PN-AAJ-920

Report of an

**ENGINEERING MANPOWER SURVEY
OF MALAWI**

January 1979

Prepared under

USAID INDEFINITE QUANTITY CONTRACT No. AID/AFR-C-1132

Work Order No. 25

**LOUIS BERGER INTERNATIONAL, INC.
East Orange, New Jersey, U.S.A.**

Report of an

ENGINEERING MANPOWER SURVEY

OF MALAWI

January 1979

Prepared under

USAID INDEFINITE QUANTITY CONTRACT No. AID/AFR-C-1132

Work Order No. 25

LOUIS BERGER INTERNATIONAL, INC.
East Orange, New Jersey, U.S.A.

**REPORT OF AN
ENGINEERING MANPOWER SURVEY
OF MALAWI**

Table of Contents

	<u>Page</u>
ACKNOWLEDGEMENTS	
SUMMARY	
I. CONCLUSIONS AND RECOMMENDATIONS	
A. Demand for Engineers/Diplomates/Technicians	I-1
B. Scope of Planned Polytechnic Expansion Program	I-2
C. Qualitative Aspects of Proposed Polytechnic Expansion	I-2
D. Ratio of Malawian Engineers to Expatriates	I-6
E. Quality and Appropriateness of Engineering Training Received Outside of Malawi	I-6
F. Quantity and Quality of Secondary School Output.	I-7
G. Job Movements and Movement Pattern of Engineers.	I-7
H. Recommendations for PP Team Staffing and Specific Areas of Concern	I-8
I. Advance Preparation for PP Team.	I-10
J. Recapitulation.	I-11
II. INTRODUCTION	
A. General	II-1
B. Statement of Work for Manpower Survey Team	II-2
C. Background Details of Importance	II-3
III. SURVEY APPROACH	
A. Approach	III-1
B. Shortcomings of Approach	III-2
IV. SURVEY RESULTS AND GENERAL REMARKS	
A. Present Need and Future Demand - Engineers.	IV-2
B. Quality and Appropriateness of Training Received Abroad.	IV-13
C. The Job Movement Pattern of Malawian Engineers/ Technicians.	IV-17
D. Qualitative Adequacy of Engineering Student Supply from Secondary Schools	IV-19
E. Quantitative Adequacy of Engineering Student Supply from Secondary Schools	IV-21
F. Review of Demand for Engineers by Category of Engineer	IV-23
G. Data Accuracy.	IV-24
V. SPECIAL POINTS OF INTEREST AND CONCERN	

**REPORT OF AN ENGINEERING MANPOWER SURVEY
OF MALAWI**

List of Tables

<u>Table No.</u>	<u>Title</u>	<u>Page</u>
1	Summary of Survey Results – <i>Engineers</i>	IV-3
2	Summary of Survey Results – <i>Diplomates (or Equivalent)</i>	IV-9
3	Summary of Survey Results – <i>Technicians</i>	IV-12
4	Outputs of Secondary Schools -- 1972-1990	IV-22
5	Summary of Survey Results – <i>Graduate Engineer Demand by Engineer Category</i>	IV-25

List of Figures

1	Demand versus Supply - Malawian Engineers	I-3
2	Demand versus Supply - Malawian Polytechnic Diplomates	I-4
3	Malawi's Integrated Higher Education System as It Is Geared to Malawi's Long Range Development Policy	ff H-3
4	Malawi: Planned Structure of Educational System, 1978	ff H-3

ACKNOWLEDGEMENTS

The Engineering Manpower Survey Team worked directly with Mr. Z. T. Soko, Senior Economist, Economic Planning Division, Office of the President and Cabinet, and his assistant, Mr. C. Mthenda. Mr. Soko arranged for and accompanied the Team on all of its initial interviews. Mr. Mthenda provided back-up assistance in the final week of data consolidation. The Team gratefully acknowledges their valuable support.

In addition, each key organization manager and his staff who were contacted during the survey contributed freely and fully to it. Their considered and thoughtful opinions have helped structure the Team's final recommendations as set forth in this report.

Finally, the detailed background information and briefings provided by the University of Malawi and its Polytechnic Institute on the latter's expansion plans and associated problems helped the Team in orienting its survey. These briefings held at the beginning of the survey, along with a constructive critique of the Team's findings upon completion, were invaluable.

SUMMARY

This report presents results of an intensive one month (November 14-December 14, 1978) on-site survey of existing and future engineering and engineering technician supply and demand in Malawi. The basic objective of the survey was to provide inputs into a future USAID Project Paper (PP) to be prepared describing support for a major expansion of the AID-built Polytechnic Institute. (See the Work Statement in Section II B.)

This survey was conducted through direct, structured interviews with the major "users" (the managers) of engineering talent in government, parastatal, and private organizations. In addition, considerable data was obtained on the planned expansion program, which has been in the works for a period of more than four years.

The Team has found that an expansion program at the Polytechnic Institute is fully justified on the basis of current and projected engineering/engineering technician needs and believes that failure to expand the Polytechnic at this time will have a serious and long-lasting negative effect upon the balanced agro-oriented development necessary for Malawi.

Complete conclusions and recommendations of the survey are included in Section I. Details and back-up data supporting these conclusions and recommendations are contained in the body of this report. In accordance with the contract, a first draft report was left with the AID Affairs Officer (DCM) in Lilongwe, Malawi, and the Team briefed both the Officer and the Ambassador upon completion of its tour.

This report is similar to the draft report left with the AID Affairs Officer, except for re-editing and the addition and refinement of topics covered during the Team's subsequent discussions with officials of the University of Malawi.

I. CONCLUSIONS AND RECOMMENDATIONS

I. CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the key points investigated by the Manpower Survey Team as specified in the Work Statement (Section II B). Comments on these points are cross-referenced, when applicable, to the more complete discussions in the body of this report.

In addition to the specific Work Statement items, the Team has also included a number of related findings it believes will be of importance to USAID, with particular reference made to the forthcoming PP team visit to Malawi to plan AID's role in the Polytechnic's expansion program. These points are also cross-referenced to supporting details elsewhere in the report.

A. Demand for Engineers/Diplomates/Technicians

The demand for these three categories of engineering talent exceeds supply at present. By 1983, when the first engineers graduate from the Polytechnic Institute, demand will have reached critical proportions. Demand is heaviest now in government and parastatal organizations involved in building Malawi's infrastructure; specifically, rural road networks, water and sewage projects, irrigation and hydro-power, rural electrification projects, and low-income housing, all related to improving the living standards of the rural poor, suffer from a lack of trained engineers/technicians.

Most companies rely heavily on expatriates to offset the shortage of local engineers/technicians. Many interviewed company officers stated that expansion projects were postponed because necessary local talent was unavailable and expatriate talent was too expensive. This again directly affects productivity in agro-business sectors.

The engineer/technician demand between the present and 1983, when the first graduates of the degree program reach the job market, can be partially met only at considerable loss to Malawi, namely by:

- increasing significantly the number of Malawians sent abroad for training;
- increasing the use of expatriate talent, with its high cost and other disadvantages (See Appendix G);
- continuing to cut back on projects in lower priority sectors; and

- attempting to do more labor substitution by breaking down skill-type technician jobs into smaller parts that can be handled by a larger number of less skilled artisans. (This process clearly will not work for engineers.)

Figure 1 shows projected graduate engineer demand, as obtained from the survey, versus supply, based on the Polytechnic's planned expansion program. Figure 2 shows the same data for diplomates from the Polytechnic. Details of technicians required for industry, parastatal, and government positions are shown on Sheet III in Appendix F. The demand for these technicians is proportionately as great as for engineers.

B. Scope of Planned Polytechnic Expansion Program

The Manpower Survey Team believes that the four year delay in implementing the recommendations of the 1974 Richards Report¹ has meant that its output recommendations of 25 engineers per year, beginning in 1983, are now too conservative. Considering the capital cost involved in setting up the degree program, plus the increased staffing requirements, the cost per degree will undoubtedly be very high. In light of the higher indicated need, output of engineers should be at least doubled over a period of time commensurate with making adequately qualified candidates available. This also means that the planned output of 150 diplomates and technicians per year is conservative, based on this survey's results, and should be re-evaluated along with engineering output.

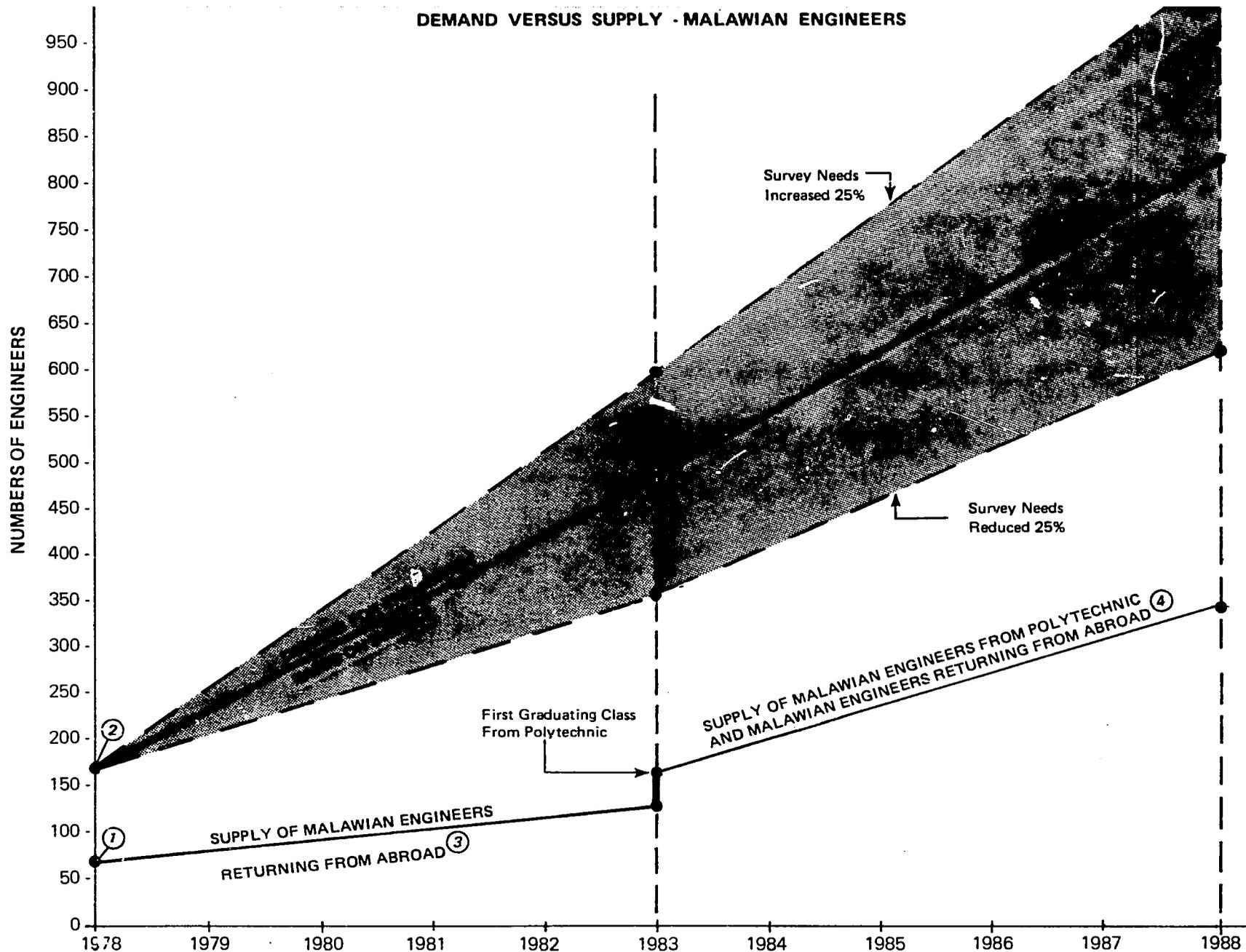
C. Qualitative Aspects of Proposed Polytechnic Expansion

As noted in Section IV, most users of the Polytechnic Institute's output stated that diplomates, in particular, rarely met their needs in terms of either theoretical or practical qualifications. This shortcoming is well known to the University, and consequently the proposed new programs at the diplomate and technician levels are designed to correct this deficiency. An expanded workshop program is planned, coupled with "sandwich" courses in industry, plus a revised classroom curriculum better tailored to the needs of the agriculturally based economy.

1

"The Desirability, Feasibility and Implementation of Setting-Up Degree Work in Engineering in the University of Malawi," The Richards Report, November 1974, Inter-University Council for Higher Education Overseas, London.

DEMAND VERSUS SUPPLY - MALAWIAN ENGINEERS



Note: Shaded area represents possible survey error of $\pm 25\%$.

Demand assumes no expatriates replaced therefore the demand estimate is very conservative.

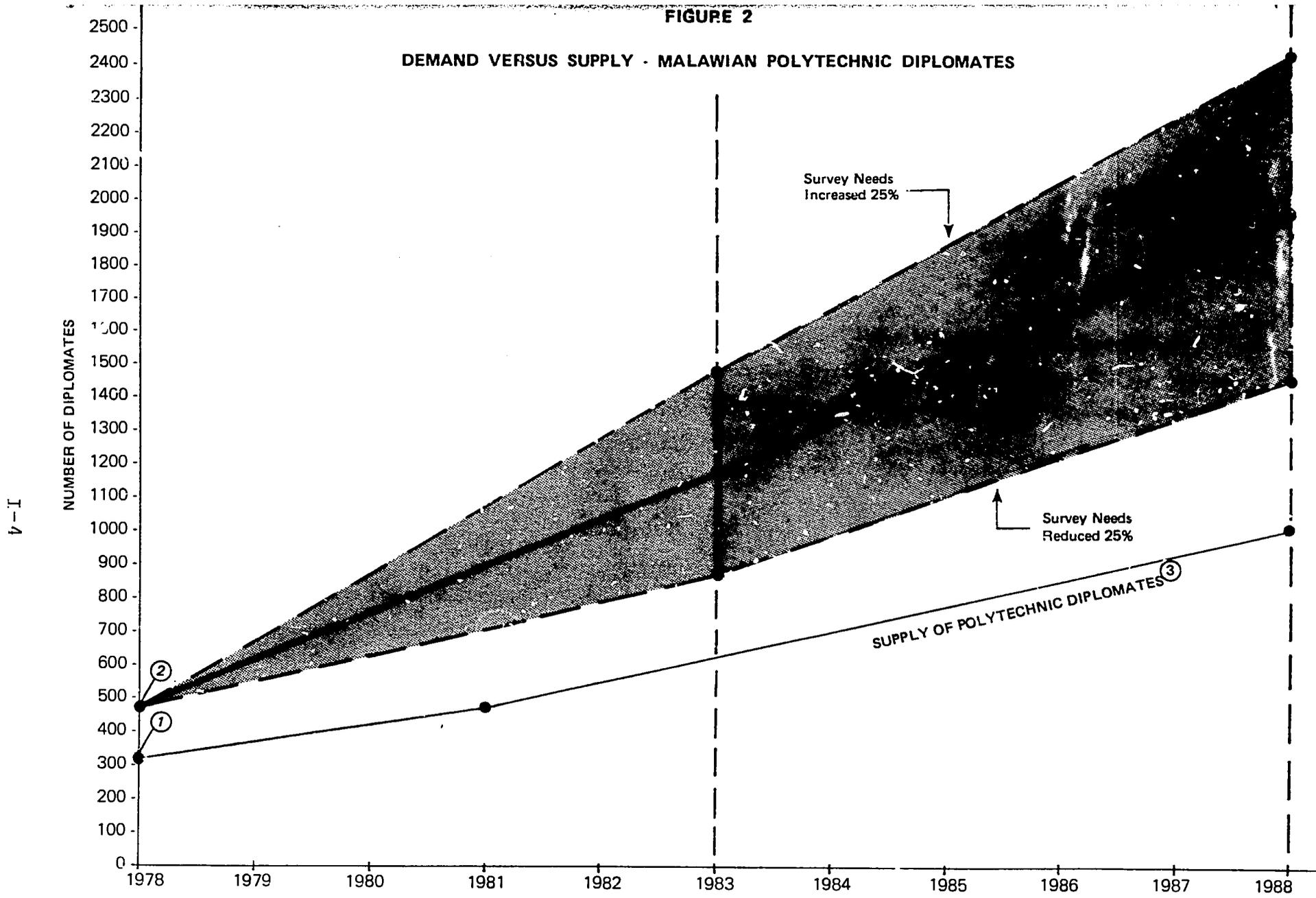
¹ Existing supply of Malawian engineers as of December 1978.

² Existing demand of Malawian engineers as of December 1978.

³ Assumes 12 Malawians returning per year to 1988.

⁴ Assumes 25 graduates per year from Polytechnic - starting in 1983.

FIGURE 2
DEMAND VERSUS SUPPLY - MALAWIAN POLYTECHNIC DIPLOMATES



Note: Shaded area represents possible survey error of $\pm 25\%$.
 Demand assumes no expatriates replaced therefore the demand estimate is very conservative.

- 1 Existing supply of Malawian diplomates as of December 1978.
- 2 Existing demand of Malawian diplomates as of December 1978.
- 3 Assumes 50/year output to 1981 -- then 75/year.

Managers interviewed by the Team felt that the new curriculum would reduce the aforementioned problem. A number of specific courses not included in the revised curriculum were also noted as being important. Some may already be included in the general courses listed by the Polytechnic, others probably cannot be fit in at the start of the program. In general, more "needs-oriented" courses and practical work are desirable and should include the following:

- elements of supervision/management;
- irrigation and sewage engineering;
- refrigeration engineering; and
- maintenance engineering.

Another desirable topic currently missing from the proposed curriculum is a course (or courses) in operations research or systems analysis. Such interdisciplinary courses cut across the traditional boundaries of the civil, mechanical, and electrical engineering fields and focus on the functions of an integrated system, like that of a railroad or a tobacco processing system.

Numerous texts exist on operations research and systems analysis. Development of a few courses tailored specifically to Malawi's agro-industrial base would be most important for increasing long-term productivity. For example, two specific courses dealing with inventory control and scheduling could follow a basic introductory course in systems analysis.

A course in adaptive research or "appropriate technology" would also be valuable. Future Malawian engineers will do little basic design work. They will, however, be called upon to help make decisions as to what advanced technologies should be imported and how these should be adapted to Malawi's agro-industries.

The need for electronics engineers will also increase rapidly in the next five to eight years. Even now, new equipment, like diesel locomotives, often has electronic elements. Plans for these future needs should be included in the Institute's Master Plan (e.g., facilities needed).

Engineers should also be given a basic course in computer applications. Although they need not be taught how to be programmers, they should be taught an understanding of the computer as an engineering tool. There are now several computers in the Blantyre area, and some have remote access capability.

It is recommended that the PP team review these aspects of the Polytechnic's program carefully, as they will have a great impact on the types of laboratories/shops planned.

D. Ratio of Malawian Engineers to Expatriates

Tables 1, 2, and 3 in Section IV provide data on the existing and projected supply of Malawian engineers/diplomates/technicians and expatriates. Because of the complexity of using expatriates versus local Malawians, a separate section has been prepared. (See Appendix G, Malawi's Localization Policy.) The Manpower Survey Team believes that Malawi's present policy of not "localizing"¹ at the expense of efficiency is sound. Some organizations contacted by the Team make deliberate plans to train local counterparts, others do not. The Team believes that some strengthening of the Government's position regarding localization would help insure proper placement of future Polytechnic graduates and diplomates, and recommends the following:

1. Require a localization plan and time schedule as a part of the issue of future Temporary Employment Permits, which should include, where possible, the identification of a specific counterpart and a training plan (ideally, some formalized training coupled with on-the-job training). The Team heard many reasons why this could not always be done--for example, there was no counterpart available. The Team also heard repeatedly of cases where a capable counterpart received few additional transferred skills from the expatriate because the training program was completely unstructured and the expatriate lacked the motivation to train him.
2. Follow up on the training program at least annually by requiring a progress report be made and by spot-checking through interviews.

E. Quality and Appropriateness of Engineering Training Received Outside of Malawi

The Team interviewed 27 returned students (see Section IV B.1). and found, with only a few exceptions, that the training received outside of the country was generally of a high quality and suited to both the student's career goals and the job in which he was placed. Most of the jobs generally involved the building of infrastructure and therefore relate directly to the upgrading of rural areas.

¹

Replacement of expatriates by local Malawians.

F. Quantity and Quality of Secondary School Output

The Team reviewed these aspects carefully and discusses them in detail in Sections IV D and E. With the on-going expansion programs in both the primary and secondary school systems, plus the upgrading of both primary and secondary school teacher training, there appears little likelihood of a shortfall in qualified secondary school input into the Polytechnic after its expansion. In addition, a degree program will attract higher level students and some diplomates and technicians now in industry can be expected to return for the improved program.

At present, the Polytechnic takes only about one student in ten with a Malawian Certificate of Education (MCE) grade of 30 or above (but the Polytechnic seldom gets the students having the top grades). With improved secondary school education, it can be expected that there will be less failures (about one-third now) and higher scores on the MCE. The gradual entry of women into the engineering field is also likely to increase in the future.

G. Job Movements and Movement Pattern of Engineers

The Manpower Survey has shown that there is practically no "brain drain" of Malawian engineers/technicians out of the country. Only three cases were noted over the past three years where a Malawian failed to return from training. There was also almost a zero wastage factor¹ in the survey sample. Malawian engineers/technicians are mostly young--under 30 years of age--and can be expected to remain in the labor force for a long period of time. Some will move out of engineering and into management positions, which is a positive factor. As noted, some diplomates can also be expected to return to the Polytechnic once it offers a degree program.

There is considerable changing of jobs, particularly on the part of technicians. Technicians generally seem to move out of government positions and into the field of industry. Diplomates move less frequently, and no significant trend was detected in the direction of flow between government, parastatal, and private sectors.

The Team found that the reason for considerable job movement was almost always because of an increase in salary and/or benefits. Since the Government increased its salaries about 30%

1

Refers to engineers/diplomates/technicians that leave the field for whatever reason.

last year, engineer/diplomate/technician outflow from government into industry should reduce. Since the individual is not lost to the Malawian economy, this movement should not be of major concern to USAID. As supply begins to meet demand, this movement will slow down.

Training engineers or technicians abroad is a risk for private companies that most managers believe exceeds the benefits. Numerous examples were given of the trainees being "lost" to another organization after finishing an expensive course abroad. This problem does not occur as frequently in the government sector, however, because the student studying outside the country is bonded for five years after his return. He can buy his way out, but the Team did not hear of any instances of this.

H. Recommendations for PP Team Staffing and Specific Areas of Concern

In regard to the PP team's structure, the Manpower Survey Team believes that the original team proposed in the Work Statement is unnecessarily large. USAID should review the team make-up based on a careful review of what has already been done in terms of planning over the past four years. The Manpower Team recommends the following professionals for staffing the PP team:

- An engineering/educational planner to look into the phased growth plan, curriculum, and future potential interrelationships and resource sharing among the three colleges of the University. (See Appendix H for a description of the Malawian educational system and the role of its colleges.) This planner is also needed to evaluate how the various donor programs fit together.

For example, Chancellor College has a plan to expand its chemistry and physics programs under a possible IDA program. Bunda College of Agriculture also is expanding under a USAID project.

Some sharing of facilities on a carefully scheduled basis might make the best use of investments in these programs. Agro-engineering students at Bunda could spend time at the Polytechnic, or an exchange could exist between Chancellor and the Polytechnic in chemistry and physics.

- A "Learning Resources Center" expert to help plan the expansion of the Polytechnic Institute's library, including provisions for linking into a computer. Ideally, this expert should have experience in audio-visual aids and a knowledge of available resources.

(The Center should be planned as the Engineering Information Center for the industrial community as well as for the Polytechnic Institute.)

- An expert engineer who knows modern engineering laboratory equipment and the associated space/teaching needs.

The Manpower Survey Team believes that the originally proposed six man PP team is not necessary, since details of the Polytechnic's expansion are well documented and unlikely to change significantly.

The Team recommends the following areas of concern be looked into by the PP team while conducting its mission:

- the Malawian localization problem (See Appendix G);
- curriculum planned versus country needs;
- possible future problem of engineering needs in Lilongwe and how this problem could best be dealt with by the Polytechnic;
- incentive program to insure against future high staff turnover at the Polytechnic;
- cost/benefit study (including the present cost to Malawi of attempting to obtain engineering talent via out-of-country training on the one hand and the import of expatriates on the other. This problem should prove a strong justification for expansion of the Polytechnic.);
- the make-up of the first few graduating classes (insuring that a high proportion of future Polytechnic teachers are part of these classes and including plans for their further education in the U.S.A.¹);
- the desirability of changing the name of the Polytechnic Institute to the "College of Engineering and Management," as recommended by the Richards Report and supported by the Manpower Survey Team; and

1

The training in the U.S.A. is important to offset the more rigid and structured traditional British education system.

- the feasibility of eventually certificating technicians to enhance the stature of the profession (beyond the present Guild Certificates).

I. Advance Preparation for PP Team

It is strongly recommended that the PP team, when selected, spend sufficient time before their departure to Malawi to:

- read all reports asterisked in Appendix E (which were delivered to USAID with Draft Report);
- familiarize itself with all past expansion planning;
- understand the present situation and, particularly, the Malawi (British) education system;
- determine in advance which areas of the planned expansion program still have questionable aspects, including: basic philosophy of expansion, curriculum, inputs (number of students for programs), laboratory facilities, and the library (Learning Resources Center); and
- determine what areas are already "locked-in" and where further investigation is not indicated. For example, the six-year general engineering graduate program, recommended by two survey teams, has now been approved by the governing bodies of the Polytechnic, and it would therefore be difficult to make program changes. (The Manpower Survey Team, incidentally, fully endorses the common curriculum philosophy described in the University's program proposal.¹ This general engineering curriculum, with some specialization in the last one or two years, is believed to be the best compromise between those who want the Polytechnic's graduates to be specialists in specific fields, such as irrigation, refrigeration, or water and sewage, versus those who want a broader-based graduate with a fundamental theoretical and practical background who will be able to move into an area of special interest at a later time.)

An analysis of the mix of requirements for specific categories of engineers (i.e., chemical, civil, electrical, mechanical) shows that the demand for civil engineers to 1988 is more than the demand for all other categories combined. In fact, this

¹

"Plan for the Development of the Engineering Faculty (at the Polytechnic Institute) on the Lines of the Richards Report up to 1985," University of Malawi, June 1975.

demand is about four times greater than for either of the next two highest-demand categories (mechanical and electrical). See Section IV F and Table 5 for details.

It is therefore recommended that the PP team review the demand versus engineer category data with the University staff to insure that it is taken into account when planning the curriculum of the General Engineering program and determining student mix.

J. Recapitulation

The Polytechnic Institute, as verified by many users of its talent, has been the "bad relation" in Malawi's University system. Built initially by USAID in 1966, and having changed little since then, it is already inadequate for its present enrollment. Students must be bused from living quarters several miles away; the cafeteria is so small that students are limited to 15 minutes for lunch (they may have to wait in line 45 minutes to use the cafeteria facilities); and some of the original 1966 shop equipment provided by the U.S.A., although operable, is hardly representative of the equipment that one finds today in Malawian industry. The library is small, and offers mostly older British texts. No common room or recreational facilities exist.

Malawi's University system should rest on three equal foundations--liberal arts, agriculture, and agro-related engineering. (See Appendix H.) Upgrading of the Polytechnic to an equal degree program status with the other two colleges of the University is long overdue. The Polytechnic now needs to become a full degree awarding college, capable of providing engineering output relevant to Malawi's long-range needs. It should become an equal partner with Bunda and Chancellor Colleges in Malawi's future education system. The sooner this is done, the better it will be for the balanced development of the country.

II. INTRODUCTION

II. INTRODUCTION

A. General

This report presents the results of an intensive one-month on-site survey of engineer and engineering technician demand and supply in the Republic of Malawi.

The survey's objective was to provide USAID with the necessary information to enable it to judge the need for and direction of assistance in expanding the Polytechnic Institute so as to increase the output of diploma-level engineering technicians and to start a new degree awarding engineering program.

The expansion of the Polytechnic Institute is required for upgrading the college's quality, for increasing the output of technicians and diplomates, and for adding a new Bachelor of Science Engineering program.

The upgrading will be accomplished by the addition of one year to the existing three year diploma course. The first year will offer a theoretical approach to basic civil, mechanical and electrical engineering, while the next three years will be "sandwich" type--with the student spending considerable time in industry, "sandwiched" between continued theory and laboratory work. This new program will help correct a major deficiency in the present diploma curriculum.

The new Bachelor of Science program will be added "end-on" to the strengthened diploma program and will entail an additional two years of general engineering. A B.S. in General Engineering will be awarded upon completion of the student's six years.

The degree program will initially be open to a select group of students (about 25 per year) who show they are capable of continuing their engineering education beyond the diploma level.

In addition to its "diplomates" and future B.S. engineers, the Polytechnic Institute will also increase the output of its "Board of Governors" courses. These are courses for lower level technicians that come under a "Board of Governors" representing government, industry and commerce, and the University. The new program provides for two types of technician courses--the University Diploma, as noted, and a mixed course of theory and practice for students already placed in industry and who are working for City and Guild Certificates. The basic change in the expanded technician program is increased practical work, which is now lacking in the existing curriculum.

Additional teaching staff for this work will require careful recruiting and could pose a problem. The Richards Report¹ recommends establishing "professional" posts at the Polytechnic similar to those at Chancellor and Bunda Colleges, which would help attract competent individuals. Expatriates will clearly be required until qualified and interested local graduates come back from advanced courses abroad.

The expansion and upgrading program cannot be carried out with the present limited space and out-of-date facilities and equipment of the Polytechnic. The physical plant expansion, as proposed by the University of Malawi and British Ministry of Overseas Development,² consists of the following:

- new and modernly equipped laboratories and shops;
- an expanded professional library;
- new staff housing;
- new student hostels on campus (there are none at present);
- an expanded cafeteria; and
- added recreation and common areas (there are none at present).

B. Statement of Work for Manpower Survey Team

Based on the need to upgrade and expand the Polytechnic Institute, USAID required specific information regarding Malawi's ability to provide the required increased supply of qualified entry level students. An appraisal of the ability of government, parastatal, and industrial organizations to absorb the increased output of both diplomate and degree holding engineers was also necessary.

1

"The Desirability, Feasibility and Implementation of Setting-Up Degree Work in Engineering in the University of Malawi," The Richards Report, November 1974, Inter-University Council for Higher Education Overseas, London.

2

"Report of the Project Development Mission on the Creation of Faculty of Engineering, University of Malawi," January 1978, British Ministry of Overseas Development.

The Manpower Survey Team was therefore asked "to determine, primarily, the demand for and supply of engineers and engineering technicians in Malawi for the present and projected to the year 2000." Specifically, the Team was to "focus narrowly" on the engineering professions (including both degree holders and non-degree technicians).¹

The following specific tasks were undertaken by the Survey Team per the Work Statement contained in Work Order No. 25 of USAID Indefinite Quantity Contract No. AID/AFR-C-1132:

1. Determination, through interviews with personnel officers and managers of public and parastatal agencies, of the present need and future demand for engineers.
2. Determination, through interviews with personnel officers and managers of private companies, of the present need and future demand for engineers.
3. Determination of the existing and projected ratio of Malawian engineers to expatriate engineers.
4. Determination of the number of Malawian engineers now in Malawi and in training outside the country, and assessment of the quality and appropriateness of engineering training received for rural and agricultural development.
5. Determination of the job and job movement pattern of Malawian engineers.
6. Determination (on a qualitative and quantitative basis) of engineering student supply coming through the secondary school system.

C. Background Details of Importance

The detailed USAID Statement of Work for the Engineering Manpower Survey of Malawi presents a good summary of the Polytechnic's role in the country's future agro-industrial development. It also mentions the British Inter-University Council for Higher Education Overseas report (the Richards Report) and general plans for expansion of the Polytechnic. It does not note, however, the extensive amount of work that has already been

1

The Team interpreted this to mean the three levels of output planned for the Polytechnic, namely, degree, diploma and Board of Governors technicians.

done regarding planning, curricula design, physical facility requirements, and shop and lab requirements over a period of more than four years. It is most important for the future PP team to know the details of the work that has been done in terms of planning since the Richards Report of December 1974. This knowledge will allow the team to operate more effectively and will avoid repetition of interviews and/or work that has already been undertaken.

The Manpower Team believes strongly that a number of basic planning documents and reports, mostly prepared by the University of Malawi, should be read and studied by the PP team before it leaves the U.S.A.¹ In fact, it is highly recommended that AID/Washington review these documents carefully before deciding on the exact composition of the PP team. This Manpower Survey Report presents the Team's recommendations on this point.

The December 1974 Inter-University Council Report referred to in the Work Statement (the Richards Report) was prepared in response to a request from the University of Malawi for assistance in upgrading the Polytechnic Institute. The full title of this report is "The Desirability, Feasibility and Implementation of Setting Up Degree Work in Engineering in the University of Malawi," and its terms of the Reference follow:

- A. Advise the Council of the University of Malawi whether it is now desirable to institute degree courses in engineering at the University, and if so, recommend:
 1. Type of degree courses appropriate to the needs of Malawi.
 2. How long the degree program should be and whether it should be taken full time or "sandwiched" (combined with industry training).
 3. How degree course training should be related to existing diploma course.
 4. Where the training should be located.
- B. Provide an outline of the recommended curriculum.

1

These documents are included in the bibliography in Appendix E and are denoted by an * beside their entry.

- C. Recommend that department or school organization would be most appropriate to the training arrangements proposed.
- D. Estimate:
 - 1. Capital expenditure necessary to insure that adequate buildings and equipment are available.
 - 2. Annual recurrent costs to run the degree program with adequate academic and technical staff.

The Richards Report was circulated widely throughout the Government and other agencies, including University Senate and Council, Ministry of Education, and Ministry of Finance, in addition to other bodies such as the Board of Governors, National Advisory Committee in Technical Engineering, and the Board of Engineers. On the basis of the positive recommendations in the Richards Report and comments from the above agencies, the University prepared its own plan of action. A June 1975 report entitled "Plan for the Development of the Engineering Faculty (at the Polytechnic) on the Lines of the Richards Report up to 1985" provides a detailed description of the expansion program as adapted to the University's interpretation of its needs. This 1975 report discusses a phased growth plan, curricula, staff requirements, facilities requirements, including student hostels, staff housing, lab and workshop needs, and expanded library needs. The Manpower Team considers the "Plan for the Development of the Engineering Faculty" a well thought-out and important document because it is the University's own practical version of how the recommendations of the Richards Report could be adapted to meet the country's unique needs.

Following this report, the University prepared two Polytechnic Project Submissions: Project A--Degree in Engineering and Project B--Bachelor of Commerce Degree in Accountancy.¹

Project A discusses further the Engineering Graduate Program and provides added details on teaching space, equipment needs, a new library, staff housing, and hostels. Project B describes and justifies a program for upgrading the Polytechnic's three-year course in business studies to a Bachelor of Commerce Degree course to train accountants. The Manpower Survey Team, during its interviews with the industrial community, found the

1

"Projects Submission, Project A--Degree in Engineering and Project B--Bachelor of Commerce in Accountancy," October 1976, University of Malawi.

shortage of accountants to be at least equal to, if not greater than, the need for engineers. This aspect of the Polytechnic's expansion should also be taken into account by the PP team, since some common facilities for the two fields may be involved.

Following these reports, yet another survey was conducted by the British Ministry of Overseas Development and a report prepared in February 1978 entitled: "Report of the Project Development Mission on the Creation of the Faculty of Engineering, University of Malawi." The terms of reference for this mission were "to assist the Malawian Government in the preparation of its formal submission of a request for British aid for the establishment of the Faculty of Engineering in accordance with the basic structure already agreed within the University. Decisions as to the structure of the degree and the new diploma courses have already been taken (underlining per the Manpower Team). The mission is to consider the practical problems of implementing these decisions."

Key points in this report, which is considered mandatory reading for the USAID PP team, are summarized as follows:

- The British team endorses the University's decision to opt for a six-year degree program with a largely common curriculum.
- The intake to the degree course should be raised progressively over a two year period from 50 to 75 and then to 100--to produce 75 Diploma Degrees and 25 Bachelor of Science Degrees per year.
- Strong elements of workshop technology and industrial training should be introduced into the program. (As noted in a later section, the Manpower Survey Team has found that lack of these elements has been a critical factor in the effective use of past Polytechnic diploma holders.)
- The intake of students for certified technician courses should be raised from 50 to 75 and then to 100 over a two year period.

The 1978 British Ministry of Overseas Development report may be considered as the present status of the long-evolving Polytechnic Expansion Project.

Based upon the aforementioned decisions, the Polytechnic Institute has in fact already begun its expansion program (starting in October 1978), with the first Bachelor of Science graduates scheduled for 1983.

Thus, course philosophy, structure, curricula, physical facilities, lab and shop equipment needs, phasing, and costs have already been determined. How this new expansion will be funded is a problem of immediate concern. Whether or not any major changes could or should be made to this program at such a late date should be a question for the PP team. In particular, since AID support is mainly for capital expenditures, the question arises of the need for review of the PP team's composition as noted earlier. Clearly, a Documentation Center or Information Resources expert should be included, since expansion of the Polytechnic's library, though not clearly spelled out, is vital.

Appendix E lists all reports believed necessary in planning AID's next step in this program. The reports indicated with an * before their entry have already been delivered to the AID/AFR Program Officer in Washington.

Several other reports relevant to Polytechnic planning are also listed in Appendix E. These were University documents and as such copies were not available to the Team.

III. SURVEY APPROACH

TTT SURVEY APPROACH

A. Approach

The survey was conducted through a series of structured interviews with a wide cross-section of users of engineer and technician talent. The Manpower Team interviewed key management officers in private industry, parastatal organizations, and the Government and undertook the following while conducting its interviews:

1. Review of Manpower Team's objectives and terms of reference for the survey.
2. A general discussion as to overall needs, problems with, and suggestions for improved Polytechnic curricula. "Users" were asked if they favored a degree-in-engineering program at the Polytechnic and the overwhelming majority did favor such a program. (These individual discussions, written up and available from the contractor if required, are not included in the report. They do, however, serve as the basis for many of the recommendations made.)
3. A discussion of content and requirements to be included in a predesigned form to obtain quantitative data on engineering and engineering technician needs (Malawian and expatriate) now and in the future. This form was left with the organization and picked up when it was completed (see Form I A, B, and C in Appendix B).
4. A discussion of content and requirements to be included in a second predesigned form to obtain information about the job movement pattern of Malawian engineers and technicians. This form was also left with the organization and retrieved later (see Form II A, B, and C in Appendix B).

Both Forms I and II were detailed enough that the Team was able to get demand and supply data by specific category of graduate engineers, diplomates, and technicians.

5. The interview of any available engineers or technicians who had returned in recent years from overseas study. The objective, per the Work Statement, was to evaluate the appropriateness of such overseas work in relation to the engineer's agro-industrial job environment when he returned. Again, a structured questionnaire was used so that answers could be easily compared. (See Appendix C.)

The Team has paid particular attention to the judgments of the numerous top-level professionals interviewed during the survey. Survey numbers that appear in this report are backed up by a review of the critical points on Malawian education, industry, and engineering that were made by the many experts contacted. (See Appendix A for listing of these experts.)

The Manpower Team worked with a Senior Economist (Mr. Z.T. Soko) and his assistant (Mr. C. Mthenda) from the Economic Planning Division (EPD), Office of the President and Cabinet, during the entire survey. EPD selected the organizations that were contacted for the interviews based on their knowledge of engineering/technician placements within Malawi, and made all appointments. A representative of EPD accompanied the Team on all of its interviews. It was evident from the first meetings that this sponsorship at such a high level helped the Team greatly in establishing credibility and in generating open and constructive opinions. The sponsorship also insured that care and thought went into preparing the various questionnaires used.

B. Shortcomings of Approach

It is important to note the following shortcomings in the Manpower Survey:

1. Advance data on the size and composition of each "user organization" of engineering talent would have helped insure that the Team interviewed a truly random sample of those users. Little information was available to determine this. As noted in Appendix D, the Apprentice Training Act Levy was the only document the Team found that gave up-to-date information on industry/parastatal sizes in terms of engineering manpower.
2. The Team, because of the limited time and availability of company managers, was unable to interview several sub-sectors of industry believed important, such as:
 - oil processing;
 - sugar processing;
 - engineering consulting firms; and
 - printing operations.
3. Advance information on the status of development planning for the Polytechnic would have made the Team's visit more efficient by reducing the amount of self-learning necessary.

4. It was agreed by all local managers interviewed that the requirement to project demand to the year 2000 (as detailed in the Work Statement) was unrealistic. Numbers can be obtained by making assumptions of future growth and by acceptance or rejection of major projects, but are not sufficiently accurate to provide the basis for making sound planning decisions as to future engineering needs to the year 2000. More details on an analytic approach to this projection are contained in Appendix D.

IV. SURVEY RESULTS AND GENERAL REMARKS

IV. SURVEY RESULTS AND GENERAL REMARKS

The Manpower Survey Team interviewed and obtained survey data from 23 major private companies, parastatal organizations, and government users of engineer and technician talent. Data on an estimated 25% of the total number of engineers/technicians in the private sector were obtained in the survey. (See Appendix D for details on how this sample size was determined and adjusted for complete industry coverage.)

With regard to parastatal and government organizations, the Team believes it reached over 90% of the users of engineers/technicians.¹ For this reason, no adjustment was made to the actual survey figures. It should be noted, however, that these figures are on the conservative side because of less than 100% survey coverage.

This section of the report presents details on the fulfillment of each task of the Work Statement in the order listed. (See Section II B.)

As noted in Section III, the Team's Interview Form I (A, B, C) was designed to obtain data needed to satisfy Work Statement tasks 1, 2, and 3 (three similar sheets were used--I A for engineers, I B for diplomates from the Polytechnic, and I C for technicians).

Specific details on future engineer/diplomate/technician demand, present vacancies, and expatriates employed, as obtained from each organization contacted, are also listed on four summary work sheets in Appendix F. These detailed work sheets should be examined carefully as they give a great deal of information on the division of manpower usage among types of industrial, parastatal, and governmental users of engineers, technicians.

The data shown on the sheets in Appendix F appear in this section in three separate tables for engineers, diplomates, and technicians. (Each table will subsequently be discussed in detail.) These three tables show aggregate needs, not taking into account a specific category of engineers/technicians (i.e., civil, electrical, mechanical). This latter information was obtained in the survey per the sample Form I (A, B, C) in Appendix B and is shown on summary sheet 1-D in Appendix F. This data is consolidated and analyzed subsequently in Section IV F.

¹

Based on opinions of key individuals in these organizations.

A. Present Need and Future Demand - Engineers

Table 1 shows the survey data obtained for existing and projected demands for Graduate Engineers, both Malawian and expatriate.

This data is presented for each of the three sectors previously noted (private, parastatal, government), and then consolidated for all three to give a total picture of Graduate Engineer demands.

Table 1 presents consolidated survey data concerning the following:

1. Malawians now in training outside Malawi.
2. Existing supply of working Malawian engineers and expatriate engineers (who could be replaced given a qualified Malawian counterpart).
3. Present vacancies for Malawian engineers and expatriates.
4. Projected situation in 1983--the year the Malawian Polytechnic Institute will graduate its first Bachelors of Science.
5. Projected situation in 1988, which is as far as most interviewed managers were prepared to forecast.

The following is a concise description of the contents of Table 1.

1. Present Situation

a. Engineers in Training Outside Malawi

The figure of 68 is believed to be a reasonably accurate estimate of engineers in training outside Malawi.¹ The largest single groups, as can be seen from Sheet 1-A in Appendix F, come from ESCOM, the national electric company, and from VIPCOR, the huge pulp project still in its early planning stage.

It should be noted that no industrial organization interviewed had any engineers in training outside the country and that there is a very large number of expatriate engineers currently holding

1

Subsequent information from the Personnel Department, Office of the President and Cabinet, indicates this figure may be on the low side. Their records show 95 students in engineering training abroad as of January 1, 1978. No data was available, however, on numbers of returning students in 1978.

TABLE 1

SUMMARY OF SURVEY RESULTS--ENGINEERS

PRESENT SITUATION DECEMBER 1978							PROJECTED SITUATION 1983			PROJECTED SITUATION 1988		
1 SECTOR	2 NOW IN TRAINING OUTSIDE MALAWI	3 EXISTING SUPPLY		4 PRESENT VACANCIES		5 TOTAL DEMAND AT PRESENT ^c	6 ADDITIONAL DEMAND ^b		7 ADDITIONAL DEMAND ^c	8 ADDITIONAL DEMAND ^b		9 ADDITIONAL DEMAND ^c
		MAL.	EXPAT.	MAL.	EXPAT.		MAL.	EXPAT.		MAL.	EXPAT.	
<u>ENGINEERS</u>												
PRIVATE INDUSTRY ^a	0	12	104	8	8	16	68	64	132	120	60	180
PARASTATAL AND CITY GOVERNMENT	59	29	22	32	10	42	83	3	86	96	0	96
NATIONAL GOVERNMENT	9	28	53	54	9	63	156	4	160	132	0	132
TOTALS FOR MALAWI	68	69	180	97	27	124	307	71	378	348	60	408

^a Industry numbers have been adjusted based on ratio of sample size to total -- see Appendix D.

^b Additional or incremental demand over preceding period.

^c Malawians plus expatriates.

positions in the private sector. Information on the number of Malawians currently in training outside the country is difficult to factor into the present or future employment picture because of varying periods out of Malawi, varying return dates and, finally, because of some inconsistencies in reporting vacancies. Many engineers were slotted for positions awaiting them; hence, their numbers do not always show up in "Vacancy" Column 4.

b. Number of Malawian Engineers in Malawi at Present
(Existing Supply - Column 3)

There are several categories of graduate Malawian engineers in the country:

- Category 1: Engineers registered under the Engineers Act of 1972. This requires 3 years of job experience plus the passing of a test.
- Category 2: Degree level engineers not yet qualified to register.
- Category 3: Some non-degree engineers who have risen to hold engineering jobs (not registered).

The Team obtained the following data from the Chairman of the Malawi Board of Engineers:

- Registered Malawian Engineers--as of December 1, 1978.....	15
- Degree-Holding Engineers--as of December 1, 1978.....	<u>37</u>
 Total	 52

The Team's survey shows the existing engineering supply to be 69 (see Table 1). It was decided after discussions with the Malawi Board of Engineers Chairman that this included a number of the Category 3 non-degree engineers and was a reasonable estimate of practicing Malawian engineers in the country.

A cross-check was possible for estimating the number of expatriate engineers in Malawi at present by use of an updated listing of Registered Engineers per the Engineers Act of 1972. As of December 31, 1977, there were approximately 110 Registered Expatriate Engineers in the country. This figure is reasonably consistent with the Team's estimate one year later of 180, since the number of expatriates over the past year has increased, as confirmed in our interviews. In addition, the Team found that an unknown number of expatriates did not register for one reason or another.

The time for replacement of expatriates by Malawians will vary greatly, depending upon the particular skills required for the job and the length of time on the job after a Malawian graduate enters the work force. Most managers interviewed stated they would bring these graduates into their organization as soon as they became available and would make them understudies to expatriates. In addition, the rate of Malawians replacing expatriates varies greatly from one organization to another, and the Team observed a few cases where little was being done to effect the localization policy.

The Team recommends that USAID, as part of its agreement with the Government of Malawi to help upgrade the Polytechnic Institute, propose to the Malawi Government the following:

1. Future engineering expatriates should be expected to present a plan for localizing when they receive their Temporary Work Permit.
2. The appropriate agency of the Government of Malawi should follow-up at least annually to determine how this plan is working.
3. A careful appraisal should be made of the length of time needed to reach realistic pre-established standards of performance.

The Team noted one instance (see Section IV B) where a Malawian trained abroad replaced an expatriate engineer in a highly skilled job in the field of civil aviation in only six months. On the other hand the Team found that expatriate chief diesel technicians could not be replaced without at least seven years of on-the-job-training.

c. Present Vacancies (as of December 1978)

Column 4 of Table 1 presents this data for both Malawian engineers and expatriates. Here again, most managers stated that expatriate vacancies were listed because they knew they could not get local Malawians or because the vacancy entailed only a position of short duration, and was therefore not suitable as a career. The majority of expatriate vacancies, however, could eventually be filled by Malawian engineers, although returned graduates will need several years on any job before they can be expected to perform on an equal basis with their expatriate counterparts.

d. Total Present Demand

The total figure of 124 engineers now needed includes both expatriate and Malawians, since it is evident that the Malawian

supply from out-of-country training will fill only a portion of this need. Many jobs will remain vacant or continue to be filled by expatriates. It should be noted that the number of Malawian engineers presently in demand is equal to almost four years output from the Polytechnic Institute. The 68 Malawians being trained abroad can be expected to fill some of these posts upon their return; however, as previously noted, most are already slotted into specific jobs. By the most conservative estimate, there now exists a shortage of at least 50 Malawian engineers.

2. Projected Situation--1983 and 1988

The year 1983 was chosen as the first projection point because it is the time that the Polytechnic will graduate its first class of engineers.

By 1983, as estimated by the Manpower Team, an additional 378 engineers (Malawian and expatriate) will be required. The majority of these engineers, 160, will be absorbed by the National Government, with private industry absorbing 132 and the parastatal organizations, 86.

The Team's projection is conservative, however, for parastatal requirements. A number of major projects, such as the one-half billion dollar Viphya Pulp and Paper operation and the National Irrigation Scheme (now in an early planning stage) could increase the need for engineers in the parastatal sector dramatically. For purposes of this survey, however, such demands as shown in Table 1 should well justify the expansion of the Polytechnic Institute.

A review of the "Projected Situation to 1988" column in Table 1 clearly indicates that Malawi does not need to worry this century about an oversupply of engineers. Even if a 100% error in estimation is assumed, the need for engineers will greatly exceed the planned supply of 25 per year starting in 1983.

On the basis of projected engineering demand, the Team recommends that plans for expanding the Polytechnic be developed to at least double its engineering output over the first three years of the expansion operation. In fact, the expansion plan should be flexible enough to expand, and perhaps double, that figure by 1990.

Once local engineers enter the job market, numerous projects and expansion plans previously postponed will be activated by many organizations. In particular, managers in the private industry sector will employ them, not only for expanded work programs, but eventually for managerial positions in Engineering Departments.

Thus, there will be an unknown increased demand that cannot be predicted now, coupled with an upward movement of engineers into management over the next ten years.

Several private industrial managers commented that once local engineers became available, the competitive nature of the business would necessitate using locals in favor of expatriates.

Summary

Results of this engineer demand/supply survey show the following for engineers:

	<u>Present Need</u>	<u>Cumulative Needs by 1983</u>	<u>Cumulative Needs by 1988</u>
Malawians	97	404	752
Expatriates	<u>27</u>	<u>98</u>	<u>158</u>
TOTAL CUMULATIVE DEMAND	124	502	910

Note: These numbers are approximate and discount localization.

The Richards Report, using data from the 1971 Manpower Survey¹ and the Economic Planning Division's 1974 Engineering Manpower Survey² estimated the engineering need to be about 250 in 1980. The Richards Report further stated that the total requirement for engineers could reach 400 to 500 by the mid-1980s, based on discussions with some of the same organizations this Manpower Survey Team interviewed. The Manpower Team's survey tends to corroborate the Richards Report's estimate.

It thus appears that the immediate problem facing Malawi is not one of possible saturation or oversupply of engineers, but rather one of insufficient engineering supply, in spite of the modest expansion program proposed for the Polytechnic.

1

"Manpower Survey, 1971," Government of Malawi.

2

"The Demand and Supply of Engineers and Engineering Technicians in Malawi, 1974-1980," August 1974, Economic Planning Division.

In fact, the Team believes that a graduating class of only 25 in 1983, as proposed for degrees, hardly justifies the added staffing and higher laboratory/library requirements specified. It is strongly recommended that the PP team look into an expanded program that more realistically meets at least a portion of the basic needs of the country.

A subsequent section, on supply of students from secondary schools, will discuss possible phasing for such expansion based on student availability.

3. Present Need and Future Demand--Diplomates

Table 2 shows that survey data obtained for these Polytechnic diploma holders. (The format of this table is identical to that of Table 1.)

The majority of comments made in Table 1 also apply to Table 2. The increase in the rate of demand for the diplomates is about the same as for engineers. It is believed, however, that when future diplomates come out of the Polytechnic with stronger practical and theoretical backgrounds than at present, they will be competing with some engineers for jobs, particularly in the early phases of industrial expansion. The Team reported in an earlier section that presently users of diplomate talent had varied opinions regarding performance quality. Most users agreed that more practical work and "sandwich-type" arrangements with industry were necessary.

It is important to note that large numbers of expatriates hold jobs at the diplomate-qualification level. They are generally highly skilled specialists capable of operating unique equipment and can only be replaced slowly. There is strong evidence, however, that on-the-job-training for Malawian replacements is not formalized enough and although some companies combine on-the-job training with some formal instruction, this is the exception rather than the rule.

Localization could be sped up by requiring that an advance plan for localizing be presented for each Temporary Work Permit issued. An annual follow-up by the Government should also be made to determine how this plan is working. Again, allowance must be made for standards of performance. A question to ask is whether a Malawian technician needs to meet the same guild tests that his certified English counterpart does. Perhaps, in some cases, standards could be relaxed where they do not involve safety hazards or damage to critical equipment.

A choice exists between lowering some operating standards (when safety or equipment performance is not affected) by using more Malawians and continuing to maintain higher standards by using expatriates until localization is feasible.

TABLE 2

SUMMARY OF SURVEY RESULTS--DIPLOMATES (OR EQUIVALENT)

PRESENT SITUATION DECEMBER 1978							PROJECTED SITUATION 1983			PROJECTED SITUATION 1988		
1 SECTOR	2 NOW IN TRAINING OUTSIDE MALAWI	3 EXISTING SUPPLY		4 PRESENT VACANCIES		5 TOTAL DEMAND AT PRESENT ^c	6 ADDITIONAL DEMAND ^b		7 ADDITIONAL DEMAND ^c	8 ADDITIONAL DEMAND ^b		9 ADDITIONAL DEMAND ^c
		MAL.	EXPAT.	MAL.	EXPAT.		MAL.	EXPAT.		MAL.	EXPAT.	
<u>DIPLOMATES</u>												
PRIVATE INDUSTRY ^a	4	172	128	64	12	76	260	104	364	312	84	396
PARASTATAL AND CITY (OVERNMENT	14	44	22	41	14	55	112	10	122	154	0	154
NATIONAL (OVERNMENT	5	110	18	59	6	65	279	0	279	324	0	324
TOTALS FOR MALAWI	23	326	168	164	32	196	651	114	765	790	84	874

^a Industry numbers have been adjusted based on ratio of sample size to total -- see Appendix D.

^b Additional or incremental demands over preceding period.

^c Malawians plus expatriates.

The number of Malawians at diplomate level in training outside the country in the private industry sector as compared to the number of expatriates being used in industry lacks up points made in the Team's discussions with private industry managers, namely:

- the managers cannot afford to send diplomates and technicians abroad;
- they run a great risk of losing them to another Malawian organization if they do; and
- it takes too long for a Malawian diplomate to acquire the skills needed to allow him to do the same job as an expatriate (the Team has questioned this point).

Summary

Results of the diplomate demand show the following:

	<u>Present Need</u>	<u>Cumulative Needs by 1983</u>	<u>Cumulative Needs by 1988</u>
Malawians	164	815	1,605
Expatriates	<u>32</u>	<u>146</u>	<u>230</u>
TOTAL CUMULATIVE DEMAND	196	961	1,835

Note: These numbers are approximate and discount localization.

Here again, there appears to be little worry about saturation of the market, even disregarding some localization that will be occurring. The strengthening of the diploma program by a one year extension and the addition of much more practical work means that future diplomates will be better prepared to meet the needs of industry than they have been in the past. (One manager stated that the diplomates are presently neither technicians nor engineers, but "somewhere" in between.) In the future, diplomates will therefore be able to compete on more equal terms with technician level expatriates.

4. Present Need and Future Demand--Technicians

Data on this level of employee is difficult to obtain on a comparative basis. The Government has its own classification

system and some industries also have their own--generally based on specific Guild or other requirements. During the Team's interviews, an attempt was made to set some standard, i.e., classifying each at least as a secondary school (MCE) graduate with two or more years on the job, or as a Polytechnic technician.

Regardless of the manner in which technicians are classified, the need for them is obvious, as seen from Table 3, which shows the present situation, the projected situation to 1983, and a further projection to 1988 of technician supply and demand. The shortage pattern observed for engineers and diplomates is still evident, but even more acute when one looks at the projected demands to 1988. The ratio of Malawians to expatriates appears to be more reasonable for technicians than for diplomates. The following tabulation shows cumulative demands for technicians to 1988:

	<u>Present Need</u>	<u>Cumulative Needs by 1983</u>	<u>Cumulative Needs by 1988</u>
Malawians	344	1,743	3,599
Expatriates	<u>46</u>	<u>148</u>	<u>250</u>
TOTAL CUMULATIVE DEMAND	390	1,891	3,849

Note: These numbers are approximate and discount localization.

Since localization would logically start at the lower skill levels, this seems to imply that it is working better at the technician level than at the diplomate level.

The 40 technicians identified in Column 2 of Table 3 being trained abroad were involved with specialized electrical training in the parastatal sector. Also in Table 3, figures include a number of Junior School Certificate (ten years education) and lower technicians who had risen through job performance, although the majority are believed to be from secondary schools. They, too, place a demand on the limited supply of MCE candidates available. Many of them, however, did not qualify for any further university training or were unable to continue schooling for other reasons. Therefore, the bulk of the supply of these technicians comes from a different MCE level than the University. (See Section IV E for details on Secondary School failures.) Demand for them, therefore, does not adversely affect University of Malawi intake to any significant extent.

TABLE 3

SUMMARY OF SURVEY RESULTS--TECHNICIANS

PRESENT SITUATION DECEMBER 1978							PROJECTED SITUATION 1983			PROJECTED SITUATION 1988		
1 SECTOR	2 NOW IN TRAINING OUTSIDE MALAWI	3 EXISTING SUPPLY		4 PRESENT VACANCIES		5 TOTAL DEMAND AT PRESENT ^c	6 ADDITIONAL DEMAND ^b		7 ADDITIONAL DEMAND ^c	8 ADDITIONAL DEMAND ^b		9 ADDITIONAL DEMAND ^c
		MAL.	EXPAT.	MAL.	EXPAT.		MAL.	EXPAT.		MAL.	EXPAT.	
TECHNICIANS PRIVATE INDUSTRY ^a	0	324	60	112	12	124	660	60	720	948	72	950
PARASTATAL AND CITY GOVERNMENT	40	258	58	122	34	156	271	40	311	432	30	462
NATIONAL GOVERNMENT	0	322	72	110	0	110	468	2	470	381	0	381
TOTALS FOR MALAWI	40	904	190	344	46	390	1,399	102	1,501	1,856	102	1,958

^a Industry numbers have been adjusted based on ratio of sample size to total -- see Appendix D.

^b Additional or incremental needs over preceding period.

^c Malawians plus expatriates.

The great demand for technicians confirms what the Team heard from almost every organization it interviewed. As the Secretary for the Ministry of Works and Supplies (largest user) stated in an interview, "if anything stands out from this exercise (referring to his Ministry only) it is the need for good-quality technicians."

Job movements of technicians within the country have been great because of spiralling demand coupled with increased benefits and salaries. One Ministry reports that it loses about 30% of its technicians annually to private industry (this may have slowed since the recent government salary increases). In any event, such movement occurs within the country and the individual, therefore, is not lost to the trade.

In summary, the survey of needs for skilled technicians shows even greater critical shortages than found for diplomats and engineers. The new "sandwich" program the Polytechnic is beginning with industry, coupled with an expanded technician output, will alleviate the problem but not solve it. New trade schools need to be built and both industry and government need to speed up institution of their own training programs.

B. Quality and Appropriateness of Training Received Abroad

The Team interviewed a cross-section of out-of-country-trained students who have returned to Malawi over the past two years to obtain details on quality of training received and its appropriateness and relevance to Malawi's agro-based engineering manpower needs. In addition, the "users" of this talent were interviewed as a routine part of the survey.

1. Interviews with Returned Students

A pre-planned questionnaire was used so that results could be readily consolidated. A total of 27 student returnees filled out this questionnaire and discussed specific points of importance with the Team. Appendix C contains a list of all persons that filled out the questionnaire, the degree or certificate obtained, and organization affiliation at the time of the interview. It may be valuable to follow up on the degree-level people in a few years to determine how their out-of-country studies helped them professionally in the long run. Appendix C also contains two examples of outstanding results made possible because of such training.

As noted, Interview Questionnaires were completed by 27 trainees. Over one-half were trained in England, three in Canada, three

in the United States, and one each in New Zealand, Zambia, Nairobi, Bangladesh, and Scotland. Other than secondary education (five were A-level)¹, eight had completed work at the Polytechnic, and three were from Chancellor College.

About 60% of the trainees returned with Bachelor of Science degrees in engineering, and one is expected to receive a Master of Science degree in 1979. One had a diploma, seven had certificates, and two were sent out for instruction on the operation of specialized machinery and to observe manufacturing processes.

Almost one-half of the trainees were sponsored and funded by their organizations. The balance were on fellowships and funded by organizations such as UK, CIDA, SCAAP, the Malawi Government, UNDP/FAO and AID.

Generally, the training the Malawians received out of the country was good and relevant to needs. The trainees mentioned coming home with new skills and to new or better jobs at higher salaries. Some felt the experience improved their standing with management and other employees; others gained confidence in problem solving and in further self-study.

An outstanding result of overseas training was observed in the experience of a young man with only a Cambridge School Certificate from a secondary school. After working as a trainee in the radio department of the Ministry of Transportation for six months, AID sent him to the University of Texas for a program in electronic engineering. After completing courses in basic electronics, digital circuits, amplifiers, transmitters, antennas, computer programming, radar, power generators, modulation systems, and radio frequency planning, he received a BS degree in electrical engineering. He then enrolled at the Oklahoma FAA Academy, where he qualified for a license in aeronautical radio and navigation aids. During vacation periods, AID sent him to airports in several states to observe their operations, which covered aviation equipment, maintenance, and installation. Upon returning to the radio department in Malawi's Ministry of Transportation, he was assigned as an understudy to an expatriate engineer. Six months later he replaced him. (See his completed questionnaire in Appendix C.)

¹

Equivalent to 14 years of schooling versus 12 for "O" level.

Another exceptional case was a graduate from Chancellor College in Physical Sciences. (See his completed questionnaire in Appendix C.) UNDP/FAO sent him to Syracuse University for a mechanical engineering degree with a major in Paper Science. After meeting the basic engineering requirements, which included special courses in Pulping Technology, Paper Control, Economics, and Paper Properties, he returned and accepted a position as Professional Officer at the Viphya Pulp and Paper Co. He should be very valuable to the operations of the one-half billion dollar company as it develops. This company has sent 19 Malawians out of the country for training, since they propose to operate the plant solely with Malawian engineers once it begins operations.

Air Malawi¹ has sent and will continue to send trainees out of the country because of its special needs--it depends on British Airways for technician training. Mention was made that if electronic engineers became available from the Polytechnic, they could be trained on the job in a short time--thus eliminating the long training period in England for this type of employee.

The trainees interviewed seemed to prefer the "sandwich-type" of training practiced in the United Kingdom, where their time is split between college and industry. This seems a practical approach, and could better meet the needs of the Malawians.

One of the problems faced by trainees is the long time--three to four years--they spend overseas without a home leave. Initially it is difficult for them to find their way around and to adjust to another culture; even the colder weather they experienced was unpleasant. Three stated that if there had been a degree program at the time at the Polytechnic, they would have preferred going there instead of abroad.

In a few cases, trainees expressed some disappointment with their training abroad. One trainee enrolled in a college in England and expected to get a degree. He said he lost interest partially because of homesickness; he failed electrical engineering courses during his second year and was not permitted to repeat them. He was then told to pursue a higher level National Certificate so that he could return home in the allotted time; he expressed frustration, but was able to complete the program. This trainee favored the offering of an engineering degree at the Polytechnic and expressed an interest in attending the course if given the opportunity. Upon the return to his company,

¹
Air Malawi did not fill out their Form I satisfactorily, as it showed no future requirement for engineers (See Appendix F, Sheet 1A.)

he was given a salary increase (from K144 to K320) and given a slight increase in responsibility, although he was still in job training.

In another case, a trainee completed a three year program in electrical engineering at an English university. He felt the course was too short and there was not enough time for practical training. Therefore, his company permitted him to do further work with the South of Scotland Electric Board, which proved to be worthwhile, although he complained that he could not work on his own--he could only observe and ask questions.

One of the trainees sent by the Malawian Government to a university in the United States for a BS degree in mechanical engineering was enrolled in a highly theoretical program that offered no opportunity for doing practical work. When he returned to Malawi, he was hired by a large company that had no need for a professional engineer. Unfortunately, he was assigned a technician's job. The manager was most critical of his performance as compared with the other technicians. There was a case of being overly educated for the job at hand. The "technician" appeared little motivated to change positions, however, for reasons not expressed to the interviewer. Since it would appear that there were plenty of vacancies in Government, this trainee could have used his engineering background more effectively.

2. Discussion with "Users" of Out-of-Country-Trained Students

The Team found considerable differences of opinion regarding the benefits of out-of-country training in its discussions with engineering and company managers. For example:

- a. The private construction industry presently does not send anyone abroad for training because of the high cost involved and the great risk of losing the returning student to a competitor.
- b. Many other private companies favor some specialized training but are unable to afford it (the smaller growing concerns).
- c. Some companies oppose out-of-country training as a matter of principle. "We don't believe in it," stated the General Manager of one large private company.
- d. Private companies in general tend to use expatriates and they provide on-the-job training for an eventual (often not yet identified) local counterpart. Many

companies train their good local hires (i.e., diplomates from the Polytechnic) and give them an increasing amount of responsibility when they show they are ready for it.

- e. Specialized training to operate or maintain complex equipment is given to secondary school graduates (and lower-level staff in certain cases) in the processing industries. These industries have unique equipment and therefore do not worry about losing their returned "expert" to another company.

3. In conclusion, the Team generally found past out-of-country training of a high quality and reasonably matched to local needs. It is considered a very important aspect of Malawi's future integrated education system. In the future, such training should be re-evaluated in terms of its unique objectives when qualified engineers are being produced within Malawi. The basic criterion to be met--the training objective--cannot presently be accomplished within the required time span.

C. The Job Movement Pattern of Malawian Engineers/Technicians

A separate form (Form II, A,B,C) was set up to obtain information on the job movement pattern of Malawian engineers/technicians. (See Appendix B.) This form was set up in response to USAID's concern about "brain drain" and to collect information on attrition ("wastage"¹) for manpower projections.

The Team has reviewed basic data from each of the organizations interviewed and has reached the following conclusions:

1. There is no "brain drain"--since Malawians cannot leave the country without special permission.
2. The majority of Malawians in training abroad return to their country when their studies are completed. (The Team has no concrete information about any Malawian being outside the country for training and not returning, although two to three cases of this type occurred over the past three years, and were mentioned verbally to the Team.)
3. Movement of diplomates and technicians within the country has been great because of a spiralling wage, increased benefits, and increasing diplomate/technician demand. For

¹ Refers to engineers/diplomates/technicians that leave the field for whatever reason.

example, the Team knows of several Polytechnic diploma-level persons who changed jobs so they could join a company that gave car loans.

The "piracy" among private, parastatal, and government organizations will probably continue until a reasonable balance is established between supply and demand.

4. The Team believes that the inter-organization movements do not pose a tremendous problem as long as they occur within the country. The individual is usually able to upgrade himself, he still possesses a useful skill, and he is able to take full advantage of the free market.
5. Attrition, or a "wastage factor," is so low that in any manpower projections the Team uses it can be considered to be zero. Most Malawian engineers, diplomates, and technicians are young and few will even approach the Government retirement age of 50 this century. Wastage in education, in fact, will likely be matched by former students re-entering the school system. The Team saw an example of this at Bunda Agricultural College, where a special class of 40 students "re-entered" the system after having been in out-of-school activities for several years.

The Team believes the following excerpts from survey data to be of interest in regard to this discussion:

- Air Malawi lost 19 people over a three year period to Gulf Airlines.
- Malawi Railways lost only three engineers and two technicians over three years to other organizations. The slow rate of localization was responsible for at least one engineer resigning.
- The only attrition of an engineer not associated with resigning for a better job was because of an accidental death.
- The high mobility among diplomates and technicians is directly related to varying benefits and stability of employment. The engineers/diplomates/technicians are well-informed about the job market--one firm has had no movement at all in five years.

It was not possible to determine if the flow of engineers and diplomates went from government into private industry. Since government salaries were raised 30% last year, it is likely

that the flow became equal in all directions. The Master Chart prepared by the Team for "Job and Job Movement Patterns" contained so many zeros because of the lack of job movement that it was not worthwhile for inclusion into the report. (The chart is available and can be reproduced for AID/W if necessary.)

D. Qualitative Adequacy of Engineering Student Supply from Secondary Schools

There is a concerted effort in Malawi to improve the quality of education at both the primary and secondary level and to provide more facilities to accommodate a greater number of students.

During the decade ending 1975/76, the number of students in primary schools increased from approximately 286,000 to 642,000, with an increase in teaching staff of 180%. The increased enrollment of the secondary level was from approximately 6,500 to 14,500 with 3-5 times the number of teachers. This gives a teacher to student ratio of 1 to 60 in the primary schools and 1 to 20 at the secondary level.

Emphasis in the primary schools is being placed on the agricultural content of courses because this is a final program for about 90% of the students in Malawi. Most of them return to thousands of small farms to take part in production agriculture. This process is justified because the prospects for rapid economic development depend upon a rise in agricultural production.

The vocational training program for volunteer "Young Pioneers" has been very worthwhile. After one year of training they return to their communities and serve as advisors to local farmers.

The goal for 1980 is for 50% of those of primary school age to be attending school. This should have a positive effect on the agricultural sector. It will have the added advantage of increasing the number of Primary School Leavers Certificate (PSLC) holders eligible to enter secondary schools.

An improvement in the quality of education at the primary level will depend on better teaching standards. Three new national colleges have been completed over the past decade and one new training college has been recently completed under the IDA II project at Mzuzu. In 1978, 210 students will be accommodated. This figure will increase to 420 in the following year. By 1980, when full capacity is reached, the increased primary school teacher capacity will be 520/year.

Primary school teachers train in a national college for three years, then obtain a "probationary license." After teaching for two years under close monitoring, they obtain their "Authority to Teach." Most of them return to their own villages to continue teaching.

The improved teaching resulting from the training program should also increase the number of Primary School Leavers Certificate (PSLC) holders in the secondary school pool. At the present time, the secondary schools can take only 10% to 15% of the output from the primary schools. Therefore, a grade of 90 or better on the test that awards a PSLC is presently required for acceptance into a secondary boarding school.

The chief function of secondary schools is to prepare the growing supply of MCE graduates to meet the increasing number of posts available in the private and public sectors and to prepare students for post-secondary education.

There are presently only 61 secondary schools in Malawi--with an average capacity of 260 students. There is a definite need for more schools at this level. However, comments were heard during the survey expressing the fear that a rapid expansion in the number of secondary schools might work against the schools' quality for the following reasons:

- the entry standards were likely to be lowered to achieve the desired intake;
- the expansion could result in recruiting poorly qualified or unqualified teachers; and
- the construction of new facilities might occur slowly, thus overcrowding could result, and cause an adverse effect upon internal efficiency.

During the course of the survey, the Team heard comments by members of industry and also by the Polytechnic staff about the poor quality of student output from some secondary schools. Because of this shortcoming, the Polytechnic has had to include a considerable amount of remedial work in the courses given during the first academic year. The problems in the secondary schools center around quality of teaching; day schools versus boarding schools; and the lack of advanced courses in mathematics and the physical sciences, in drawing, and in shop practice.

Quality of education depends, to a large extent, upon the quality of teaching. The present plans to expand the teacher training center at Chancellor College are important to insure continued

quality outputs from the country's secondary schools. With this expansion, Malawi will have enough qualified teachers to serve the secondary schools. Earlier reliance upon expatriates in these schools is being reduced.

Secondary boarding schools, which have in the past turned out students with higher test scores for the Malawi Certificate of Education (MCE), will acquire increased capacity for approximately 1,800 students by 1979. Seven of these schools are for girls; one school is coed.

Upgrading of "O" level schools to "A" level through the addition of two more years of study would improve the quality of secondary education. There is only one school in this category now and one more is being developed. There are those that argue that the two year difference is not that significant. In fact, Zambia went into an "A" level expansion, only to drop it later on. (It is the Team's understanding that these issues have been addressed in the IDA Phase III Plan--which it has been unable to obtain.)

In summary, it can be stated that Malawi is making great progress in upgrading the quality of secondary schools through a well-conceived program that extends into the primary schools. The upgrading can result in the increased number of qualified candidates for the University. (See Section IV E for details on numbers.)

E. Quantitative Adequacy of Engineering Student Supply from Secondary Schools

Table 4 shows the output of secondary schools beginning in 1972, when the first Malawi Certificates of Education (MCE) were issued. It also projects this figure to 1990 based on known expansion of the secondary school system (data provided by the Ministry of Education).

This expansion occurs in boarding schools, which will not only increase secondary school capacity considerably, but will also increase the quality of the output (see Section IV D). As seen in Table 4, more than one-third of all secondary school attendees presently (1978) fail to get their MCE. This figure should decrease considerably after the new schools begin next year because of the impact of on-going improved primary school teacher training. A new Teacher Training College is being completed under the IDA II program in Mzuzu in the north, and, in addition, Chancellor College is improving and expanding its secondary school teacher training output.

It was stated in discussions with a wide cross-section of knowledgeable education experts at the Ministry of Education

TABLE 4

OUTPUTS OF SECONDARY SCHOOLS--1972-1990
(Ministry of Education data)

YEAR	NUMBER ENTERED (rounded)	NUMBER PASSED (rounded)	PERCENT PASSED ^a (rounded)	POLYTECHNIC DEMAND ^d (per year)	REMARKS
1972	2,000	1,275	63		The first year that the Malawi School Certificate of Education (MCE) issued.
1973	2,400	1,350	56		
1974	2,500	1,350	55		
1975	2,600	1,600	68		
1976	2,500	1,600	65		
1977	2,650	1,650	62		
1978	2,650	1,650	62	91	
<hr style="border-top: 1px dashed black;"/>					
1979	2,900	1,750 ^b	60	166	Assumed 60% - conservative
1980	2,900	1,750	60	250	Assumed 60% - conservative
1981	3,000	1,800	60	325	Assumed 60% - conservative
1985 ^c	4,350	2,800	65	350	Assumed 65% - since increase in capacity is in boarding schools.
1990 ^c	4,350	3,150	70	350	Full impact felt of primary and secondary teacher upgrading. IDA III program may also be complete (further upgrading of primary schools).

^aAverage number of students passing 1972-1978 about 60%.

^bAssumes International Development Association II program outputs of about 1,750/year added (all boarding school expansion).

^cData obtained from Ministry of Education.

^dFor degree/diploma program, expanded program.

and the University that high-level students will be available for future enrollment in the Polytechnic.¹ The Team agrees that this is likely to be the case, but recommends that the PP team follow up to determine what effect the parallel expansion of the Polytechnic, Chancellor College, and Bunda College of Agriculture will have. The Team lacked sufficient time to investigate this aspect fully, and recommends that the PP team consider the University of Malawi as an integrated educational system, rather than looking at its colleges separately. This will be important for using AID's investment in Malawi's educational system to the best advantage. The Team, for example, has heard little about the interchange of students among the three colleges, although it is logical to assume there will be some--particularly between Bunda and the Polytechnic Institute when it has a degree program. This aspect should be looked into by the PP team.

Table 4 shows projected demand for inputs at the Polytechnic compared to available secondary school outputs. As can be seen, there appears to be a sufficiently large pool of students available to the Polytechnic. However, even if the supply of students with MCE scores of over 30 proves limited, the Polytechnic can accept students having slightly lower scores in order to fill its complement.

A final point of interest is that the National Wages and Salaries Policy is an instrument that can be used to create or modify incentives for specific occupations. It can thus stimulate or suppress entry into the engineering profession, using as its basis frequent appraisals of need.

In summary, the Team found that although the output of the secondary schools is more than adequate quantitatively to meet the future needs of the Polytechnic, an integrated evaluation of the long-range needs of the University of Malawi is recommended as part of the PP team's work.

F. Review of Demand for Engineers by Category of Engineer

The Engineering Degree Program recommended in the Richards Report and accepted in principle by the University of Malawi was of a general engineering nature, offering some opportunities for the students to take extra courses in civil, mechanical, or electrical engineering during their last two years of study.

1

The Polytechnic currently selects one in ten applicants--namely, those who apply who have a 30 or higher MCE score.

The University decided to opt for a general engineering program on the basis of expected comparable long-range needs among the major engineering fields and the desire to provide the student with a strong and broad engineering base before entering the job market. As noted elsewhere in this report, this viewpoint has not been universally accepted by the "users" of this engineering talent. Some believe the Malawi degree holder should be more narrowly specialized.

Table 5 provides an analysis of 10 year cumulative demand for Malawian and expatriate engineers by category (i.e., chemical, civil, mechanical, electrical). The table shows that the demand for civil engineers over the next decade is greater than all other categories combined and is four times greater than either of the next highest demand categories (electrical and mechanical). This need is directly related to the build-up of Malawi's road infrastructure, dams, and water and sewage systems. It can be expected to peak in the next 10 years and then begin to level off as these systems come "on-line."

These results should be taken into account when structuring the General Engineering Program to meet indicated needs; for the foreseeable future, strong civil engineering "minors" or options would be important for these general engineering students.

The PP Team should therefore review this data with the University staff and insure that the qualitative output of the General Engineering Degree Program meets the indicated needs in civil engineering.

G. Data Accuracy

It is difficult in such a survey to evaluate data accuracy. Since the basic information on "Present Situation" in Tables 1, 2, and 3 came directly from Organizational Records, these should be accurate. As noted elsewhere, "vacancies" often posed a problem. In some cases there would be a vacancy only if a Malawian were available to fill the post. Hence, the Team believes that the number of vacancies is very much on the conservative side.

As to projections, these are based on the estimates of those who know their organization best. The five-year projections should be realistic; those for ten years will probably have a somewhat larger variance.

The managers who made these projections generally made conservative assumptions. Therefore, it is likely that the case for future needs has been understated. One reason for this likelihood is that some of the major development projects will come into being during the next ten years.

TABLE 5

SUMMARY OF SURVEY RESULTS--GRADUATE ENGINEER DEMAND BY ENGINEER CATEGORY

CATEGORY OF ENGINEER	PRESENT SITUATION DECEMBER 1978					PROJECTED SITUATION 1983			PROJECTED SITUATION 1988			PERCENT DEMAND BY CATEGORY ⁴
	PRESENT SUPPLY		PRESENT VACANCIES			CUMULATIVE DEMAND 1983 ²			CUMULATIVE DEMAND 1988 ³			
	MAL.	EXPAT.	MAL.	EXPAT.	TOTAL	MAL.	EXPAT.	CUM. TOTAL	MAL.	EXPAT.	CUM. TOTAL	
CHEMICAL	4	0	2	0	2	9	11	20	17	11	28	4%
CIVIL	27	73	64	7	71	230	21	251	380	33	413	60%
ELECTRICAL/ ELECTRONIC	10	8	9	7	16	41	11	52	87	11	98	15%
MECHANICAL	13	11	15	4	19	47	8	55	87	11	98	15%
OTHER ¹	6	10	1	3	4	20	4	24	34	4	38	6%
TOTAL FOR MALAWI	60	102	91	21	112	347	55	402	605	70	675	100%

Note: Actual survey numbers. Not adjusted for 25% industry sample (see Appendix D).

¹ "Other" consists of marine, aircraft engineers and teachers.

² Vacancies plus 1983 incremental demand.

³ 1983 Cumulative Demand plus 1988 incremental (see Appendix F - Sheet IV).

⁴ Rounded off.

Another source of error is in projecting from the Team's survey sample for private industry to the total population of engineers and technicians in all companies in private industry. The rationale for this adjustment is discussed in Appendix D. The actual number of all engineers/diplomates/technicians in private industry in Malawi (per Tables 1, 2 and 3) could also be in error. Here again, however, the end result should be on the conservative side for the following three reasons:

1. There is an assumed 100% sample of government and parastatal organizations (not the case, of course).
2. The Industrial Training Act Levy--used to obtain the ratio of population of engineers/technicians in private companies to the observed sample--did not cover these companies 100%. The Labor Department official in charge of this Levy estimated 80% coverage, again making the survey numbers conservative.
3. It is understood that the most recent Levy, to be issued on December 31, 1978, will show at least a 10% increase over the prior one (used by the Team). This again puts the assumed numbers on the conservative side.

It should be noted that the objective of the survey was to provide AID with a basis for making a rational decision for the continued further expansion of the Polytechnic. The Team believes the data obtained during the survey will provide substantial support for such a decision.

Historically, it has been found that opinion surveys of future manpower requirements beyond a period of five years at most are subject to considerable error.¹ In some cases, however, organizations work on a ten-year projection, and some of the projections the Team obtained for up to ten years may be realistic. After discussion with AID/W, up-to-date data on GDP (monetary) and population growth, and results of the Malawi 1971 manpower survey² were sent back to the Manpower Survey Team for review of the feasibility of econometric projections. Such projections would require Malawi Government projections of Gross Domestic Product. Appendix D discusses this point.

1

Specific studies of the accuracy of such projections to 10 years indicate error of as much as 100%. (See "An Evaluation of the Occupational Training Information System (OTIS)," Economic Development Administration, U.S. Department of Commerce, 1974.)

2

"Manpower Survey, 1971," Government of Malawi.

Because so little data exists, however, the confidence in any projection remains low. In fact, the Team believes, as did the Richards Report, that the valuable judgment of users of engineering/technician talent, who are familiar with the country, its development policies, and their particular growth plans, should be given as much importance in a decision to expand the Polytechnic as a manpower survey.

V. SPECIAL POINTS OF INTEREST AND CONCERN

V. SPECIAL POINTS OF INTEREST AND CONCERN

The following points arose during the course of the Manpower Team's interviews and background reading, and are listed here as background for the PP team. Some points are repeats of those made and amplified elsewhere in this report.

1. All the key private industry managers interviewed stated positively that immediate strengthening of the Polytechnic through an improved curriculum and addition of a degree program was most important to the future balanced development of Malawi. One manager in the processing industry said the program would not help him because he did not use any engineers (although he had a returned overseas graduate being used as a technician).
2. A point made often was that the present diplomate graduates from the Polytechnic were at a sort of "half-way house." They were neither good technicians (because of insufficient lab/shop training) nor were they engineers (because of insufficient basic engineering studies). The new program offering considerably more "sandwich-type" training (i.e., rotation into industry, Government) should correct this deficiency for the diplomate.
3. The addition of a degree program at the Polytechnic will increase the quality of the student body. At present, secondary school graduates with high scores and ambition tend to go to Chancellor College where they can get a Bachelor Degree. When a degree in engineering can be obtained at the Polytechnic, many of these students will choose to go there.

This point was checked by reviewing the "College of Choice" listed for about 1,500 secondary school graduates in 1977. Results were as follows:

<u>Student Grade</u>	<u>Chancellor</u>	<u>Poly- technic*</u>	<u>Bunda</u>
7-10 (7 is highest possible)	3	1	1
11-20 (equivalent to A-B level)	47	9	2
21-30 (equivalent to B-C level)	60	27	28

*30 is cut-off point for Polytechnic acceptance.

It was stated by the Polytechnic staff that about 1 in 10 applicants are accepted, although few of these applicants come from the top two levels, as can be seen from the preceding table.

4. The point was often made that higher education in Malawi is unbalanced. It now rests on two firm bases of equal status--the Liberal Arts and Law College at Chancellor and the Agriculture College at Bunda, both awarding degrees--and on one unequal base, the Polytechnic Institute, awarding only diplomas. For balanced development, with Malawians moving into key positions, it was believed essential that the three bases be equal.
5. The expatriate engineer problem is a critical one. At least one industrial leader stated he used expatriates "to survive." When he can replace an expatriate with a qualified Malawian, he will do so.

The Team found some abuse of the liberal Malawian Government Policy of using expatriates only until they could be replaced by locals with no lost efficiency. In particular, some parastatal organizations headed by expatriates have only token Malawian staff at higher levels and inadequate training programs to qualify others to become more highly skilled. This has been a reason why a few Malawian engineers have left these organizations.

6. High staff turnover at the Polytechnic has resulted in uneven quality of instruction. Here again, ungrading the lab/shop and other physical facilities, plus setting up professorships and salaries consistent with the other two Colleges, should alleviate the problem.
7. The cost of using expatriates instead of locally trained engineers, coupled with out-of-country training of the locals, has a double-edged impact on Malawi's balance of payments. If dependency on expatriates was reduced and Malawians were trained locally, currency outflow would be reduced in two ways. Funds thus saved could be channeled into high-priority projects. The AID PP team should take this factor into account when appraising the "Cost versus Benefits" of the expansion program.
8. Job movements among the three sectors of private industry, parastatal, and government organizations appear to be a function of the differentials of salary and benefits security that exist. It would be advisable for

the Government of Malawi to anticipate increasing competition for engineering/technician talent from the private sector and continue to plan to offset it with equal conditions of hire. It would be detrimental to the country's balanced development at this stage to let the Government be the training ground for young engineers, who then move into industry to capitalize on their knowledge of government and use their contacts to enhance a private industry. It should be noted that such movement is often desirable at a later stage of a country's development, but not before the necessary infrastructure of roads, railways, irrigation and water systems, and electricity are already in place.

9. The Team has found little information on any research activities going on outside the realm of agriculture. It is believed important that this subject be included in a degree curricula and that it be directed toward the problem of adapting and applying existing technology to solve practical agro-rural development problems. This is a new area but skills can be taught that will allow one to evaluate alternative technologies against a set of criteria appropriate to Malawi's development policies. This would help decision-makers in deciding how best to set priorities on new secondary industries desirous of establishing themselves in Malawi.
10. The Richards Report recommended that the Polytechnic change its name to "College of Engineering and Management," since a poor image was often associated with the Polytechnic because of the "better than you" attitude of some of the trades' artisans that it turned out. The Team suggests that with its new program at the degree level, a name change might increase the number of applicants.
11. As some indication of the explosive industrial growth around the new capital city of Lilongwe, officers of the Capital City Development Corporation showed the Team a list of 18 major companies listed for the new industrial park. They claim that even this early in the city's growth, industrial park space is at a premium. Although it was not possible to get actual numbers on this expansion, it will result in considerable added demand for engineers and technicians.
12. There will also be a growing problem with adequate on-the-job-training coupled with Polytechnic theoretical work in the rapidly growing Capital City area around Lilongwe. With a lot of new industry moving in, the

new International Airport scheduled to open soon, and the continued growth of the new Capital and Ministries, the need for the "sandwich" program of combined in-service plus in-Polytechnic training will grow. It is recommended that the Polytechnic develop plans for supplying Lilongwe with the support it will need. Perhaps upgrading of the Lilongwe Technical School should be considered. (At present, it turns out only apprentices and artisans.)

In the longer range, closed circuit or general television may have to be installed in order to bring theoretical courses at the Polytechnic in Blantyre to Malawi's growing Capital City in the north. The Team has no immediate answers for this problem, but believes it should be an important factor in the University of Malawi's master expansion plan.

13. Once engineers are available "in the marketplace," many postponed or shelved projects and activities will begin, according to most managers. Therefore, the "vacancies" shown in the Team's survey do not fully reflect the stored-up need--they reflect needs based on what the managers believe to be realistic, taking into account their judgement of availability.

APPENDIX A

LIST OF ORGANIZATIONS AND INDIVIDUALS CONTACTED

APPENDIX A

LIST OF ORGANIZATIONS AND INDIVIDUALS CONTACTED

INDUSTRIAL

1. Brown and Clapperton Group of Companies
Manufacturers of small tools and machinery.
Also jobbers of specialized equipment.
Alan N. Mills, Director and Group Manager

2. British American Tobacco (Malawi) Ltd. (B.A.T.)
Cigarette Manufacturers.
J.C. Hazel, Chairman and General Manager

3. Cold Storage Company Ltd.
Refrigerated storage of fish and meat.
R. Vart, Company Secretary
W. Thompson, Chief Engineer

4. W and C French (Malawi) Ltd.
Construction Engineers.
M.B. Jardine, Managing Director

5. Howard Humphreys and Sons Ltd.
Consulting Civil Engineers.
R.J. Capper, Manager
S. Coldwill, Engineer

6. Imperial Group Ltd.
Tobacco Processors.
J.F. Whitelock, Engineering Manager
N.N.P. Thinowa, Personnel Manager

7. Lever Brothers (Malawi) Ltd.
Manufacturers of soap products.
J.P. Birchall, Technical Director

8. United Transport (Malawi) Ltd.
Bus and trucking lines.
J. Brookfield, General Manager

9. David Whitehead and Sons (Malawi) Ltd.
Textile manufacturers.
N. Rutherford, Manager

PARASTATAL OR CITY

1. Agricultural Development and Marketing Corporation
(ADMARC)
Buyers and sellers of agricultural products, also suppliers
of seed, fertilizers, insecticides, etc.
R.W. Heanly, Director
F.J. Buttawo, Assistant Director of Personnel

2. Air Malawi
Air transportation.
G.M.C. Mughogho, Personnel and Training Manager

3. Electricity Supply Commission of Malawi (ESCOM)
Suppliers of electricity.
T. Uko, Manager of Training

4. Malawi Housing Corporation (MHC)
Housing developers.
A.W. Misomali, Chief Development Officer

5. Malawi Railways Ltd.
Rail and ship transportation.
G.G. Geddes, General Manager
R.F. MacLean, Chief Civil Engineer
W.W. Gordon, Works Manager
R.G. Nkana, Assistant Works Manager
J.R.P. McCrindle, Chief Diesel Engineer

6. Viphya Pulp and Paper Corporation Ltd.
Development of a new wood pulping plant in process.
J.A.A. Jana, Assistant Co-ordinating Officer

7. Blantyre City Council--City Engineers Department
Operation of utilities.
M.C.E. Fernando, City Engineer

8. Blantyre Water Board
Water supplier.
G.N. Sukumaran, Engineer Manager

GOVERNMENT

1. Ministry of Agriculture and Natural Resources
G. Chirwa, Principal Economist
M.L. Wales, Chief Projects Officer
B.H. Mwakikunga, Senior Irrigation Engineer
V.K. Duggal, Acting Principal Irrigation Engineer
2. Ministry of Education
H. Mbale, Deputy Secretary
N. Nyirongo, Planning Officer
J.C. Malewezi, Acting Chief Education Officer
W.K. Sichinga, Statistician
3. Ministry of Finance
K. Nkhoma
C. Mphande, Undersecretary of Treasury
4. Ministry of Labour
B.Y.C. Gondwe, Assistant Secretary of Labour
D.G. Chimalizowi, Superintending Officer
S.O. Nyirewgh, Economist
R.W. Pguw, Economist
D.B. Msanjama, Chief Industrial Training Division

5. Ministry of Transport and Communications
H.M.S. Chunga, Undersecretary
A.M.B. Kuthemba, Principal Administrative Officer
C.W. Madise, Senior Engineer

6. Ministry of Works and Supplies
R.J. King, Senior Deputy Secretary
R.H. Banda, Under Secretary
C.J. Malino, Principal Personnel Officer
E. Cowley, Regional Engineer at Blantyre
Assistant Chief Plant and Vehicle Controller
Harry K. Mwalwenje, Engineer in Chief (AG)

7. Office of the President and Cabinet
Z.T. Soko, Economic Planning (arranged Team's agenda and
appointments)
L. Chivvewe, Development Division
A.B. Pwele, Deputy Secretary for Personnel Management
and Training.
A.K. Phiri, Chief Personnel Officer
R.F. Kankondo, Chief Training Officer
C.O. Nthenda, Economist (supported Team in Lilongwe)

8. Posts and Telecommunications Department
F.V.V. Watson, Chief Engineer

9. Malawi Board of Engineers
John R. Dilks, Chairman
Anthony D.G. Inazanza, Secretary

OTHER ORGANIZATIONS

1. University of Malawi
Dr. David Kimble, Vice Chancellor for the entire University
R.B. Mbaya, Registrar
S.A. Patchett, Librarian
D.A. Mpwepo, Administrative Assistant
2. Bunda College of Agriculture (near Lilongwe)
E.C. Lawson, Professor and Head of Agricultural Engineering
3. Polytechnic Institute at Blantyre
A.V. Kambalamotore, Principal
Charles Old, Head of Engineering Department
David Broad, Head of Mathematics and Physics and
Dean of the School of Technology

MISCELLANEOUS

4. British High Commission
J.M.A. Herdman, First Secretary (Aid)
5. Chamber of Commerce and Industry
T.G. Chapweteka, Secretary
6. Central Statistics Bureau--Zomba
A.G.T. Carter, Statistician
Commissioner of Census and Statistics

7. Capital City Development Corporation (CCDC) -- Lilongwe

J.C. Metcalfe, Manager

8. U.S. Embassy

Harold E. Horan, Ambassador

Gilbert H. Sheinbaum, D.C.M.

James Wilson, Economist

APPENDIX B
EXAMPLES OF SURVEY INSTRUMENTS USED

APPENDIX B

EXAMPLES OF SURVEY INSTRUMENTS USED

This appendix includes completed examples of the prestructured forms (Form I and Form II) used by the Manpower Team in its survey of Malawi Engineering Manpower.

Data taken from all Form I's were consolidated on the summary work sheets shown in Appendix F. As noted in Section IV C, the job movement pattern as obtained through Form II was so slight for Malawians over the three year sample that a summary sheet was not included in the report. (It is available, however, from the Team.)

FORM I, A,B,C

This form was used to obtain data on present staff and vacancies and projected incremental needs out to 20 years. This form covers both Malawian and expatriate needs. The form contains 3 pages-- A--for engineers; B--for diplomates from the Polytechnic; and C--for technicians.

NAME OF ORGANIZATION:

LOCATION: BLANTYRE

SECTOR:

DATE:

BROWN & CLAPPERTON GROUP

PERSON INTERVIEWED:

DEC 1 1978

INCREMENTAL-IN ADDITION TO PRECEDING PERIOD

CERTIFICATE LEVEL TECHNICIANS (School)	PRESENT STAFF		PRESENT VACANCIES		PROJECTED NEEDS 5 YEARS		PROJECTED NEEDS 10 YEARS		PROJECTED NEEDS 20 YEARS		REMARKS
	NUMBER MALAWIANS	NUMBER EXPATS.	NO. MAL.	NO. EXPAT.	NO. MAL.	NO. EXPAT.	NO. MAL.	NO. EXPAT.	NO. MAL.	NO. EXPAT.	
ELECTRICAL EQUIP.											
INSTALLATION	3	-	2	-	+ 3		+ 2		?		
MAINTENANCE											
MOTOR VEHICLE	-	1	1	-	+ 1		-		?		
SURVEYING		-		-							
WELDING		-	1	-	+ 1		+ 2		?		
OTHER (LIST)											
Machine Shop	-	3	2	-	+ 3		+ 3		?		
Engine Maintenance & Repair		3	1	-	+ 3		+ 3		?		
	3	7	7	0	11	0	10	0	-		

FORM II A,B,C

This form was used to obtain information on out-of-country training and the job movement pattern of Malawian engineers/technicians.

Here again, three sheets were used: A--for engineers; B--for diplomates; and C--for technicians.

NAME OF ORGANIZATION:

LOCATION: BLANTYRE

SECTOR:

DATE:

BROWN & CLAPPERTON GROUP

PERSON INTERVIEWED:

DEC 1 1978

3 YEARS

DEGREE LEVEL ENGINEERS	NOW IN TRAINING OUTSIDE MALAWI	REPLACEMENTS					REMARKS/DETAILS
		RESIGNED	RETIRED	DECEASED	LEFT PROFESSION	OTHER	
ARCHITECTURAL							
AGRICULTURAL							
AGRONOMIST							
CHEMICAL							
CIVIL							
ELECTRICAL/ ELECTRONIC							
MECHANICAL	0	0	0	0	0	0	
OTHER (List)							

NAME OF ORGANIZATION:

LOCATION: BLANJYRI.

SECTOR:

DATE:

BROWN & CLAPPERTON GROUP

PERSON INTERVIEWED:

DEC 1 1979

3 YEARS

DIPLOMA LEVEL ENGINEERS	NOW IN TRAINING OUTSIDE MALAWI	REPLACEMENTS					REMARKS/DETAILS
		RESIGNED	RETIRED	DECEASED	LEFT PRO- FESSION	OTHER	
AGRICULTURAL							
BUILDING TRADES							
CIVIL							
ELECTRICAL/ ELECTRONIC	0	* 2	0	0	0	0	*1 - personal financial problem
MECHANICAL							1 - drink problem
OTHER (List)							

FORM II-C JOB AND JOB MOVEMENT PATTERN - MALAWIANS

NAME OF ORGANIZATION:

LOCATION: BLANTYRE

SECTOR:

DATE:

BROWN & CLAPPERTON GROUP

PERSON INTERVIEWED:

DEC 1 1978

3 YEARS

School ----- <u>CERTIFICATE LEVEL</u> TECHNICIANS	NOW IN TRAINING OUTSIDE MALAWI	REPLACEMENTS					REMARKS/DETAILS
		RESIGNED	RETIRED	DECEASED	LEFT PRO- FESSION	OTHER	
ELECTRICAL EQUIP. INSTALLATION	0						
MAINTENANCE	-						
MOTOR VEHICLE	0						
SURVEYING	-		NO	DATA			
WELDING	0						
OTHER (LIST)	0						

APPENDIX C

**LIST OF RETURNED OUT-OF-COUNTRY TRAINEES CONTACTED
AND EXAMPLES OF FILLED-OUT QUESTIONNAIRES**

APPENDIX C

LIST OF RETURNED OUT-OF-COUNTRY TRAINEES CONTACTED AND EXAMPLES OF FILLED-OUT QUESTIONNAIRES

Following is a listing of returned out-of-country trainees interviewed by the "Dean of Engineering" member of the Manpower Survey Team. Most of these trainees filled out the questionnaire (see last section of Appendix C) during the interview, and a few wanted more time for consideration of the points raised. In a few cases, the trainee was not immediately available. In these cases, the questionnaire was given to him by his superior and returned with the other two forms of the survey.

List of Trainees Contacted

Band, E.G. Assistant Plant Manager
British American Tobacco Co.
O-Level High School On Job Training
7 weeks in Kenya on Plant Maintenance

Bandaz, S.A.A. Technician Engineer
Brown and Clapperton Group of Companies
O-Level High School-Diploma Polytechnic
Higher National Diploma
Leicester Polytechnic UK

Chanika, D.G. Assistant Communications Engineer
Electric Supply Commission of Malawi
O-Level High School--1 year at Courtland
College--2 years at Cambridge UK
Certificate in Technology Communications

Davsa, A.H. Unlicensed Engineer
Air Malawi
Polytechnic--3 years at Avionic Engineering UK
Certificate

Dagomero, R.C. Factory Manager
British American Tobacco Co.
Certificate Cambridge High School
2 years at Livingstonia Junior College
1969--UK Learning Cigarette Manufacturing Techniques
1975--Ghana-Ditto
1977--Nairobi-Ditto
1978--Nairobi Taste and Flavor Panel

Gondwe, I.D. Civil Engineer
Malawi Housing Corporation
Polytechnic--BS Degree in Civil Engineering
Fredericton New Brunswick Canada

Kalilani, G.h.J. Engineer
Air Malawi
O-Level High School--BS in Sciences
Chancellor College--Full Apprenticeship with
British Airways plus courses at Southall
College of Technology UK

Kasembe, E.J. Group Leader
David Whitehead and Sons
Polytechnic--BS in Mechanical Engineering--
University of Mass.--US

Lijoni, R.M. Graduate Engineer
Blantyre Water Board
Polytechnic--BS in Electrical
Engineering University of New Brunswick, Canada

Madise, C.W. Senior Engineer, Civil Aviation
Ministry of Transportation and Communications
Cambridge School Certificate
BS Degree in Electrical Engineering
University of Texas. FAA
License in Aeronautical Radio and Navigations
AID FAA Academy in Oklahoma. Worked several
airports for experience during vacation periods

Madza, A.D. Deputy City Engineer
Blantyre City Council
Master of Science in Public Health
Engineering to be completed in July 1979 from
Imperial College of Science and Technology, UK

Mandambwe, A.G. Assistant Protection Engineer
Electric Supply Commission of Malawi
BS in Electrical Engineering--Manchester UK
1 year with South of Scotland Electricity
Board and three weeks Protective Course with
Brown Bovers and Co.--Switzerland

Mondiwa, M. Unlicensed Engineer
Air Malawi
A-Level High School - 3 years study British
Airways on Engines and Air Frames--Certificate
Part II

Mphule, L.D. Assistant Engineering Supervisor
Imperial Group
Apprentice--3 years; On Job Training 3 years
2 years at Brunel Technical College UK
Mechanics Engineering Certificate

Mtaula, G. Assistant Maintenance Engineer
Electrical Supply Commission of Malawi
A-Level High School--Bs in Mechanical Engineering
Portsmouth Polytechnic UK

Munthali, S.H.C. Acting Supply Engineer
Blantyre Water Board
Polytechnic--BS in Civil Engineering
University of Canterbury New Zealand
First job was with Malawi Railway on the design
and construction of the rail link between
Salima and Lilongwe then resigned to join the
Water Board

Mwakikunga, B.H. Senior Irrigation Engineer
 Ministry of Agriculture and Natural Resources
 Cambridge Oversea School Certificate
 BS--Civil Engineering; University of Washington
 MS--Water Engineering; University of New South
 Wales, Sydney, Australia

Mwanza, F.R.D. Chief Engineer
 Posts and Telecommunications
 BS in Electrical Engineering
 Dacca, Bangladesh

Namanjo, E.J. Engineering Department
 Posts and Telecommunications
 BS in Electrical Engineering
 University of Aslon, Birmingham UK

Ngoma, C.A. Recently Employed by Lever Bros.
 Bachelor of Engineering from Lusaka, Zambia

Nkana, R.G. Assistant Works Manager
 Malawi Railways
 A-Level High School BS Degree in Engineering
 Paisley College of Technology, Glasgow Scotland
 Cooperative Program with Yarrow and Co. (ship
 builders and boilermakers)

Nyengo, T. Assistant Electrical Supervisor
 Imperial Group
 City and Guilds Technicians
 Certificate Brunel Technical College

Pete, G.T. Graduate Engineer
 Electricity Supply Commission of Malawi
 A-Level High School-BS in Electrical Engineering
 Paisley College of Technology plus 18 months
 in industry

Rabana, W.A. Assistant Engineering Supervisor
 Imperial Group
 Apprenticeship 4 years--On Job
 Training 4 years--Brunel Technical
 College UK 3 years--Certificate Part I and II

Sadyaluixda, O.L. Professional Officer
 Viphya Pulp and Paper Corporation
 O-Level High School--Two years at Chancellor
 College in Science
 BS in Mechanical Engineering majoring in Paper
 Science Engineering, Syracuse University

Saiwala, M.B. . Electrical Technician
Brown and Clapperton Group of Companies
0-Level High School
Polytechnic--Higher National Diploma from
Leicester Polytechnic UK

Zikuwo, D.D. Mechanical Engineer
Ministry of Works and Supplies
Polytechnic--BS Mechanical Engineer
University of New Brunswick, Canada

EXAMPLES OF FILLED-OUT QUESTIONNAIRES

FORM III

INTERVIEW QUESTIONNAIRE

(To be filled out by trainee and/or immediate supervisor)

ENGINEERING & ENGINEERING TECHNICAL TRAINING RECEIVED OUTSIDE MALAWI:

I. BACKGROUND INFORMATION

DATE _____

- A. Person (s) Interviewed: CHIMBWANA WILLIAM MADISE
- B. Title & Organization: Senior Engineer Civil Aviation
- C. Name of Trainee: _____
- D. Title & Organization: Ministry of Transportation and Communications

II. DESCRIPTION OF OUTSIDE TRAINING

- A. Title of Program: Electrical Engineering Degree and Aeronautical Radio and Nav aids
- B. Location: University of Texas and Oklahoma
- C. Period of Training: 5 years August 1966 to May 1972
- D. Program Description:
- | | |
|---------------------|----------------------------------|
| Basic Electronics | Computer Programming |
| Digital Circuits | Radar, ILS, VOR |
| Amplifiers | Tape Recorders, Power Generators |
| Transmitters | Modulation Systems |
| Antenna Engineering | Radio Frequency Planning |
- E. Certificate or Diploma Received: BSC Electrical Engineering

III. OBJECTIVE OF TRAINING

To train local personnel in

order to take over responsibility from expatriate personnel.

IV. SPONSORED BY: AID

V. FUNDED BY: AID

VI. HOW SELECTED: Interviewed for training

VII. NOTES: Completed secondary school with a Cambridge School Certificate and joined aviation department and worked as a trainee in radio for 6 months before proceeding on a course to the USA.

VIII. APPRAISAL OF TRAINING EFFECTIVENESS:

A. Effect on Personal Center (New job; job level change, increased responsibility; salary; prestige; etc.):

Acquired new skills and new job and responsibilities, I never thought I would ever carry in my life.

B. Effect on Sponsoring Organization (Improved efficiency on job; filled higher level vacancy, etc.):

Localized and expatriate and started having ideas from local on organization matters.

C. Relevance to Job or Career Goals

My training at college and FAA Academy was geared to my future job in aviation, but I didn't expect to hold as high responsibilities as has come about eventually.

D. Quality of Training Program (Teaching; instructional material; practicality)

Practical training was excellent and very pertinent to the job. At the University certain courses were not very relevant to my country's needs.

E. Method of Evaluation of Trainee

I got degree certificate and professional certificates in aviation and on return home after sometime replaced an expatriate.

F. Problems Encountered by Trainee

On entry at Texas it took time to fully adjust language and occasionally missed mixing with other foreigners because I happened to have been the first foreigner at the Electronic Institute. Weather was harsh at times. It was not difficult to adjust to foods. The difficulties were encountered only when we went to Chicano foods.

G. Notes

During summer vacations AID sent me to airports in various states to acquaint myself with aviation equipment maintenance and installations and obtained certificates. As a result I returned home experienced in airport equipment. After a short period of work on my return I was assigned to understudy an expatriate whom I replaced in 6 months. I worked as installations and maintenance for 1 1/2 years.

FORM III

INTERVIEW QUESTIONNAIRE

(To be filled out by trainee and/or immediate supervisor)

ENGINEERING & ENGINEERING TECHNICAL TRAINING RECEIVED OUTSIDE MALAWI:

I. BACKGROUND INFORMATION: DATE Dec. 1st, 1978

A. Person (s) Interviewed: OSWIN L. SADYALUNDA

B. Title & Organization: Professional Officer (VIPCOR)

C. Name of Trainee: _____

D. Title & Organization: Viphya Pulp and Paper Corporation

II. DESCRIPTION OF OUTSIDE TRAINING:

A. Title of Program: Paper Science Engr/Mechanical Engr

B. Location: Syracuse University

C. Period of Training: Sept. 1974 - May 1978

D. Program Description: _____

Fluid mechancis, Dynamics/Statics, Heavy transfer engineering analysis, Design, Paper Properties, Pulping technology, Economics, Computer Programming, Process Control

E. Certificate or Diploma Received: BSC (MEE)

III. OBJECTIVE OF TRAINING: To train myself as an engineer so as to accept offer at VIPCOR.

IV. SPONSORED BY: UNDP/FAO

V. FUNDED BY: UN

VI. HOW SELECTED:

After two years of college work at Chancellor College selected by interview.

VII. NOTES:

I had qualified in "O" level before joining Chancellor (University of Malawi). I took Natural Science courses at Chancellor including, physics, chem, biology and maths.

VIII. APPRAISAL OF TRAINING EFFECTIVENESS:

A. Effect of Personal Center (New job; job level change, increased responsibility; salary; prestige, etc.):

As a result of training program, I got a job with VIPCOR.

B. Effect on Sponsoring Organization (Improved efficiency on job; filled higher level vacancy, etc.):

I was hired to be part and parcel of staff running the Pulpmill at Chintheche. My main responsibility being on maintenance.

C. Relevance to Job or Career Goals:

I hope after some practical training and experience I would become a registered engineer and take up more responsibilities.

D. Quality of Training Program (Teaching; instructional material; practicality):

Academic side was alright but not adequate provisions on practical aspect.

E. Method of Evaluation of Trainee

F. Problems Encountered by Trainee

Getting adjusted to American system of education,

after being exposed to British system for so long.
The training period was 4 years and I didn't get
chance to go home.

G. Notes

If Polytechnic had a degree program, I would have gone
there instead of Chancellor College.

APPENDIX D.
MANPOWER PROJECTION METHODOLOGY

APPENDIX D

MANPOWER PROJECTION METHODOLOGY

Background

There have been several past studies of manpower demand/supply made that the Team has reviewed for relevance to its Engineering Manpower Survey.

The basic document for manpower planning in Malawi is the report of the Manpower Survey conducted by the Economic Planning Division of the Office of the President and Cabinet in 1971.¹ This survey covered all high and intermediate level personnel (HIMLP) in the country. Actual field samplings of employment were taken with a mailed questionnaire.

The survey used the International Standard Coding for Occupations (ISCO) put out by the International Labour Organisation and reported results by aggregating categories. Unfortunately, the two categories needed for the engineering/technician manpower study were not grouped together, but each was grouped with another category; namely, Category 3, Professional Occupations, was grouped with Category 1, Top Management, and Category 4,

¹"Manpower Survey ,1971," Government of Malawi.

Technical Occupations, was grouped with Category 2, Middle and Junior Management.

This was a very theoretical study that attempted to project manpower growth ten years in the future based on non-linear relationships between Malawi's manpower and its Gross Domestic Product (monetary) taking into account a number of variables including elasticity (ratio of category growth relative to GDP) and wastage (losses in the system due to any reason--death, leaving profession, etc).

This report was criticized by many, including the University of Malawi's Manpower Assessment Committee.

The major areas of disagreement were three:

1. Assumptions of elasticity level;
2. Assumptions of wastage; and
3. Assumptions of allowance of trained manpower between the public and private sectors.

The University's report thus differed substantially from the earlier report.

The first known attempt to assess engineering and technician manpower separately was done by the Economic Planning Division

in 1974.¹ The assessment was based primarily on the Division's earlier 1971 survey updated to make 1973 the Baseline Year. Since projections in this later report were based on the same assumptions as the earlier 1971 report,² it presumably has been questioned on the same points as its predecessor.

In any event, the Engineering Manpower Survey Team has attempted to avoid a further extrapolation of questionable assumptions by attempting to establish a 1978 baseline for future engineering manpower projections.

Development of 1978 Baseline

The following approach was used to develop a 1978 baseline figure upon which estimates of future engineering demand could be based:

Private Organizations

A random survey of private organizations was performed to determine the existing number of Malawian and expatriate engineers, diplomats, and technicians. As many firms as possible were included, given the limited time period available.

¹"The Demand and Supply of Engineers and Engineering Technicians in Malawi, 1974-1980," August 1974, Economic Planning Division.

²"Manpower Survey, 1971," Government of Malawi.

The sample results were inflated to represent the population of all private organizations by means of the data found in Government Notice No. 80 - "Industrial Training Act--Industrial Training (Levy) Order, 1978."

This act was set up so that government and industry could share in the costs of the Government-sponsored apprenticeship training program. It enacts levies against all private and parastatal organizations based on the number of persons it employs under four separate categories:

1. Building trades;
2. Engineering trades;
3. Motor trades; and
4. Printing trades.

After discussions with persons in the Department of Labour who administer this Act, it was determined that the information it contained was obtained semi-annually by a letter questionnaire. The Team used the latest available Levy report, which covered the period 1 October 1977 to 31 March 1978.¹

The Labour Department officials also affirmed that the data on engineering trades represented the total number of "engineering trades" personnel (including technicians) in each company.

¹"Government Notice No. 80, Industrial Training Act--Industrial Training (Levy) Order, 1978." Covers 6 months from 1 October 1977 to 31 March 1978.

Thus, the total number of persons in the engineering trades in any company can be determined by dividing the amount the company was levied for engineering trades (as shown in the levy order) into the total levy for that organization. The Team performed an independent check for a number of companies and found this method to be reasonably accurate.

Therefore, to determine the ratio of the total engineering/technician supply in private industry to the Team's survey sample, it was necessary to divide total levies for engineering (all private organizations) by the total levies for the specific organizations interviewed. This was done as shown below:

$$\frac{\text{Total levies against all private organizations} = 53,300}{\text{Levies against private organizations surveyed} = 14,400} = 3.70$$

This ratio, rounded off to 4/1, was the most reasonable way to determine the total supply/demand picture in private industry. Therefore, the Summary Work Sheets in Appendix F show a line labelled "adjusted total" for private industry only. This total was obtained by multiplying the "survey industry" totals by 4. This approach was reviewed with the University, the Chairman of the Malawi Board of Engineers, and a number of organization managers. All agreed that no other information was available to estimate total industry engineering composition.

Parastatal and Government Organizations

This adjustment was not necessary for government and parastatal organizations, according to knowledgeable managers, since the Survey Team obtained about 90% coverage of all engineer users. The tables in Section IV thus provide the baseline data needed for future projections.

Projecting Future Engineering Demand

Projections of engineering demand to 1988 were performed by the relevant experts in each organization in the sample. The officials interviewed were asked, based on their own organization's plans, to estimate the required number of engineers, diplomates, and technicians that would be necessary in 1988. Also, assuming no supply constraints, they were asked to disaggregate their requirements into Malawian and expatriate components. The results of this effort are shown in the tables in Section IV.

Although attempts were made to extend these projections to the year 2000, this proved to be unfeasible. Few of the local managers interviewed were willing to provide estimates of their own needs beyond a ten year horizon. Indeed, all of those interviewed felt that such projections would have to be based on gross assumptions concerning future growth, the acceptance or rejection of particular projects, and changing technology. In this view, the magnitude of these assumptions could only lead to severe inaccuracies in the projections. (The work sheets in Appendix F show 20 year figures for those who did make estimates.)

A similar attempt to apply a more quantitative approach also proved infeasible. The methodology used in the 1971 manpower survey¹ was re-examined for possible use. However, even if more accurate assumptions concerning sampling error, wastage, elasticity, and the private/government split could be made, no estimate of year 2000 GDP is currently available. As any valid methodology should be based on the relationship between engineering demand and GDP, the absence of a Malawi government estimate makes the application of the methodology impractical at this time. An accurate, independent projection of GDP to the year 2000 was not considered feasible given the limited time for this study and the fact that assumptions made by the Team on the above factors would be as questionable as the earlier survey's. Based on survey results, it was also not considered necessary for AID's decision making as to its future action.

The Government of Malawi will be releasing its next 10 year Development Plan (to 1990) shortly. At that time, data will be available on the economic indicators needed to forecast manpower to 1990. The USAID PP team should advise the Economic Planning Division to plan to use the survey's base data to project demand to 1990 when these basic economic projections become available.

¹"Manpower Survey, 1971," Government of Malawi.

APPENDIX E
BIBLIOGRAPHY

APPENDIX E

BIBLIOGRAPHY

1. "Manpower Survey 1971", Government of Malawi.
2. "Report of the University of Malawi Manpower Assessment Committee: November 1974, University of Malawi.
3. "The Demand and Supply of Engineers and Engineering Technicians in Malawi, 1974 - 1980", August 1974, Economic Planning Division.
- *4. "The Desirability, Feasibility and Implementation of Setting-up Degree Work in Engineering in the University of Malawi", The Richards Report, November 1974, Inter-University Council for Higher Education Overseas, London.
- *5. "Plan for the Development of the Engineering Faculty (at the Polytechnic Institute) on the Lines of the Richards Report up to 1985". University of Malawi, June 1975.
6. "Development Assistance Programme (DAP) Substitute", January 1975, OSARAC, Mbabane.
7. "University of Malawi Polytechnic Proposals", September 1975, Norman and Dawbarn, Architects and Consulting Engineers, Surrey, England.
- *8. "Projects Submission, Project A-Degree in Engineering and Project B - Bachelor of Commerce in Accountancy", October 1976, University of Malawi.
9. "Proposed Sequence of Construction at the Polytechnic, 1978-82", (undated), University of Malawi.
- *10. "Report of the Project Development Mission on the Creation of Faculty of Engineering, University of Malawi", January 1978. British Ministry of Overseas Development.
11. "Analysis of Requirements for Diploma and Degree in Engineering and Technical Courses". David Kimble, University of Malawi, March 1978.

*Suggested reading for PP team. Copies have been given to USAID AFR/DR/SAP.

12. "The Training of Professional Engineers with Special Reference to Malawi". C.L. Old (undated), University of Malawi--Polytechnic Institute.
13. "Recommendations of the Academic Planning Committee to the Senate for a Degree in Engineering at the University of Malawi" (no date).
- *14. "A Plan for the Implementation of Proposals to Mount New Diploma/Degree Courses in Engineering and a Degree Course in Accounting at the Polytechnic", Gordon Hunnings--Vice Chancellor, University of Malawi. (No date, appeared in 1975.)
- *15. "Education Plan of Malawi - 1973-1980", Ministry of Education.
16. "Government Notice No. 80, Industrial Training Act--Industrial Training (Levy) Order, 1978". (Covers 6 months 1 October 1977 - 31 March 1978).
17. "Statement of Development Policies 1971-1980", Government of Malawi.
18. "Project Submission - Expansion Provisions for Chancellor College", December 1977, University of Malawi.
19. "An Evaluation of the Occupational Training Information System (OTIS)" - Economic Development Administration, U.S. Department of Commerce, 1974.

*Suggested reading for PP team. Copies have been given to USAID AFR/DR/SAP.

APPENDIX F
SUMMARY WORK SHEETS FOR SURVEY

APPENDIX F

SUMMARY WORK SHEETS FOR SURVEY

The following summary work sheets show the consolidated data for all of the organizations interviewed during the survey. Sheet Number I is for engineers, II is for diplomates, and III is for technicians. Work sheet IV shows the breakdown of supply/demand for engineers by category of engineer (civil, mechanical, electrical, etc.). Note that this work sheet was not adjusted for private industry since it was not considered necessary.

The data on these sheets was obtained directly from the completed Form I's filled out by the organizations (see Appendix B).

SUMMARY WORK SHEET FOR FORM IA - DEGREE LEVEL ENGINEERS

SECTOR	NAME OF ORGANIZATION	IN TRAINING OUTSIDE MALAWI	PRESENT STAFF		PRESENT VACANCIES		PROJECTED NEEDS 5 YRS		PROJECTED ADDL NEEDS 10 YRS		PROJECTED ADDL NEEDS 20 YRS		REMARKS
			MALAWIAN	EXPAT.	MALAWIAN	EXPAT	MALAWIAN	EXPAT	MALAWIAN	EXPAT	MALAWIAN	EXPAT	
A. PRIVATE	BRIT AM TOBACCO	0	0	1	0	0	1	0	1	0	-	-	Single product line process
B. INDUSTRY	BROWN & CLAPPERTON	0	1	2	1	1	8	0	8	8	-	-	Major Manufacturing/Construction Company
	COLD STORAGE						-	-	-	-	-	-	Did not get forms back
	W.C FRENCH	0	0	9	0	0	4	13	12	12	22	8	Contract expats. at 2 year intervals until locals available
	HUMPHREYS	0	0	10	-	-	-	-	-	-	-	-	Up & Down Mkt. - cannot predict
	IMPER. TOBACCO	0	0	1	0	1	-	-	1	0	1	0	Consult Engrs. - would hire local if possible
	LEVER BROTHERS	0	1	2	1	0	-	-	-	-	-	-	Single product line process
	UNITED TRANSPORT	0	0	1	0	0	0	2	2	2	4	0	Soap products
	DAVID WHITEHEAD	0	1	0	-	-	0	2	2	2	4	0	Textile processing
C SURVEY/INDUSTRY	— TOTAL	0	3	26	2	2	17	16	30	15	37	8	
D. ADJUSTED ¹	— TOTAL	0	12	104	8	8	68	64	120	60	148	32	Adjusted per procedure in Appendix D
E. PARASTATAL & LOCAL GOVERNMENT	ADMARC												Did not get forms back
	AIR MALAWI		2	0	-	-	-	-	-	-	-	-	Inadequate response
	CITY ENGINEER — BLANTYRE	1	1	1	4	1	8	1	13	0	-	-	
	ESCOM	27	8	4	6	3	22	0	29	0	39	0	Elect. Supply Comm.
	MALAWI HOUSING	1	7	3	13	1	22	0	20	0	20	0	
	MALAWI RAILWAYS	8	4	5	9	5	16	0	26	0	28	0	
	VIPCOR	19	3	0	-	-	-	-	-	-	-	-	Major Paper Pulp Project cannot project needs now
	UNIV. OF MALAWI	3	4	9	0	0	15	1	8	0	-	-	Engr. Teachers — Poly-Bunda
F. TOTAL	PARASTATAL SURVEY	59	29	22	32	10	83	3	96	0	87	0	
G. NATIONAL GOVERNMENT	MIN. OF AGRIC. IRR. DIV.	2	3	5	3	5	16	0	-	-	-	-	Expand department—based on approval
	MIN. LABOUR	0	1	1	5	0	3	0	3	0	3	0	Did not get forms (only a few)
	MIN. TRANS. & COMM.	0	1	0	0	0	6	2	12	0	-	-	Civil Aviation Division only
	MIN. WORKS & SUPPLIES	0	17	40	31	0	76	0	25	0	51	0	Must use expats to fill posts when locals not available
	POST & TELCOMM.	0	2	2	4	4	7	2	14	0	28	0	—assumes most work being contracted out the last 10 years
	WATER SEWAGE TREATMENT	7	4	6	14	0	49	0	78	0	-	-	
H TOTALS	GOVERNMENT SURVEY	9	28	54	57	9	156	4	132	0	82	0	
GRAND TOTAL	SURVEY ³	68	60	102	91	21	256	23	258	15	206	8	
GRAND TOTAL	ADJUSTED ⁴	68	69	180	97	27	307	71	348	60	317	32	

1. Adjusted to account for approximately 25% sample of industry—see Appendix D for details.
 2. Presented for information only—not used in analysis.

3. Equal to the sum of lines C, F, and H.
 4. Equal to the sum of lines D, F, and H.

SUMMARY WORK SHEET FOR FORM 1B¹ - DIPLOMA LEVEL (OR EQUIVALENT)

SECTOR	NAME OF ORGANIZATION	IN TRAINING OUTSIDE MALAWI	PRESENT STAFF		PRESENT VACANCIES		PROJECTED NEEDS 5 YRS ADDL.		PROJECTED NEEDS 10 YRS		PROJECTED ADDL. NEEDS 20 YRS ²		REMARKS
			MALAWIAN	EXPAT.	MALAWIAN	EXPAT.	MALAWIAN	EXPAT.	MALAWIAN	EXPAT.	MALAWIAN	EXPAT.	
A. PRIVATE	BRIT AM TOBACCO	0	0	0	0	0	0	0	0	0	0	0	Use Secondary School Grades
B. INDUSTRY	BROWN & CLAPPERTON		5	7	6	1	9	0					
	COLD STORAGE	0	0	0	0	0	0	0	0	0	0	0	Did not receive report
	W C FRENCH	0	16	12	7	2	30	18	41	18	57	6	
	HUMPHREYS	1	2	0	0	0							Cannot project future needs because of nature of business
	IMPER. TOBACCO		1	0	0	0	0	0	0	0	0	0	
	LEVER BROTHERS		10	0	3	0	15	0	17	0	20	0	
	UNITED TRANSPORT	0	3	9	0	0	9	8	18	3	23	0	
	DAVID WHITEHEAD	0	6	4	0	0	2	0	2	0	2	0	
C. SURVEY INDUSTRY	— TOTAL	1	43	32	16	3	65	26	78	21	102	6	
D. ADJUSTED ¹	— TOTAL	4	172	128	64	12	260	104	312	84	408	24	
E. PARASTATAL & LOCAL GOVERNMENT	ADMARC												Did not receive report back
	AIR MALAWI	2	2	0	0	0	0	0	0	0	0	0	This does not make sense with fleet expansion
	CITY ENGINEER - BLANTYRE	0	8	1	9	1	20	0	36	0	-	-	
	ESCOM	2	20	3	5	0	35	0	45	0	50	0	
	MALAWI HOUSING	1	8	0	13	0	19	0	23	0	31	0	
	MALAWI RAILWAYS	5	5	8	12	13	32	10	45	0	51	0	(Training in Marine Engineer) High level-Expt. - see notes
	VIPCOR	0	0	0	0	0	0	0	0	0	0	0	Cannot project needs until Engr. Study completed in May
	UNIV. OF MALAWI	4	1	10	2	0	6	0	5	0	-	-	
F. TOTAL	PARASTATAL SURVEY	14	44	22	41	14	112	10	154	0	132	0	
G. NATIONAL GOVERNMENT	MIN. OF AGRIC. IRR. DV.	0	11	0	5	5	37	0	-	-	-	-	Depends on approval of expansion plan
	MIN. LABOUR	0	6	0	5	0	9	0	9	0	9	0	
	MIN. TRANS. & COMM.	5	12	1	6	1	30	0	50	0			Trained for highly sophisticated equipment
	MIN. WORKS & SUPPLIES	0	50	15	41	0	166	0	181	0	127	0	Vacancies will be filled by expats. if no Malawian candidates - more outside contracts in last 10 years
	POST & TELCOMM.	0	0	0	0	0	0	0	0	0	0	0	
	WATER SEWAGE TREATMENT	0	31	2	2	0	37	0	84	0	-	0	Water and sewage req. for entire country
H. TOTALS —	GOVERNMENT SURVEY	5	110	18	59	6	279	0	324	0	136	0	
GRAND TOTAL —	SURVEY ³	20	197	72	116	23	456	36	556	0	370	0	
GRAND TOTAL —	ADJUSTED ⁴	23	326	168	164	32	651	114	790	84	876	0	

1. Adjusted to account for approximately 25% sample of industry—see Appendix D for details.
 2. Presented for information only—not used in analysis.

3. Equal to the sum of lines C, F, and H.
 4. Equal to the sum of lines D, F, and H.

SUMMARY WORK SHEET FOR FORM IC – TECHNICIANS

SECTOR	NAME OF ORGANIZATION	IN TRAINING OUTSIDE MALAWI	PRESENT STAFF		PRESENT VACANCIES		PROJECTED NEEDS 5 YRS		PROJECTED ADDL NEEDS 10 YRS		PROJECTED ADDL NEEDS 20 YRS		REMARKS
			MALAWIAN	EXPAT.	MALAWIAN	EXPAT	MALAWIAN	EXPAT	MALAWIAN	EXPAT	MALAWIAN	EXPAT	
A. PRIVATE	BRIT AM TOBACCO	0	9	0	1	0	2	0	2	0	-	-	
B. INDUSTRY	BROWN & CLAPPERTON	0	3	7	7	0	11	0	10	0	-	-	
	COLD STORAGE												
	W.C. FRENCH	0	17	6	8	3	38	15	57	15	80	15	
	HUMPHREYS	0	6	0	-								Cannot project because of uncertain nature of work
	IMPER. TOBACCO	0	1	2	0	0	1		1	3			Promote people up from artisan
	LEVER BROTHERS	0	4	?	0	0	4	0	6	0	8	0	
	UNITED TRANSPORT	0	33	0	0	0	85	0	125	0	170	0	
	DAVID WHITEHEAD	0	8	0	12	0	24	0	36	0	120	0	
C. SURVEY INDUS-TRY	— TOTAL	0	81	15	28	3	165	15	237	18	378	15	
D. ADJUSTED ¹	— TOTAL	0	324	60	112	12	660	60	948	72	1512	60	
E. PARASTATAL & LOCAL GOVERNMENT	ADMARC												Did not return forms
	AIR MALAWI	4	9	24	15	10	24	40	54	30			Getting new wide body jets
	CITY ENGINEER — BLANTYRE	10	17	0	16	0	51	0	82	0			
	ESCOM	24	69	0	0	0	92	0	197	0	259	0	
	MALAWI HOUSING	0	25	0	27	0	55	0	62	0	55	0	
	MALAWI RAILWAYS	2	138	34	64	24	49	0	37	0	37	0	
	VIPCOR												
	UNIV. OF MALAWI												
F. TOTAL	PARASTATAL SURVEY	40	258	58	122	34	271	40	432	30	351	0	
G. NATIONAL GOVERNMENT	M.N. OF AGRIC. IRR DIV.	0	24	0	1	0	65	0					Depends upon approval of expansion plan
	MIN. LABOUR	0	10	0	7	0	4	0	7	0	7	0	
	MIN. TRANS. & COMM.	0	16	0	5	0	34	2	60	0			Trained on-the-job
	MIN. WORKS & SUPPLIES	0	128	56	49	0	152	0	110	0	210	0	
	POST & TELCOMM.		91	10	21	0	135	0	149	0	164	0	
	WATER SEWAGE TREATMENT	0	53	6	27	0	78	0	150	0			
H. TOTALS —	GOVERNMENT SURVEY	0	322	72	110	0	468	2	476	0	381	0	
GRAND TOTAL —	SURVEY ²	40	661	145	260	37	904	57	1146	48	1110	15	
GRAND TOTAL —	ADJUSTED ⁴	40	904	190	344	46	1399	102	1856	102	2244	60	

1. Adjusted to account for approximately 25% sample of industry--see Appendix D for details.
 2. Presented for information only--not used in analysis.

3. Equal to the sum of lines C, F, and H.
 4. Equal to the sum of lines D, F, and H.

SHEET IV

SUMMARY WORK SHEET--ENGINEER SUPPLY/DEMAND BY CATEGORY OF ENGINEER

(BASED ON ACTUAL SURVEY OF 27 ORGANIZATIONS - NOT ADJUSTED FOR INDUSTRY SAMPLE)

CATEGORY OF ENGINEER	PRESENT SUPPLY		PRESENT VACANCIES		ADDITIONAL NEEDS IN 5 YEARS		ADDITIONAL NEEDS IN 10 YEARS		REMARKS
	MAL.	EXPAT.	MAL.	EXPAT.	MAL.	EXPAT.	MAL.	EXPAT.	
<u>PRIVATE INDUSTRY</u>									Team did not interview any chemical companies. Demand in private sector higher than shown here. Note high demand for expatriate Civil Engineers Per managers interviewed, this is too low an estimate
Chemical			1		2				
Civil		19			4	13	15	12	
Elect/Electronic	1	1	1		3		2		
Mechanical Other	2	6		2	8	3	13	3	
TOTALS - SURVEY	3	26	2	2	17	16	30	15	
<u>PARASTATAL</u>									Marine Engineers, Aircraft Engineers, Teachers.
Chemical	2								
Civil	10	7	17	2	33	1	40		
Elect/Electronic	6	4	4	3	16		19		
Mechanical	5	1	10	1	15	1	23		
Other	6	10	1	4	19	1	14		
TOTALS	29	22	32	10	83	3	96	0	
<u>GOVERNMENT</u>									
Chemical	2		1		5		8		
Civil	17	47	47	5	129		95		
Elect/Electronic	3	3	4	4	13	4	25		
Mechanical	6	4	5		9		4		
Other									
TOTALS	28	54	57	9	156	4	132	0	
GRAND TOTAL SURVEY	60	102	91	21	256	23	258	15	

APPENDIX G

BACKGROUND DISCUSSION-MALAWI'S LOCALIZATION POLICY

APPENDIX G

BACKGROUND DISCUSSION - MALAWI'S LOCALIZATION POLICY

A key element in Malawi's remarkable, balanced development since its independence in 1964 has been the Government's policy as regards the use of expatriate help where needed. The policy states explicitly that jobs will not be "localized" until such localization can be done at no loss of efficiency to the specific operation. This is in drastic contrast to many other African countries who localized immediately upon gaining independence.

There is no question in the Team's mind, or in the minds of most managers (both Malawian and expatriate) that were interviewed, that well-considered use of expatriate talent should and must continue to play an important role in the country's development. The present Malawian core of skilled managers, for example, is much too small to fill even key posts in Government, let alone the parastatal organizations. Private industry also finds senior Malawian management and engineering talent hard to find. Many international companies, of course, bring in their own managers, usually engineers, when starting an industry in Malawi. Many also are sincere in their desire to localize and in fact take steps to do so by formal and structured on-the-job training.

Per many managers, localization in engineering and engineering technician occupations should start at the bottom, with the less skilled jobs, where substitution of talent or restructuring of

the job content is possible. The Survey Team agrees with this philosophy as far as it goes.

However, the key question in the localization issue is when the Malawian counterpart is ready to move into the expatriate's position. An example was given in Section IV where a Malawian engineer replaced his expatriate counterpart in six months after completing his overseas training. Another example was given where it was emphatically maintained that a diesel technician needed seven years on the job before qualifying as a chief diesel technician. Thus, a negative aspect of the process is the belief by expatriates, who often are in the position to set these requirements, that time is often equated with ability. Obviously, in the latter case noted, a formal training course coupled with a planned and structured on-the-job training program should reduce the seven year "apprenticeship" to two or three years.

Another negative aspect of slow localization is its cost to Malawi. There are actual costs of supporting the expatriate; the fact that the bulk of his salary goes out of the country while he is there; and finally, perhaps most importantly, his skills and knowledge leave with him when he leaves the country.

There are no easy answers to this problem--the present policy is sound, as reflected in the orderly and efficient way that Malawi is developing--in contrast to most countries with which the Team

is familiar. Because of abuses in the system, particularly at technician level, the Team has recommended that a deliberate plan for localizing each new expatriate position be part of the requirement for obtaining future temporary employment permits. In addition, periodic follow-up should be made annually, in particular, questioning the criteria or qualifications and time frame stated as necessary to localize a given job category.

On the other hand, the Team cautions against too rapid localization at the higher levels. When Malawian engineers are eventually provided by the Polytechnic Institute, they will need several years of on-the-job experience before they can replace their expatriate counterparts. It will then take them additional years to move into engineering management positions. There are indications, as noted by senior managers interviewed, that the expectations of Malawians trained abroad in engineering may be too high. Some expect to move into key positions without going through the necessarily difficult on-the-job learning experience that eventually changes a new, theoretically sound engineering graduate into a practical practicing engineer.

From this background it can be seen that the problem of localization is much more complex than the "current and projected" ratio of Malawian engineers to expatriates. Some of the expatriates enumerated in the tables in Section IV could probably be replaced by locals immediately. Other expatriates would be

required for a long period of time even with an identified Malawian counterpart being properly trained.

This means that engineering manpower projections must take both expatriates and locals into account--since often the local is not directly or immediatley a substitute for the expatriate.

Necessarily, the managers who filled out the projections of needs for their own organizations supplied data on the basis of the country's localization policy. Therefore, the demands for Malawian engineers and technicians in the tables of Section IV reflect this localization.

Since the basic objective of this survey was to provide information about the magnitude of present and future demand for Malawian engineers/technicians, it can be seen that such need is real, long term, and not likely to be fully met by the rather modest expansion program planned for the Polytechnic Institute.

APPENDIX H

**MALAWI'S UNIVERSITY SYSTEM AND ITS ROLE IN THE
COUNTRY'S AGRO-BASED DEVELOPMENT**

APPENDIX H

MALAWI'S UNIVERSITY SYSTEM AND ITS ROLE IN THE COUNTRY'S

AGRO-BASED DEVELOPMENT

The University of Malawi at present has three colleges:

1. Chancellor College--located in Zomba--the former Capital and near the center of population distribution.
2. Bunda Agricultural College--located near Lilongwe--the new Capital in the north--near the richest agricultural areas of Malawi.
3. The Polytechnic Institute--located in Blantyre in the south--near the industrial center of the country.

Each of these colleges is playing and will continue to play a vital role in Malawi's well planned development. This development is based on the explicit policy of upgrading the levels of the rural poor (who constitute about 90% of the population) through improved agricultural production and productivity of supporting sectors of the economy.

Chancellor College at present trains secondary school teachers, science majors (physics, math and chemistry), liberal arts and law students. The International Development Association (IDA) is presently assisting in expanding Chancellor College's teacher training facility. These new teachers will strengthen the country's secondary school system, itself a part of an IDA program. This is aimed directly at providing more opportunities for the 10-15% of

primary students who are qualified and desire to obtain higher learning--i.e., the supply pipeline for the three colleges of the University.

The other 85-90% of students who come out of Primary School (with a "Primary School Leavers Certificate"), will generally stay in their villages after having gone through a primary school curriculum now specially tailored for them--to make them better farmers, to understand the principles of farm management, economics, hygiene, and those basics directly related to improving ones lot in living off the land.

The 10 to 15% that go on to secondary school have this basic spirit of the land (agriculture is Malawi's only natural resource besides eventual tourism) inbred in their spirit. Their future education and careers--by design--will fit into the country's overall development philosophy, as noted earlier. These students will choose to continue their education in one of the three colleges of the University. Regardless of their choice, these students will end up as future leaders that tie the outputs of the small landholder into an integrated national economy. They will become the future business managers, the accountants and lawyers and the engineers who plan and implement future water and irrigation systems; manage new secondary industries built to capitalize on the country's rapidly developing infrastructure; and provide further outlets and new uses for Malawi's agricultural products.

Figure 3 shows this interrelated educational system as it relates to Malawi. The three colleges of the University provide three different but equally vital inputs to the balanced development of the country. This figure makes it easy to understand why each college should be of equal stature. At present the Polytechnic Institute is a weak link in this integrated education system because it does not offer a degree-awarding program.

Figure 4 shows the basic structure of Malawi's education system. Upgrading of the Polytechnic Institute (as shown in dotted lines) so that it will issue Bachelor of Science degrees will mean that each college will send equal quality professionals into their respective areas in support of the country's long-range development program.

FIGURE 3

MALAWI'S INTEGRATED HIGHER EDUCATION SYSTEM
AS IT IS GEARED TO MALAWI'S LONG RANGE DEVELOPMENT POLICY

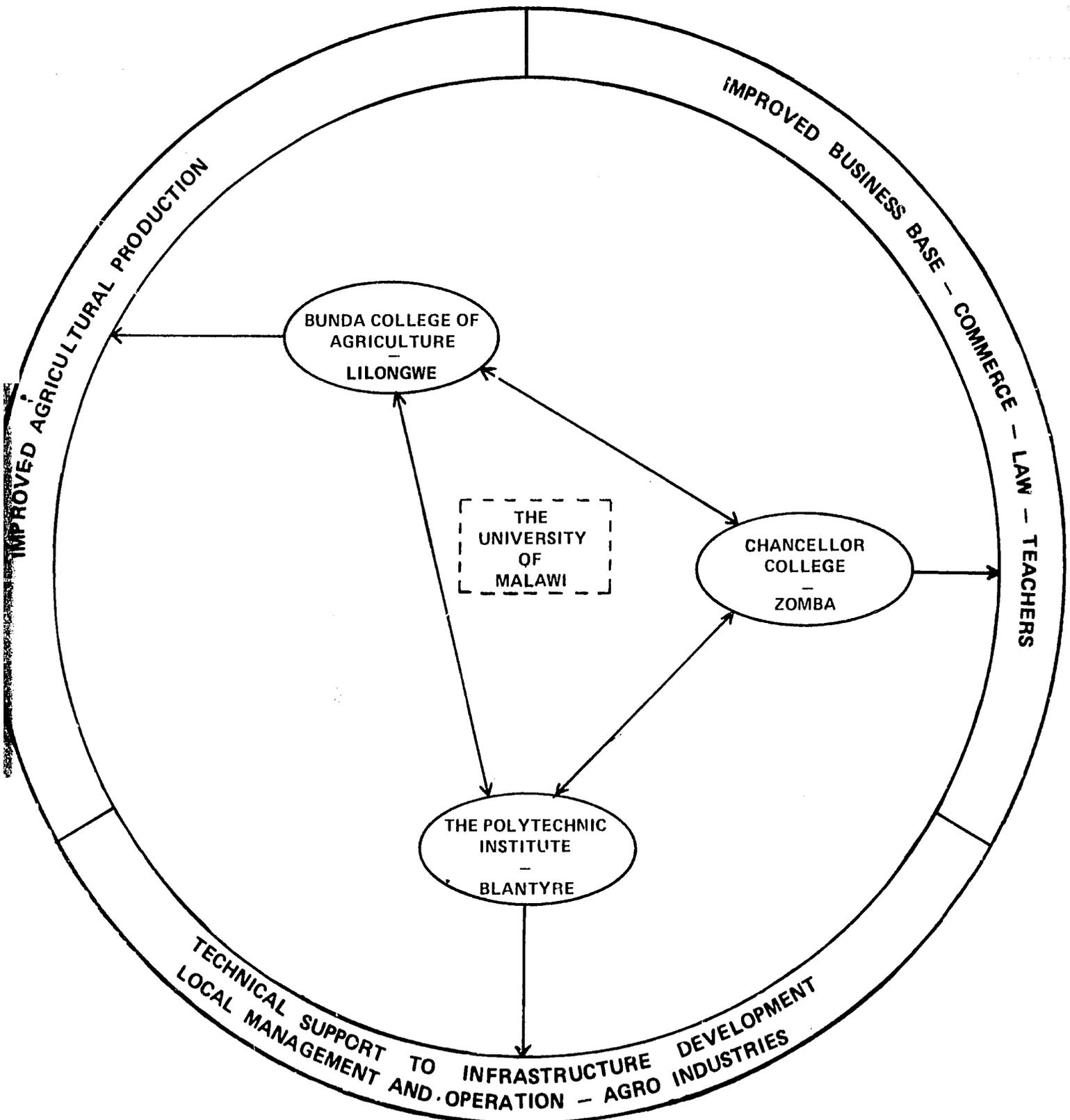
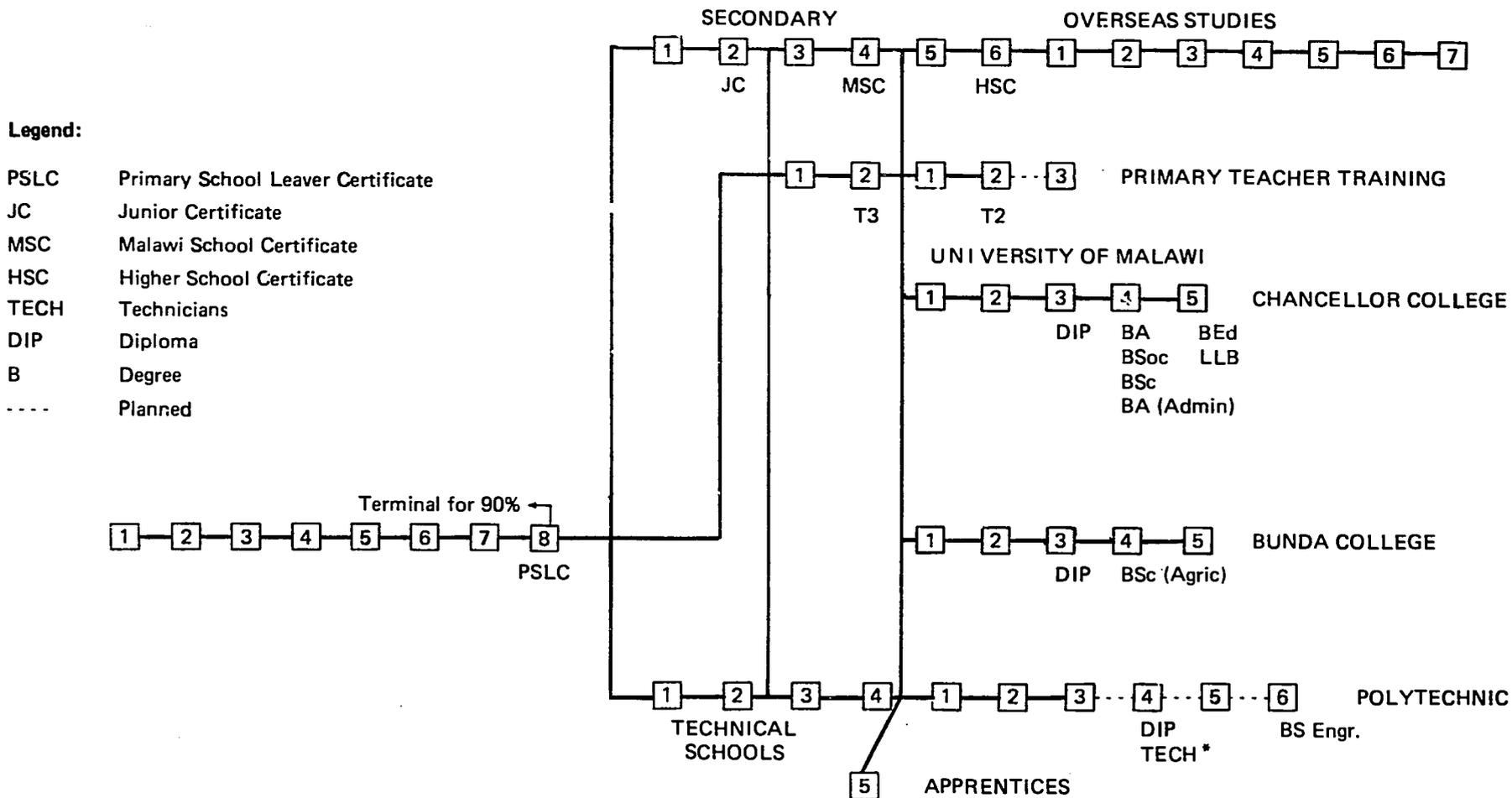


FIGURE 4
MALAWI: PLANNED STRUCTURE OF EDUCATIONAL SYSTEM, 1978



Note: - refers to number of years

*Extra year because of "sandwich" program with industry.