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Proposes avenues for development of appropriate technology in the Near East (Egypt, Israel, Jordan, Syria, the West Bank, and the Gaza Strip). Specific proposals for 18 project areas are offered, including estimated timetable and cost. These proposals are based on existing conditions and resources, needs, expected benefits, and potential for regional cooperation. Contains bibliography, and appendices outlining the economic base for each country in the region and listing science and technology institutions capable of supporting the development of appropriate technology.

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APPROPRIATE TECHNOLOGY FOR THE MIDDLE EAST: A GRASS ROOTS APPROACH FOR TECHNICAL DEVELOPMENT AND CO-OPERATION IN THE REGION

by

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Professor of Mechanical Engineering
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November 1978

This report is prepared for the United States of America Agency for Interational Development

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Appropriate Technology for the Middle East
"A GRASS ROOTS APPROACH FOR TECHNICAL DEVELOPMENT AND COOPERATION IN THE REGION"

Preface

Since the earliest days man has strived for better ways to satisfy his basic needs of shelter and survival. He has long been regarded as a tool making being and his use of tools has often been regarded as the defining characteristic of Homo Sapiens. However, Sir Peter Medawar, in his (1973) Frank Nelson Doubleday Lecture at the Smithsonian's Museum of History and Technology, suggests that what is distinctively human is not so much the devising of tools as the communication from one human being to another of the know-how to make them. This act of communication is what made possible the evolution of tools in a manner remarkably analogous to organic evolution through non-genetic channels—through indoctrination. The philosopher Karl Popper in his book Objective Knowledge introduced the concept of a "third world" to be added to the "physical world" of physical states, and the "mental world" of mental states. The third world is the world of concepts, ideas, theories, theorems, arguments and explanations. It is the world of the artifacts of the mind which is constantly undergoing an evolutionary change. This world is a product of the human mind but yet is largely autonomous. It is the world of

technological innovation and progress.

Technology is a continued response to the needs of life. In order for technology to serve the masses it has to be used as a means towards the development of people. It should be controlled by its users rather than controlling them and utilized to improve their condition without losing their ability to be creative. Appropriate Technology is that used by the people for the people.

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The objectives of this study are:

1. To survey existing conditions which bear on potential development of appropriate technology in the Near East. The primary concern here is Egypt, Israel, Jordan, Syria and the West Bank and Gaza Strip.

2. To investigate the potential for regional co-operation that exists or might be nurtured and the merits of such co-operation.

3. To propose specific activities and projects with estimated cost and timetable.

   These activities should to the greatest extent possible involve real co-operation with emphasis on projects which could begin immediately.

4. To recommend areas for future study.

Introduction

After 30 years of war, sacrifice and austerity in the name of national defense it is not unexpected that the waring countries of the Middle East are economically exhausted. The war has cost Egypt an estimated $40 billion, forced it to maintain a half-million man army and to spend 25% of its gross national product on military requirements. In 1977, $5.4 billion were needed for investment financing and balance of payment deficits which are $3.2 billion in the red.

Israel is also running an annual trade deficit of 3 billion dollars.

The economies of Syria and Jordan are only maintained by extensive foreign loans and subsidies while both countries are attempting to maintain their military posture for a possible confrontation with one of the best equipped armed forces in the world.

The effects of this long state of war can be seen most visibly in Egypt. It has to carry the largest war burden and feed an ever-increasing population which is approximately three times the total of the population of Israel, Jordan, Syria and the West Bank.

Utilities have fallen into disrepair. Skilled labor and construction workers have been attracted by better opportunities and high salaries in the oil producing countries. Choking government bureaucracy is increasing at a rapid rate and stifles initiatives. Rent control laws discourage the

building or maintainance of apartment buildings. There is a housing shortage of 1.1 million units.

Inflation of unsubsidized goods runs at an annual rate of 25%. Urban unemployment is 12%. Public transportation is bordering on collapse. No wonder the average Egyptian loks forward to the prospects of peace and not only expects the burdens of war to be lifted but anticipates a better life as well.

The prospects of peace between Egypt and Israel have improved the climate for foreign investment in the Egyptian Economy. In 1977 Noway provided $120 million and Germany $104 million in easy term loans. A consortium of French banks are lending $76 million in a number of projects in which French companies are interested. The United Kingdom is investing in several small projects including a Wilkinson $3 million razor blade factory and a Cadbury Schweppes bottling plant for Helwan mineral water. These are positive developments but they are merely a drop in a bucket. What is needed to put the region back on its feet in the post-war era is the equivalent of a Marshall plan. This will help guarantee peace and security for the future as well.

This study focuses on one potential aspect of development which may prove ideal for providing a sound technological base in rural as well as crowded urban migration centers. The ultimate objective is to utilize science and technology in an appropriate way, to achieve technological

self-reliance for the masses (especially the poor) and to present to them alternatives for a better quality of life.

Avenues for regional cooperation with a mutuality of benefits are also explored. If success is to be achieved, "Demand Pull" rather than "Technological Push" should be regarded as the fundamental law governing such cooperation.

EXISTING CONDITIONS

This section is not intended to give a detailed description of the geographic, political, educational, social and economic conditions of the area. The objective here, however, is to provide some background information which is relevant to this study. Some additional information can be found in Appendix I.

Socio-economic Indicators

A summary of the socio-economic indicators relevant to the development of Appropriate Technology is given in Figs. 1 to 4. It illustrates respectively the statistics on human resources, scientists and engineers (not including the humanities and social sciences), gross national product and gross national product per capita. The data plotted in the figures is derived from a 1978 study by J. D. Frame and A. N. Sprague for AID. It can be seen from the figures that:

1. Egypt has approximately 3 times the combined population of the rest of the countries considered in this study.

2. The labor force in Israel is 1/3 of the population and only 6% of the labor foce are engaged in agriculture (2% of the population).

   For Egypt, Jordan and Syria the labor force is approximately 20% of the total population and about 60% of the labor force are engaged in agriculture (12% of the population).

3. The urban population is 86% in Israel and approximately 40% in the other countries.

4. Egypt has over 80% of the total number of scientists and engineers in the region.

5. The G.N.P. of Israel is the highest in the region (approximately 5% higher than that of Egypt) and the G.N.P. per capita for Israel is 12 times that of Egypt and Jordan and 7.5 times that of Syria.

Existing Science and Technology Institutions Which Can Support the Development of Appropriate Technology Programs

A listing of the different governmental, educational and other institutions which can contribute to the Development of Appropriate Technology Programs is given in Appendix 2. As can be seen from the listing there are a considerable number of existing institutions and universities, especially in Egypt and Israel with specialists in practically every branch of science and technology needed for developing the basic knowledge as needed in any Appropriate Technology application. The basic philosphy in most of these institutions is scientific research rather than applications. Israel, however, has several private institutes and centers which are more oriented towards applications and community service.

It should be noted here that both Egypt and Israel have a high scientific publication record. Egypt has the same ratio of publications to G.N.P. as the U.S. while Israel has the world's highest record for this ratio.

It can also be seen that Egypt has a large number of new universities starting in rural provinces. These can be ideal centers for stimulating appropriate technology developments in the rural areas.

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It can also be seen that Egypt has a large number of new universities starting in rural provinces. These can be ideal centers for stimulating appropriate technology developments in the rural areas.

The University of Aleppo in Syria now has 9000 undergraduate students in engineering. The College of Engineering has recently decided to concentrate on undergraduate studies. Aleppo is situated in the agricultural region of Syria and is also ideally suited for stimulating appropriate technology programs in the region.

Jordan and the West Bank have, beside the growing number of engineering colleges, several technical institutes which can serve as training bases for appropriate technology.

The Socio-economic Conditions

The socio-economic conditions in all countries of the region are understandably difficult after three decades of a state of war and three armed conflicts. The following situations exist in one or more of the countries in the region.

Egypt suffers the most because it has to cope with expenditure for aramament and feeding an increasing population. Israel's situation is relatively the best in the region because of its integration of the armed reserved in civilian life and the extensive economic support it receives from abroad.

1. High reliability on imported products, including food.
2. Limited export trade and large deficits.
3. Expenditures for economic development give way to military expenditures.

4. A very high rate of inflation and a relatively fixed wage structure.

5. Maintaining armed forces larger than the economies can afford.

6. Uncertainty and instability for fear of war which discourages foreign investments.

7. Lack of capital for development.

Summary

The human and technological resource in the region are adequate and can be readily mobilzed to contribute effectively to the development of Appropriate Technology, which appears to be a viable approach, in view of the existing socio-economic conditions in the region.

THE NEEDS

The overriding need in the region is how to achieve technological and economic self-reliance for the masses, especially the poor. Because of its special circumstances, Israel may be the only country in the region which was capable of attaining a measure of technological self-reliance for the masses, but is far from attaining the goal of economic self-reliance.

Technological self-reliance implies the development of a sound "grass roots" technological base. Attempts to impose technological change from the top, in many developing countries, has often floundered due to lack of various types types of trained manpower. Government industrialization policies can function in vacuum unless there is viable interaction with the masses.

In the Arab nations of the region, there is a definite need for strategies for the development of rural communities and crowded urban migration centers. The situation is different in Israel, but there is a need for accelerating developments in order to achieve economic growth.

It should be noted that the majority of the Israeli population (86%) live in urban settings and there is a need there to accelerate the transmission of growth opportunities to the rural sector.

Some of the general technological needs in the region which are relevant to this study can be summarized in the

following. This is by no means a complete list and is given only for illustration of the type of needed activities.

1. Because of the scarcity of capital, there is a need for production technologies compatible with abundant labor resources. This requires reducing capital expenditure costs per unit of increased employment.

2. Developing the human resources for productive work through relevant training and learning by doing. If a society is unable to appropriately develop its human resources to serve its needs, it cannot develop much else.

   Attention must be given to developing indigenous skilled manpower. This requires that the educational institutions emphasize problem-solving approaches to economic and social growth as well as small-scale entrepeneurship developments.

3. Improvement in agricultural productivity with an appropriate technological base adapted to local conditions and accepted by its users. Through the use of small farm-implements, appropriate pest control and fertilization materials and practices, Japanese farm productivity is approximately double that of Egypt and Israel.

4. Technologies and systems for water resource development and management. This requires development of appropriate techniques and practices for utilization of underground water systems, rain and drip irrigation technologies to minimize waste.

5. Improvement of animal and poultry production on a scale compatible with local conditions and economics. An important problem in Egypt which requires a technological solution is the optimization of animal power use while improving meat and milk production.

6. Development of efficient inland and sea fisheries, utilizing appropriate technology for sea fishing and aquaculture. It has long been a common practice to grow fish in farm drainage ditches and the application of technology can improve the practice.

7. Practices for arid land reclamation and land rehabilitation to raise productivity.

8. Introduction of tile technology drainage and irrigation channels to reduce water waste. This can have the added advantage of controlling Bilharzia in Egypt, (an enedemic debilitating disease caused by parasitic worms which flourish on the shores of canals and irrigation channels).

9. Relieving migration to urban areas by providing productive work in the village and rural setting.

10. Development of techniques and materials for building rural and urban housing to accommodate increases in population as well as efficient maintenance procedures and equipment based on the self-help approach.

11. Improvements on methods of agriculture, animal and household waste recycling.

12. Better construction and maintenance materials and method for rural roads.

13. Techniques for storage, and processing of agricultural and food products on a small scale.

14. Expansion of service industries to cope with the increasing demand for all types of services and to provide productive work for accommodating the increase in population.

15. Means of utilization of ocean and land mineral resources on a small scale. The Sinai, Negev, West Bank, Syria, Eastern and Western Deserts.

16. Sanitation and portable water purification systems for rural areas.

17. Small machine shops for general purpose machining, metal working and fabrication.

18. Furniture manufacturing compatible with local needs and materials.

19. Small energy packages and equipment for rural homes; for cooking, heating, cooling, light, water heating, etc., using available energy sources including solar, wind and water flow.

20. Transportation systems for people and goods, utilizing human or animal power.

21. Small scale ceramic, clay, glass and plastic manufacturing.

22. Utilizing technology to improve on traditional artifacts and to develop viable cottage industries.

23. Small hotel and motel enterprizes, especially along roads traveled by tourists or near tourist recreational spots.

24. Recreational facilities and devices for urban and rural areas.

THE RESOURCES

Human Resources

The most abundant resource in the region (especially in Egypt) are human resources. The majority of the people in the region (with the exception of Israel) have a very low level of productivity and have little chance of improving their lot due to the general economic condition. There is no shortage in "educated" pwople, because of government policies of making education available to the masses. Even the workers and the farmers sacrifice all they can in order to give their children the highest possible education.

The organization and optimum utilization of human capital is a very real problem which if successfully handled can bring about economic prosperity. We know the principles of raising money capital which is to restrict consumption and use the results of savings for investment.

To raise capital for development in less developed countries presents challenges in mobilizing the poorer peoples to build additional productive capability as they raise their standard of living.

This concomitant growth may seem paradoxical in an economic theoretical sense because savings are essential for capital formation. Saving requires foregoing consumption, but how can one save and increase consumption simultaneously? The answer may be found in developing technologies for improving the overall efficiency of production at

a rate in excess of saving rate.

Institutions of Science and Technology

A list of existing institutions of learning, research and development for the different countries in the region is given in Appendix 2. It can be seen from the list that such institutions are capable of providing the basic science and technology support that is required to fulfill any of the needs stated in the previous sections.

Special organizational structures have to be developed however, to mobilize these institutions for contributing to the goals of this study. Examples of possible structures will be proposed in the implementation section with emphasis placed on regional cooperation and sharing of technical resources.

Economic and Financial Resources

The economic resources in the area are primarily agricultural with a limited variety of mineral resources. Syria has vast areas which can be reclaimed for agriculture. Potential expansion of agricultural lands in the other countries is rather limited, but the productivity of existing land can still be enhanced.

If current oil exploration activities are successful, Egypt may soon be an oil exporting country. Egypt, Jordan and Israel are also likely to benefit from oil transit tariffs.

Certainly there is a tremendous potential in tourism with Egypt's historical appeal and the religious attractions of the holy places in Jerusalem and Bethlehem. The Mediterranean has some of the most beautiful beaches in the world. The Red Sea has the best skin diving and one of the best climates. None of the countries of the region however have funds for tourism development projects.

With peace in the area, the Sudan and other Middle East and African countries, with their vast natural resources, but lack of human resources can prove to be ideal partners in the regional development.

THE CONSTRAINTS

There are some socio-economic constraints which have to be considered in planning labor intensive technologies in the region. These include the negative reactions against manual work in some of the countries. There are also other constraints which have to be adequately dealt with in any proposed regional co-operation.

A. Socio-economic Constraints

1. Limited resources and slow economic expansion.

2. Lack of basic tools and materials which, for the most part, have to be imported with scarce capital.

3. Established governmental bureaucracies with complex networks of agencies and regulations.

4. Those who should advocate appropriate technology are those who are unable to articulate their needs and lack the necessary entrepreneurship for new technical ventures.

5. Lack of respect for manual labor is entrenched in Near Eastern cultural values. A respectful man is expected not to have his hands dirty.

6. Respect of office work. Status, power and authority usually go with it. It is therefore sought after even if the work is not challanging and the pay is poor.

7. A negative attitutde towards "home-made" or "hand-made" and a blind positive attitude towards the imported or machine made.

8. Traditions and agrarian value systems established over thousands of years have as strong an influence on human behavior as religion.

9. The educational system reflects and amplifies the cultural attitudes towards manual labor. There is a very high regard for scholarship and intellectual endeavors. A person's status is elevated when he uses his mind and not his hands. Even when the children of workers and farmers go to

school, their own families expect them to act their part and not to get their hands dirty.

10. There is a universal belief that labor intensive technologies are inferior technologies and distract from catching up rapidly with established technological societies.

B. Constraints against regional cooperation

1. Natural suspicion and fear of economic abuse or domination.

2. The human ego is notoriously reistant to ideas and concepts which do not originate from the known, tested, and trusted individual.

3. The old political difference and animosities between nations may influence the attitudes of people for some time.

4. Intergovernmental bureaucratic regulations, customs and communications may prove to be much too difficult for the small enterprises to survive.

APPROPRIATE TECHNOLOGY AS AN APPROACH TO TECHNICAL DEVELOPMENT AND COOPERATION IN THE MIDDLE EAST

The Near East region, has an abundance of human resources, a lack of capital and a viable scientific and technological base which would make it ideal for appropriate technology application. It can, if properly introduced in the region, provide an effective,practical vehicle for economic and social advances as well as a cushion against outside economic changes. For the masses, the foremost benefit of appropriate technology is the developing and extending of their problem solving ability, entrepeneurship and skills. It would establish a self-sustaining and expanding reservoir of skills and would reduce unnecessary dependancy on external resources. Employment, human productivity and equity can be achieved with low cost labor-intensive technology.

Appropriate technology requires a small amount of capital, it is maintainable on a local level, it is applicable to many people and it is labor intensive. It should be compatible with local cultural patterns and therefore controlled by its users. Appropriate technology can be delivered at low cost and can be applied to the production of goods as well as the provisions of services. Hardware is only a part of the overall process of organizing people into effective working groups.

Some of the basic criteria for appropriate technology are:

1. High employment potential.
2. Better producitivity than existing technology in the same field.
3. High local content.
4. Low dependance on complicated infrastructure.
5. Small scale entrepeneurship development and local ownership.
6. Integration of science and technology into the cultural setting.
7. Meaningful work, personal grwoth and self reliance.
8. More personal involvement in direct production and less bureaucratic paper shuffling.

In a broad sense, appropriate technology is being applied in the Israeli Kabutz. This may very well provide some practical proof as to the viability of this approach and a basis for regional cooperation. Conditions are somewhat different in the small villages of Egypt, Syria, Jordan or the West Bank. The problems, needs and solutions may also be somewhat different. Regional cooperation in appropriate technology should be encouraged, whenever possible, to enhance progress rather than hinder it. Cooperative arrangements can be developed. Networks among small scale economic producers can exchange products, services and materials for the ultimate benefit of each producer.

IMPLEMENTATION PHILOSOPHY AND MECHANISMS

The need to mobilize scientific and technical resources in support of regional developments is clear. Many economic and social problems can be solved, and the efficiency and productivity can be imporved if local groups, both independently and through national and regional organization, see to identify, describe and set priorities on problems important to their citizens.

Characteristics and hence solutions to many domestic problems vary from locality to locality. Finding effective ways to define and implement appropriate technology programs requires that local groups are able to undertake projects shaped to their needs. Most of the governments of the region command the major resources, laboratories and personnel needed to implement such programs but they lack the close contact with the people directly affected.

The mechanism of science and technology applications to community needs is one of agents not agencies. Individual initiative, effective communications and interpersonal relationships are the most important factors contributing to successful technology application. The role of the governments is to avoid direct involvement in the developmental process but at the same time, provide ready accessibility to economic data, technical resources and innovations (foreign, regional and local). The government could provide "seed funding" to groups who identify problems. Public service and

public service oriented agencies should work through universities to train practically oriented field agents with a strong commitment to appropriate technology applications.

There are challenges in implementing appropriate technology programs in countries with established and complex bureaucratic structures. Another problem which has to be faced is how to give apriori RESPECTABILITY to appropriate technology activities in the scientific and financial circles. The latter is by far the most important point on which the future of the entire enterprise may rest.

The following are some specific steps which have to be taken by the governments in implementing appropriate technology:

1. A communications policy with an action network are needed to assure that appropriate technology is developed efficiently and in accordance with the needs of the people.

2. Mechanisms that allow for regional partnerships in technology sharing should be developed.

3. These regional partnerships should explore funding arrangements that strengthen local efforts and stimulate the use of private and public resources.

4. Administrative and legislative action is needed to perpetrate there regional exchanges and partnerships.

5. Government interference in the actual practice of appropriate technology should be kept to a minimum.

6. The mass media i.e. the public press and communication systems should be utilized to publicize appropriate technology efforts.

7. Incentives and rewards should be instituted to recognize public and private agencies for effective and substantive services to appropriate technology.

8. Educational objectives, particularly at the University level, should reflect this need for training people—not only with the knowledge of sophisticated technologies but more importantly—how to use this technology in in a practical, productive and economically fruitful way.

9. Roving workshops and awareness centers should be developed on a regional basis to provide on-the-spot exchange of results and to link the technological capabilities of the educational and research institutions with the needs of the region.

10. Governments and scientific organizations should recognize appropriate technology activities as an important aspect of the national technological development. Respectability of this type of activity is essential for motivating innovative and enterprising engineers and scientists to be involved.

Implementation Mechanisms

In the initial phases of implementation, students in the universities and technical institutes would be the hub of the activity. Most of them come from the villages or the conjested urban areas. They are the ideal link between the potential users of technology and the technology centers. They represent future leaders of their communities and if properly motivated, would be eager to serve.

A proposed plan for appropriate technology implementation based on student involvement is outlined in the following:

1. Appropriate technology projects would start in the jun or year of college as part of the academic program. Projects should be initiated by the students. The basic criterion for an acceptable project is that it represents a response to a true need in the community where a student or a group of students live. The students would be graded based on the documentation of the need and proposed solutions. Students in this part of the world (and their families) are very sensitive to course grades and would be consequently motivated to produce meaningful investigations.

2. Seed money would be made available to the students to undertake a feasibility study of their projects during their summer vacation which they normally spend unproductively in their home communities. A documented report on the summer implementation would be required for academic credit. Grades would be based on the seriousness of the effort and the involvement of the community in the project. Involving local high school students should be encouraged.

3. The projects would be appraised for technical, economic and social impact during the senior year. A comprehensive report would be required before graduation in partial fulfillment of their degree.

   It should be noted here that an extensive senior project is currently an integral part of the engineering curricula in most of the universities in the region. What is proposed here is simply an emphasis on relevant applications.

4. National competitions for projects in different areas would be held annually.

5. The winners in the national competitions would compete in the regional competition.

6. All promising projects would receive immediate financial support for implementation and the students would be exempted from military service.

7. The winners in the regional competition would be also awarded with study trips abroad to acquire more knowledge relevent to their projects.

8. Appropriate rewards should be given to the faculty supervising the successful projects.

Administration

1. A university committee on appropriate technology would be set-up in each university or technical institute to administer the academic programs and accumulate a central library on the subject. The committee is to be headed by the academic vice-president of the university with representation from the different departments by faculty who are supervising student projects.

2. A "Faculty-Government-Industry-Citizens" Council would administer the national competitions.

3. A national advisory committee under the auspicies of the Chief of State and headed by his science and technology advisor or another designee would include the heads of the different institutional committees.

4. A regional Appropriate Technology Coordinating Board would be formed to assess developments, apply for regional grants and administer the regional competitions. Since this is a critical committee it should have a broad representation in terms of nationality, rank, age and skills. Its members should have a commitment to appropriate technology applications and are well respected by their peers.

   A suggested structure for this committee can be:

   a. A respected professor of engineering design (for example, Professor S. Bayomi, Head of Design and Production Engineering Department, Cairo University. He is highly respected by his students and the engineering community and has made many contributions to appropriate technology).

   b. A science and technology dean (a suggested candidate is the Dean of Engineering at Ben Gorian University or the Technion, Israel.

   c. A university president (a suggested name is Dr. Ahmad Hassan of Aleppo University, Syria. He is a former dean of engineering and very active in international engineering education programs). The College of Engineering in Aleppo has 9,000 engineering students.

   d. A high level government official with genuine interest in fostering appropriate technology (a suggested candidate is His Royal Highness Crown Prince Hassan Bin Talal of Jordan. His address to the

Second Arab-European Business Cooperation Symposium in Montreaux-Switzerland, May 1978 reflects his interest in technology transfer).

e. A respected progressive community leader (a suggested candidate is the mayor of Nabulis or Bethlehem, West Bank).

f. A former student who has demonstrated exceptional ability in appropriate technology application (a suggested candidate is the winner of the regional competition).

g. A senior economics or financial officer from the U.S. State Department, UNIDO or the World Bank.

h. The Board would have corresponding members or consultants from the U.S. who have intimate knowledge of the socio-economic aspect of the region and are interested in technology applications (preferably from the Near East Origin). Midwest Universities Consortium for International Activities (MUCIA) can play a significant role in this regard. The consortium includes most of the major universities of the Midwest and has a long history of service and cooperation with the less developed countries all over the world. It also has active interest in Appropriate Technology applications.

SUGGESTED BUDGET FOR INITIAL IMPLEMENTATION PHASE

Because of the limited financial resources of the region, it is inevitable that the U.S. will have to finance any demonstration projects. The following is a suggested budget which is envisioned to be adequate to initiate appropriate technology activity in the region.

Total Expenditure/Year ..... $35 million

Period .... 4 years

Annual Allocations per year

EGYPT

Univ. of Cairo.....	$1 million
Univ. of Alexandria.....	$1 million
Ain Shams University.....	$1 million
Tanta University.....	$ .5 million
Mansoura University.....	$ .5 million
Asuit University.....	$ .5 million
Menia University.....	$ .5 million
Zagazig University.....	$ .5 million
High Technical Institutes and other technical schools.....	$ 2 million
	Total $7.5 million

ISRAEL

Tel Aviv University.....	$1 million
Technion.....	$1 million
Bar Jlan University.....	$1 million
Ben Gorian University.....	$1 million
Hebrew University.....	$1 million
	Total $5 million

These universities can work in conjunction with Inst. of Packaging, Wine Institute, Inst. of Transportation Research, Desert Institute, Mer Mem. Institute, etc.

JORDAN

University of Amman.....$ .5 million

Yarmouk University.....$ .5 million

Other technical institutes.....$ 1 million
(see Appendix)

Total 2 million

SYRIA

University of Damascus.....$ 1 million

Aleppo University.....$ 1 million

Latthakia University.....$ .5 million

Other Technical Institutes.....$ 1 million

Total $3.5 million

WEST BANK AND GHAZA

Different technical institutes.....Total $2 million
(see Appendix)

This budget reflects an average expenditure of $1,000 per involved student per year to cover direct project costs and university expenditure for the special tutoring necessary to supervise the proposed activity.

REGIONAL APPROPRIATE TECHNOLOGY CENTER

-Central administration and central library operations.....$ 5 million

-Roving workships, awareness centers, field agents and consultants.....$ 5 million

-Support for other community activities other than those connected with the educational institutions.....$ 5 million

SPECIFIC AREAS FOR UTILIZATION OF APPROPRIATE TECHNOLOGY WITH POTENTIAL FOR REGIONAL CO-OPERATION

This section lists examples of specific projects which may be considered as demonstrations of technology applications. The list briefly describes the envisioned need, existing conditions, available resources and expected economic and social benefits. Also considered are such problems as implementation, community acceptance, blockages, implementation, wide adaptation possibilities and the potential for regional co-operation.

This list is by no means complete and the order of presentation does not necessarily reflect the priority assigned to the project.

Project Area-I

Need:

Small scale agricultural tools and practices to improve the efficiency of human and animal work and increase the productivity of small tracts of land.

Existing Conditions:

With the exception of the Israeli co-operative farms and a few mechanized farms in the rest of the region, farm tools and practices are essentially the same as in ancient times.

Available Resources:

Technical Solutions

Because of the universal interest in this type of problem, many technical solutions have been developed, field tested and evaluated in several world communities. Available solutions may or may not be directly applicable to the Near Eastern farming needs.

Materials

Can be readily obtained if not already available in the region.

Human Resources

Available with proper training. Joint projects between the engineering and agricultural schools would be necessary.

Financial Resources

Seed money is needed for development and small loans would be necessary for production ventures.

Expected Social and Economic Benefits

Creating an industry for agricultural tools. This would affect approximately half the working force in the region. It would improve food production efficiency, reduce migration to overcrowded cities and provide the training for manufacturing skills. It would also encourage agricultural land development.

Community Acceptance

There would be resistance to change unless the farmers are involved in the development and evaluation process.

Potential for Regional Cooperation

Excellent if the political climate permits.

Project Area-II

Need:

Tools for do-it-yourself improvement and maintenance of urban homes.

Existing Conditions:

This project is particularly needed for Egypt where the maintenance of home exteriors and interiors has virtually stopped for many years. Tools to simplify plastering, painting, window repairing, floor tile installation, plumbing, etc. are badly needed.

Hand operated floor sweepers and floor washers are also needed to compensate for the shortage of domestic help.

In spite of the continuous transfer of airborne dust and domestic flies through the windows there is no industry for window screens which can be easily mounted on existing windows and are easy to clean.

Available Resources:

Technical Solutions

There are some technical resources to assist in this project. However, the majority of the tools would have to be specially designed to suit the existing habits and life style of the people.

Materials

Natural fibers (especially cotton) are available in abundance. Small scale plastics technology is easily transferable.

Human Resources

The skills needed to work on this project are available in large numbers in the different engineering schools and technical insitutes.

Financial Resources

Financing mechanisms would be needed for manufacturing the products.

Expected Social and Economic Benefits

Improving home environment and sanitation. Creating a large number of urban small scale industries.

Community Acceptance

These tools would be welcomed by the community. A change of attitude is necessary to create the social climate for do-it-yourself activities.

Potential for Regional Co-operation

Joint ventures between Egypt and Israel to develop small-scale manufacturing in this area would be mutually beneficial.

Project Area-III

Need:

Developing self-help housing industry for the rural and urban areas.

Existing Conditions:

There is a severe housing shortage in both rural and urban areas, particularly in Egypt.

A housing technology based on utilization of local materials (stone or brick and processed agricultural waste products) and self-help construction would ease existing shortages and encourage development of new industrial and agricultural settlements and workshops.

Potential for Regional Co-operation

The experience Israel in development of self-help settlements would be helpful to Egyptians planning efficient home construction technology.

Project Area-IV

Need:

Small-scale fertilizer and insecticides production.

Existing Conditions:

All countries in the region including Israel use lower fertilizers and insecticides per acre than is required for maximum output.

Regional Co-operation:

This is an area where regional co-operation in developing the necessary technology and production facilities would be beneficial to all participants. The political climate would determine the level of co-operation.

Project Area-V

Need:

Developing irrigation systems and technologies, such as drip irrigation, for water conservation.

Existing Conditions:

There is a considerable waste of water resources in areas where water is readily available. Water conservation practices would allow more land reclamation.

Project Area-VI

Need:

Developing effective artesian well drilling tools and practices for water resource development.

Existing Conditions:

Many areas of the region rely on rain for irrigation. Vast uncultivated regions can be rendered productive if underground water resources are tapped.

Project Area-VII

Need:

Developing solar energy applications for urban and rural use.

Existing Conditions:

The region is ideally suited for solar energy utilization, especially for home use, water desalinization and purification.

Regional Cooperation Potential

Israel and Egypt have had interest in this field for a long time. This area of technology application would be ideal for regional cooperation.

Project Area-VIII

Need:

Development of aquaculture and fisheries.

Existing Conditions:

All countries in the region can benefit considerably from small-scale aquaculture technology to boost their meat production capabilities.

Project Area-IX

Need:

Development of small scale industries for packaging, processing and storing of agricultural products, especially fruits and vegetables.

Existing Conditions:

There is hardly any small-scale agricultural products processing industries in the villages of the region. This technology if applied can increase the flow of farm products to the cities.

Project Area-X

Need:

Developing clean sources of energy for household use in rural areas — as for example; making methane gas from animal dung.

Existing Conditions:

In the Egyptian village, dried animal dung has been used for centuries as the primary source for cooking and baking. A clean source of energy can be readily produced from the dung in the form of methane gas. The material remaining after the extraction of methane can still be dried and formed into fuel discs or fertilizer.

Project Area-XI

Need:

Small scale olive oil and grape processing industries, also soap and detergent manufacturing from the oil.

Existing Conditions:

This project is primarily for Syria, the West Bank and Jordan where old inefficient techniques are still in use.

Available Resources:

Technical Solution

The large scale technology exists and has to be scaled down so that they fit the existing pattern of family owned enterprises.

Material and Human Resources

Both Syria and Israel have the material, manufacturing and human resources for developing this project.

Financial Resources

External resources will be needed to support the research and development.

Expected Social and Economic Benefits

This project would considerably benefit the olive growers by increasing employment and extending marketing potential

Community Acceptance

The communities growing olives and grapes would be very receptive to any improvement in processing and marketing their harvest.

Potential for Regional Co-operation

Regional co-operation in this project on a large scale is not possible without peace in the region.

Project Area-XII

Need:

Effective single or two passenger transportation vehicles which are human operated or with very small gasoline engines. They could be utilized in congested urban commuting as well as in the rural areas where they use animals.

Existing Conditions:

The transportation problem is very acute. Private transportation by car is out of the reach of most of the population in the region. It would also alleviate the overcrowding of buses, trains and public transportation.

Project Area-XIII

Need:

There is need for tile production for use in irrigation ditches as well as efficient pottery industries.

Project Area-XIV

Need:

Small-scale furniture industries utilizing local materials. Emphasis on functional design rather than ornamentation should be stressed; this would require some education. It could become popular and thus socially acceptable — just as modern design has gained acceptance in the U.S.

Project Area-XV

Need:

Developing sanitary systems for rural house-hold waste disposal and recycling.

Project Area-XVI

Need:

Applying modern production,managerial and marketing technologies to the local artifacts industries for export trade.

Project Area-XVII

Need:

Developing appropriate practices and technology for grazing of sheep, goats and other livestock. This problem is important for Syria, Jordan, the West Bank and the non-agricultural desert regions of Egypt.

Existing Conditions:

Current practices are archaic and in many situations they are counterproductive.

Project Area-XVIII

Need:

Small machine shops for patch manufacturing and repairs. Also electrical machinery repair shops.

Existing Conditions:

This type of activity is the basis on which any meaningful industrialization is built. Existing shops are short in number, equipment, good management practices and skilled labor.

Encouraging the development of this project would create meaningful and productive jobs for many of the engineering graduates as well as training for a skilled industrial labor force.

IMPLEMENTATION FEASIBILITY AND THE U.S. ROLE IN SUCCESSFUL IMPLEMENTATION

Many of the projects listed in the previous section can be implemented now even without direct regional co-operation if funding resources are available and if the Appropriate Technology philosophy is adopted as an integral part of the development plans for the various governments.

Regional co-operation can start immediately on the technical level. Technology is a commodity, an essential neutral tool. There are many examples of technology transfer between nations with diverse political systems. The U.S. can play an effective role in initiating technological co-operation by acting as a mediator through existing university structure.

Organizations such as the Midwest Universities Consortium for International Activities (MUCIA), which has extensive technological resources and linkages to all countries in the region, can provide valuable neutral grounds for technical co-operation, for technology transfer, consultation services and training of key personnel.

Future direct technical and economic co-operation would naturally evolve as the political situation permits.

The needs of the people in the region, the existing economic conditions, and the expectation of help from the U.S. makes it timely to initiate grass roots technological developments with U.S. universities and resources

participating as full partners during the initial or early phases of the process.

This is an important and necessary function which should not be taken lightly if peace based on economic stability and self-reliance is to reign in a region of vital interest to the U.S.

Many of the universities and technical institutes in the entire region are looking to the U.S. for help and direction. The U.S. should capitalize on this to help them expand and direct some of their resources for Appropriate Technology developments.

We should also provide them with sorely needed practical technical resources and funds. Technical co-operation to develop a viable grass roots technology in the region is very much needed. Such development can, in the long run, ease the heavy financial burden carried by the U.S. in economic aid for the region.

AREAS FOR FUTURE INVESTIGATION

The implementation mechanisms proposed in this report represent suggested approaches and guide lines. Detailed plans for implementation with specific budget and resource identification would require further studies on specific aspects of the general plan given this proposal, especially with regard to effective regional co-operation and mechanisms.

It is a relatively easy task to legislate change; however, it is sometimes difficult to generate the grass root commitment and support needed to guide the masses in the direction of more self-help and less reliance on the governments for accomplishing a better quality of life.

There are no rules for enforcing initiative, innovation or motivation. These can only develop if the proper climate exists. This is a role for the universities to fulfill. Further studies are needed to assess the capabilities and the needs of each university or technical institute in order to accomplish these goals within the framework of their current policies and obligations.

SUMMARY

1. The Near East countries considered in this study (Egypt, Israel, Jordan, Syria and the West Bank and Gaza) have a combined population of over 50 million (of these, 39 million are in Egypt). The science and technology man power not including social scientists is 290,000 (of these 240,000 are Egyptian). The regional Gross National Product is approximately $23 billion (of these $9 billion are for Egypt and $9.5 billion for Israel). The Gross National Product ranges from over $3,000 per capita for Israel to $400 for Syria, and $250 for Egypt and Jordan (See Figs. 1 to 4).
2. Except for Israel, approximately 60% of the popluation is engaged in food production and don't produce enough to supply the needs.
3. The region is highly dependent on foreign economic aid. The dependency seems to increase with time.
4. There are high expectations for prosperity after peace in the region especially in Egypt. The overwhelming majority believe that peace will bring with it economic miracles.
5. The primary objective of all countries in the region is economic self-reliance.
6. Most of the industrial and agricultural development plans are focused exclusively on large-scale government-owned enterprises. They have been operating on a low level of

efficiency due to the lack of attention to the infrastructure needed for meaningful large-scale industrialization.

7. Appropriate small-scale technology can provide the answer to developing a grass roots industrial base for improving the overall efficiency of production.

8. The region has many educational and research institutions with the potential to provide the needed support for technology applications. The graduates of most of the institutions, however, are not adequately trained to weave their knowledge in the fabric of their communities. Most of the scientists and technologists are employed in over-crowded government agencies. Their productivity is low.

9. Technology applications should involve the masses as partners in the development process.

10. The most pressing problem in the region is improving the food production and service industries.

11. Improvement of food production is possible by improving existing practices and increasing land reclamation, especially in Syria. Some major advances could be attained if the Sudan was involved in some economic and/or technical partnerships.

12. There are areas for technology applications which would be readily accepted by the masses because it would mean an opportunity for self-improvement. These potential

beneficiaries, however, lack capital and the access to technical and managerial resources to initiate such ventures.

13. The established government bureaucracies and banking practices are not conducive to support small enterprises.

14. The universities and technical insitutes are the natural place for initiating programs of technology applications and entrepeneurships.

15. Universities can also provide a practical forum for initiating regional cooperation in this type of activity.

16. Students are a good representation of the different segments of the socio-economic structure and are therefore the ideal link for initiating technology applications in the various communities. The can also be the link for initiating regional co-operation through exchanges and internships.

17. Most university resources are limited and the faculty are too heavily loaded and over-extended to undertake additional development responsibilities. Supporting staff committed to appropriate technology applications have to be hired and trained to supervise the student projects. Additional work space to accommodate the student project activities would be needed.

18. United States universities and organizations interested in appropriate technology applications (such as MUCIA)

can play a very important role in the training of the needed staff and fostering regional co-operation. Short term seminars for staff and students from the region could start in the U.S. universities as soon as funding is available. Technology information and consultation services for the Near East can be readily organized by these universities.

The initial involvement of U.S. universities would diminish after the activities take root in the region and would cost between one and four million dollars per year — depending on the extent of the participation.

19. VISIBILITY and RESPECTABILITY are needed to motivate participation of the best talent. This kind of technology application would contribute to the needs of the masses.

For example, President Sadat's Village (Mit Abu El Kom) as well as the birthplaces of the prominent national leaders would make excellent experimental locations for initiating some of the rural self-help projects.

20. Regional cooperation can start immediately in the West Bank and Gaza, particularly on projects related to agricultural productivity, marketing and housing. Teams from Egypt, Israel and Jordan would work with local farmers and students. They would begin by recognizing and defining problems, then they would plan feasible workable solutions.

21. The Sinai would also be a natural arena for co-operation between Egypt and Israel. As soon as a peace treaty is signed, there are 1/2 million acres of ariable land and a wealth of mineral and ocean resources. The Sinai has been under Israeli occupation since 1967. Israel has much technical data and experience there and Egypt is planning on it for some development. Israeli experience can contribute to the building of settlements and resorts, etc., as well as developing agriculture and harvesting natural resources.

22. In implementing appropriate technology, the role of the governments is to provide the proper climate for the various activities to develop and to reward effective service to the cause.

23. Total or partial exemption from military service should be awarded to those working on appropriate technology projects.

24. Research institutes for science and technology should devote part of their effort to studies relevant to national and regional need.

25. Mass media should give adequate coverage, support and recognition to this field of endeavor. This would help to motivate mass involvement and participation.

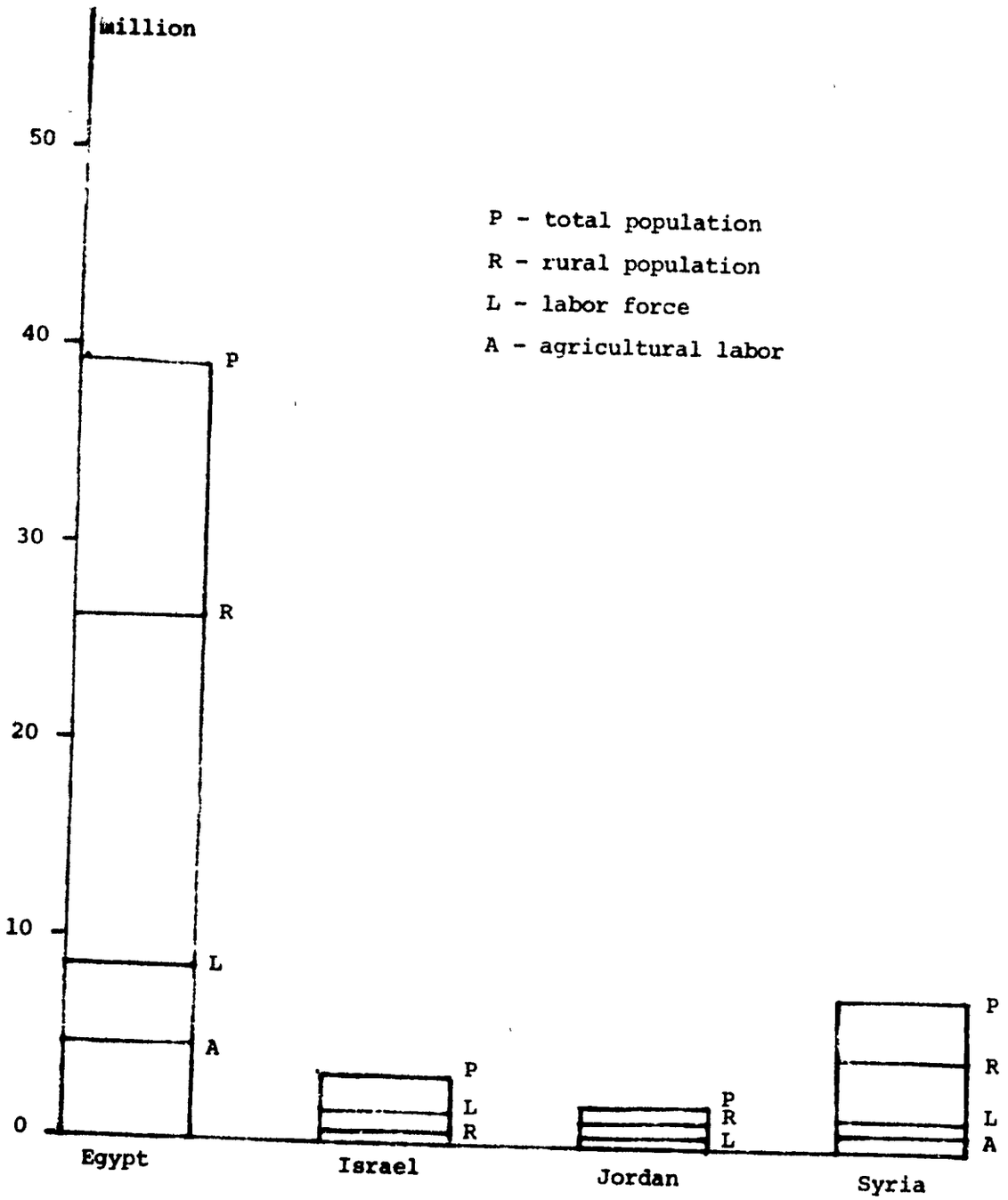

Figure 1. Human Resources

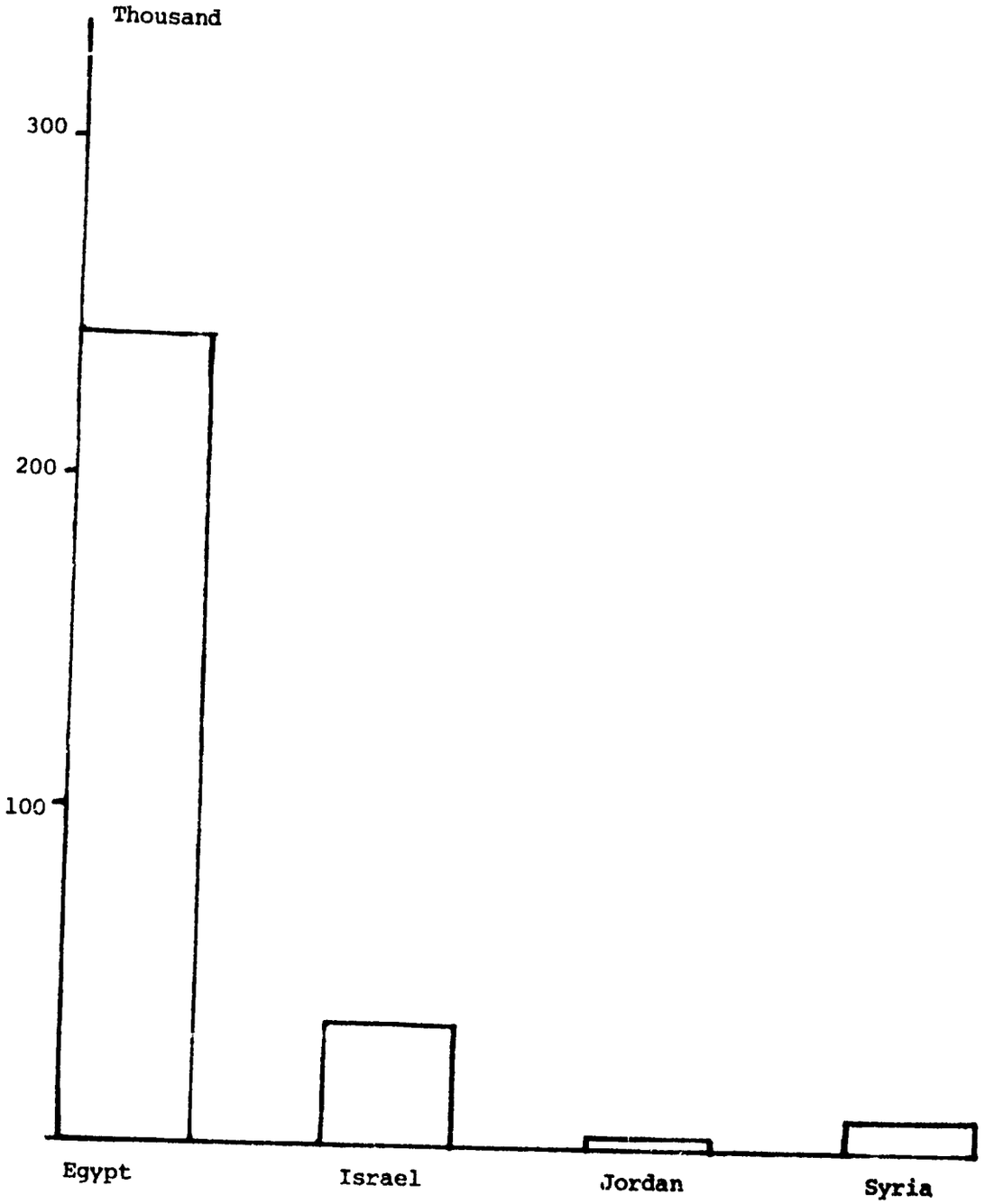

Figure 2. Scientists and Engineers (not including Humanities)

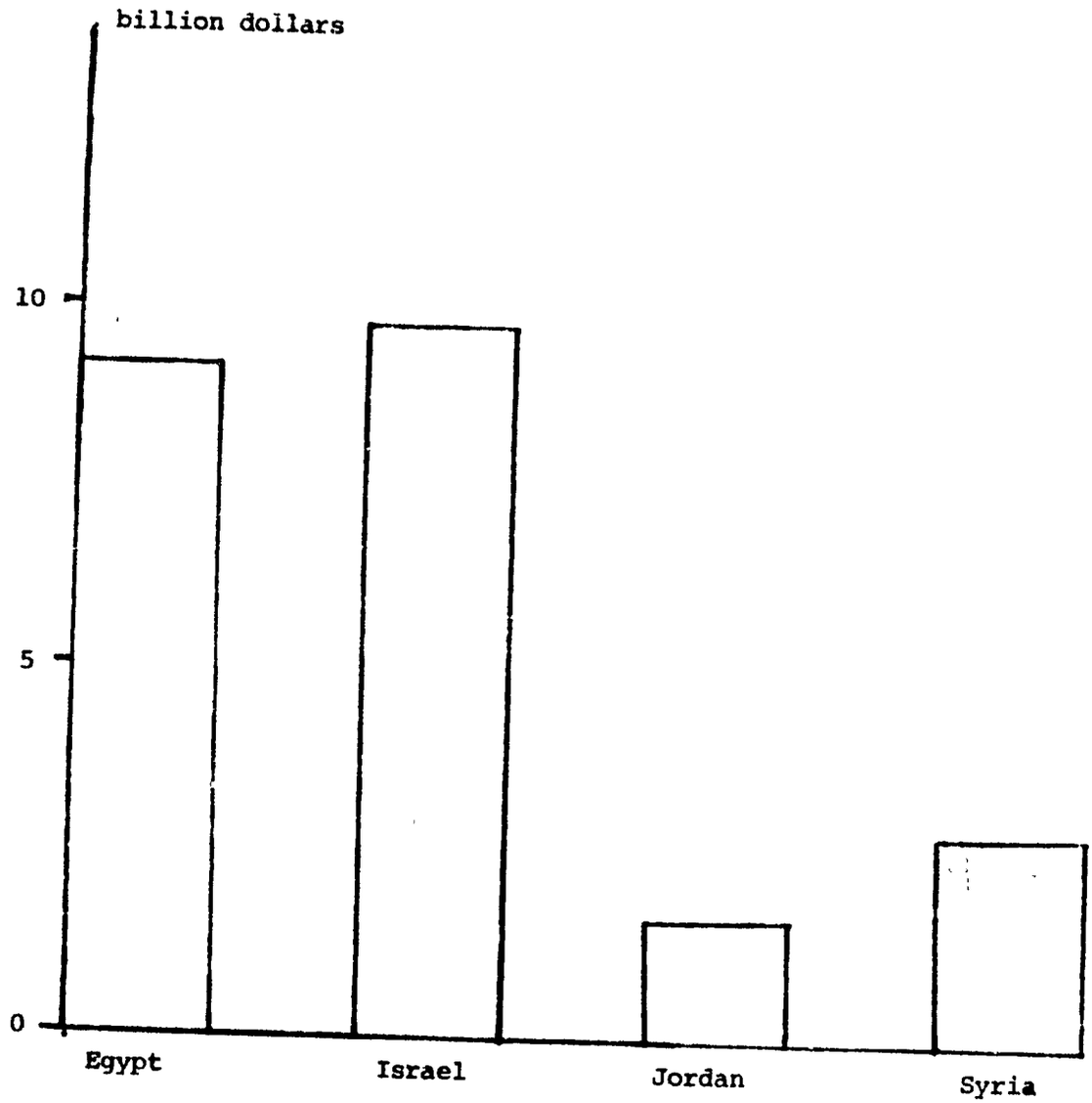

Figure 3. Gross National Product

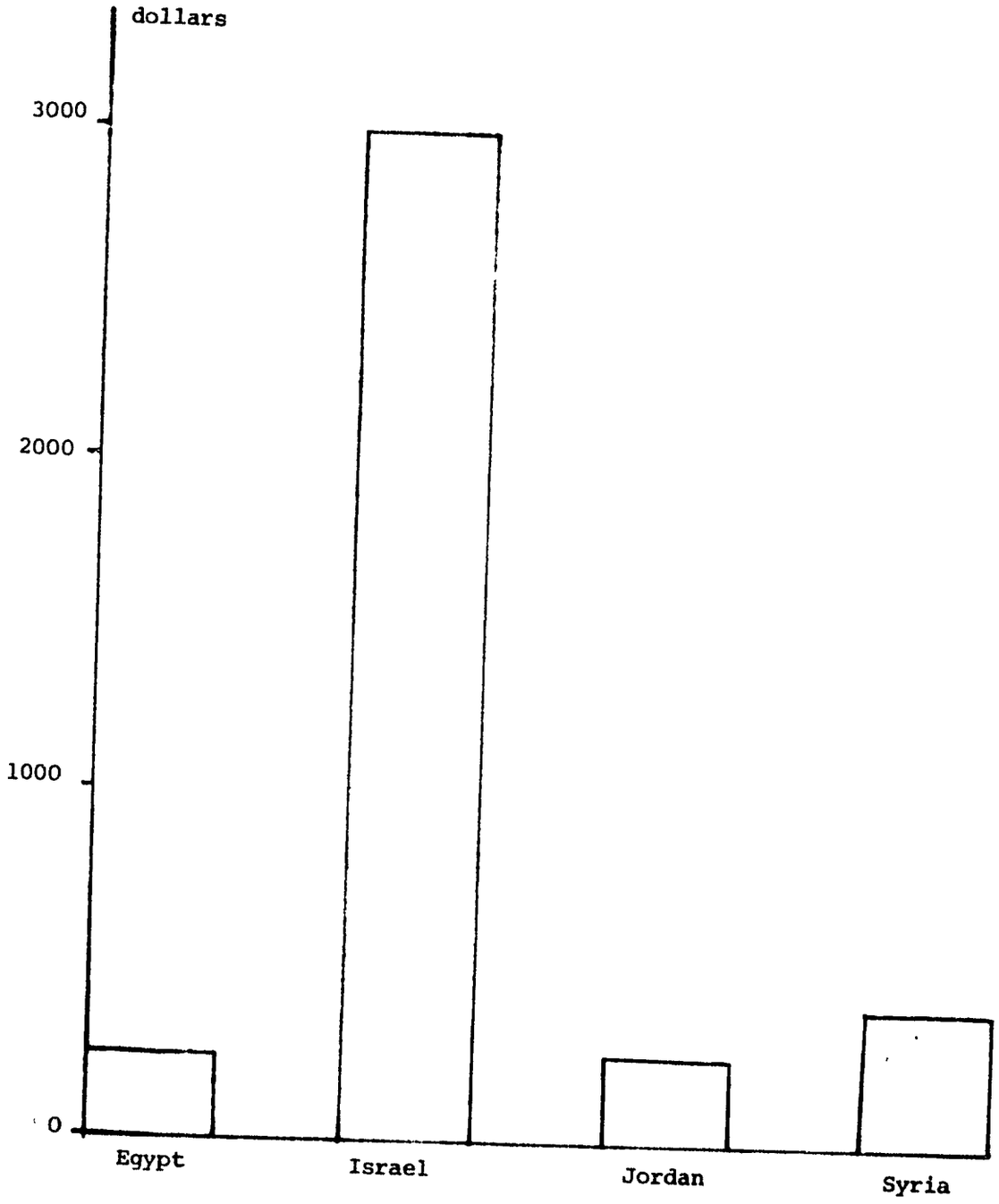

Figure 4. Gross National Product/Capita

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APPENDIX 1

BRIEF OUTLINE OF THE ECONOMIC BASE FOR THE DIFFERENT COUNTRIES IN THE REGION

EGYPT

Food Production

Egypt has very large desert regions, but the Nile Valley has one of the world's highest population densities.

Egypt is primarily an agricultural country. Approximately 60% of the population live in rural areas and approximately 60% of the human resources are engaged in food production. There are no forest or woodlands in Egypt.

All agriculture depends on irrigation since rainfall is negligible. Agriculture is labor intensive and the small plots of land are worked with tools differing little from those in ancient times. Livestock is raised primarily for draft purposes rather than milk and meat production. Only 10% of the milk is consummed as milk and 30% is converted into cheese. The remainder is used to make butter. Fish is an important source of protein and the annual consumption is approximately 7 lb. per person. One third of all fish is from inland waters and the rest is from the Mediterranean. Most fishing is an individual or family operation.

Egypt produces a variety of cereal crops; rice, beans, clover, vegetables, sugar cane, and a wide variety of fruit. There are approximately 6,000,000 date palms in Egypt. Because of the high population density and rapid growth of population, Egypt is not self-sufficient in food. The chief export crop is cotton.

Mineral Resources

Egypt has a variety of mineral resources which include: oil, phosphate of lime, caustic soda, gypsum, talc, lead, asbestos, chrome and deposits of low grade iron one. Although all wood is imported, there is an abundance of building materials such as limestone, alabaster, marble, granite and basalt.

Industry

Most of the manufacturing industries are concentrated in Cairo and Alexandria. Some industrial parks are beginning to form in the Suez Canal region. Textile industries are primarily in Mehalla, Al-Kubra and Kafr El-Dawar. The spinning and weaving factory at Mehalla is the largest in the world and employs approximately 30,000 workers.

Food industries are limited. Otherwise there is a wide variety of industries (primarily public ownership) which include metal (steel, copper, aluminum), chemical (soap, fertilizers and pharmaceuticals), petroleum products, cement, rubber, leather (5,000,000 pairs of shoes annually), glass (including plate glass windows).

Transportation

There is a network of highways connecting the major cities. Traffic on the highways and within the city is highly congested. Railroad transportation has suffered extensively in the last thirty years but is still the main

mode of transportation for the masses.

There are approximately 2,000 miles of navigable canals (including 950 miles of the Nile) which are used for heavy cargo transport by almost ancient flat bottom feloukas.

Donkeys (there is an estimated 1,000,000 of them) and animal driven carts are the main form of transporting farm produce from the villages to the city markets.

ISRAEL

Israel has by far the highest standard of living in the considered region ($3,000 per capita versus $250 for Egypt and Jordan and $400 in Syria). This can be attributed to the high rate of development in agriculture and industry and the foreign financial assistance, especially from Jewish communities around the world.

Food Production

Only 6% of the total labor force is engaged in agriculture (as contrasted to approximately 60% for Egypt, Jordan and Syria). Most agriculture is undertaken by cooperative and collective agricultural settlements. There is extensive use of agricultural machinery and fertilizers. There is active fishing in the Gulf of Aqaba and the Mediterranean. It is interesting to note here that comparison of agricultural productivity in selected developing countries published in "Foreign Agriculture Economic Report No. 27-ERS, USDA"

gave the following statistics:

Country	Agr. Workers per 100 Ha (arable)	Agr. Output per Ha (arable)	Tractors per 1000 Ha Large	Tractors per 1000 Ha Small	Fert. per Ha (Kg)
Japan	250	961	1.55	232.82	270.1
Egypt	166.7	643	4.28	--	109.8
Israel	33.3	557	19.24	--	85.2

The Israeli agricultural villages founded in the Negev Desert have been successful due to excellent utilization and management of water resources and the development of appropriate practices for the region.

Israel agricultural products include citrus fruit (which is the major agricultural export) sugar beets, grapes, cotton, wheat and barley.

Mineral Resources

Potash, bromide and magnesium from the Dead Sea. Precious stone deposits on limited scale. Stone for building materials is a highly developed resource. There is some oil on a very small scale.

Industry

In its 30 years of existence, Israel developed a viable industrial base which covers a wide range of manufacturing and processing plants as well as a large variety of light industries.

Transportation

Because of the special circumstances of Israel and its geography, road transportation is the primary means of transporting people and goods.

JORDAN AND WEST BANK

Jordan and West Bank are traditionally agricultural areas with a fair percentage of the population engaged in stock raising.

Agricultural and Food Resources

Except for the Ghor Canal project which taps the Yarmouk River most of the agriculture relies on rainfall. The major products are olives, grapes, figs, wheat, barley, beans, and lentils.

Agricultural products are not sufficient for population needs. Stock raising is essentially the same as in biblical times with sheep and goats as the primary stock. Some fishing is undertaken in the Gulf of Aqaba.

There are Aleppo pines and oaks in some patches of woodland.

Minerals

There is potash in the Dead Sea, and phosphates. Copper and manganese ores can be found in limited quantities. Iron ore of good quality can be found in scattered areas.

Industry

There are a number of small industries which include many local olive oil presses and refineries, tobacco factories, sugar refineries, tanneries and soap manufacturing. There is a considerable handcraft industry especially in Jerusalem and Bethlehem which thrives on the tourist trade.

Transportation

The primary mode of transportation is essentially by roads, which are generally in poor condition. Animals are the main mode of transportation in the agricultural areas.

SYRIA

Syria is also a primarily agricultural country with approximately 60% of the labor force engaged in agriculture. It has vast undeveloped agricultural regions which require extensive irrigation and settlement projects. Most of the current agriculture rely on rainfall and there are some high forest of Aleppo pine and oak in the mountain regions. Most of the urban population live in Damascus, Aleppo and Latakia.

Food Production

Agriculture is primarily labor intensive although mechanization is being introduced at a rapid pace. There are large coastal strips of mulberry and olive groves and the typical Mediterranean products of wheat, barley, grapes, apricots, sugar beets, and cotton.

Meat production relies on raising of sheep and goats.

Industry

There is a growing number of heavy and light manufacturing which is being introduced to enhance the industrial base of the economy. Traditional industries include the manufacturing of furniture, textiles, wool and silk yarns, leather, soap, glass and cement. Food processing industries include sugar refining and canning of fruits and vegetables on a limited scale.

Syria has no oil industry but is in the route of an oil pipe line transit to the Mediterranean.

APPENDIX 2

EXISTING SCIENCE AND TECHNOLOGY INSTITUTIONS WHICH CAN SUPPORT DEVELOPMENT OF APPROPRIATE TECHNOLOGY

INSTITUTIONS FOR POTENTIAL WORK IN APPROPRIATE TECHNOLOGY

Egypt

1. Ministry of Agriculture: Administers agricultural experiment stations and specialized research institutes throughout Egypt.

2. National Research Center

   National Resources
   Food and Agriculture
   Health & Environment including six medical research institutes
   Energy

3. Ministry of Housing and Reconstruction

   Building Research Institute
   General organization for housing, building and planning research

4. Egyptian Agricultural Organization

5. Desert Institute

6. Ministry of Petroleum and Mineral Wealth

   Egyptian Petroleum Institute
   Geological Survey and Mining Authority

7. Textile esearch Center

8. Al Azhar University (in Cairo) (over 1,000 years oldest university in the world) with graduates from all Arab countries primarily in theology.

9. Cairo University (oldest modern university in the region) with graduates from all Arab countries and some who are now Israeli citizens. Has complete academic departments including all disciplines of engineering and agricultural research. Has extensive experimental farming.

10. University of Alexandria: Has complete university facilities, an institute for public health, medical research and sanitary engineering, marine engineering, agricultural experimental farms, etc.

11. Ain Shams University (in Cairo). Has complete university facilities, and houses a Middle East Research Center.

12. University of Assiut (Upper Egypt).

13. Tanta University (Center of Nile Delta and railroad network).

14. University of Mansoura (on the Eastern Branch of the Nile Delta).

15. University of Zagazig (in the Eastern province between Cairo and Suez Canal).

16. University of Aswan (Upper Egypt).

17. University of Minea (Upper Egypt between Cairo and Assiut).

18. Cairo Institute of Technology: technical education.

19. Higher Technical Institute: technical education.

20. Ministry of Public Health: Administers numerous public health institutes and hospitals throughout Egypt.

21. Ministry of Public Works: Administers irrigation policies, research and development.

22. Ministry of Transportation: Administers transportation policies and research.

ISRAEL

1. Ministry of Agriculture

   Institute of Soil and Water
   Institute of Field and Garden Crops
   Institute of Horticulture
   Institute of Animal Science
   Institute of Plant Protection
   Institute of Technology and Storage of Agricultural Products
   Fisheries Technology Unit
   Lab for Research of Fish Disease
   Settlement Study Center

2. Ministry of Commerce and Industry

   Fiber Institute
   Paint Research Institute
   Ceramic and Silicate Institute
   Geological Survey
   Institute for Petroleum Research and Geophysics
   Oceanographic and Limnological Research Company
   Food Industries Advisory Service

3. Technion: Israel Institute of Technology. Has excellent facilities for the different fields of science and technology. Department of Stone Technology.

4. Hebrew University: Center for ground water.

5. Ben Gurion University: (in Beersheba, Negev) Desert research. Chemicals and natural products research.

6. Tel Aviv University

7. Citrus Marketing Board

8. Israel Institute of Packaging

9. Israel Wine Institute

10. Israel Institue of Transportation Planning and Research.

11. International Institute for Development Cooperation and Labor Studies (AFRO-ASIAN Institute).

12. Israel Institute of Productivity

13. Mount Carmel International Training Center for Community Services (rural development, handicraft promotion and marketing).

JORDAN

1. Royal Scientific Society (Amman). Has library facilities and printing press. Reports directly to Crown Prince Engineering and Economics.

2. University of Jordan (Amman). Engineering, Agriculture, Medicine and Economics.

3. Yarmouk University (Irbid): An engineering college is under development.

4. Jordan Polytechnic Institute (Amman). All engineering fields.

5. Wad Elsair Technical Training Center (Amman).

6. Hawara Technical Center (Irbid).

7. Shniller German Institute (Amman).

8. Jordan Cooperative Organization (Amman).

9. Jordan Institute of Social Work (Amman).

10. Ministry of Agriculture.

11. Ministry of Health.

WEST BANK

1. Hebron University (Hebron). Under development.
2. U.N. Kalandya Technical Institute (East Jerusalem).
3. Shniller German Institute (Rammalla).
4. Teerah Girl Training Center (Rammalla).
5. Khadooree Science Institute (Toolkarm).
6. El-Arroob Training Center (Hebron).

SYRIA

1. Ministry of Agriculture and Agrarian Reform
   Agricultural research
2. University of Alleppo (has an engineering enrollment of 9,000 students)
   Agricultural Research
   Food Technology
   Medical Research
   Animal Science and Veterinary Medicine
   Science
3. University of Damascus
   Science Agriculture
   Engineering
   Medicine
4. University of Lattakia
   Agriculture and engineering

There are several technical institutes and government agencies engaged in research and development in science and technology.

APPENDIX 3

EXAMPLES OF MASS MEDIA

RESPONSE TO RELEVANT

STUDENT PROJECT ACTIVITIES

CHICAGO TRIBUNE
Page 1
June 14, 1976

Column 1

Schoolwork in a class all by itself

Engineering students make ideas help people

By Michael Kilian

Chicago Tribune Press Service

MADISON, Wis.—Last fall, a group of University of Wisconsin students seized a 6,000-pound mobile laboratory, carted it over to nearby Lake Mendota, and dropped it into 45 feet of water.

Similar deeds have won the university something of a reputation for politically inspired vandalism and mayhem. But, this time, the university applauded. The students involved were from the Mechanical Engineering Department, and the sinking of the lab marked the successful completion of a class project.

The great minds of "Introduction to Engineering Design" had scored again, in this case having built from scratch and set in place their own fully scientific underwater habitat—the only one in the country to be used under winter ice.

CONSISTING largely of a 12-foot high erstwhile wine vat and assorted scrap metal, the underwater lab is one of this undergraduate class's most ambitious projects in terms of size.

But the students, most of them 19 and 20 years old, have devised things considerably more complicated—and ingenious. In recent years, these have included a phone which a blind quadraplegic can operate simply by moving his head, a battery-operated walking machine for paraplegics, gliders that fly under water, and a parachute cable jump device for rescuing people from burning high-rise buildings.

And, for those cold, winter Arab oil boycotts, a simple contraption for converting furnaces from oil to coal fuel for less than $200.

WITH THE GUIDANCE of Seirig and other engineering faculty, a team of 25 students put the laboratory together, doing all the design work, welding, and other construction. Including the air compressor and scientific monitoring equipment that was installed, the total cost came to less than $5,000—considerably less than the federal government is used to paying for such things.

The hard part was moving it. Using a crane, they hauled the three-ton object to the shore, then floated it on a raft to its mooring place just off Lake Mendota's Picnic Point.

Resembling a space capsule, the lab functions as an anchored bubble, held beneath the water's surface by cables attached to a concrete slab on the lake bottom.

THE ONLY ENTRANCE to the lab is through the open bottom, which limits its use to divers. Inside, it contains a dry air space large enough for four persons and an assortment of diving and scientific equipment. Other appointments include interior and exterior lighting, a side window, an observation dome on the top, and a hydrophone system for communicating with divers in the water or on the surface.

Ideal for diving training, the lab's scientific uses are almost unlimited, testing the water for pollution, studying algae and other marine life, and monitoring the effects of light and weather on the lake's ecology.

Experiments will also be made to determine how well humans can perform in various underwater conditions. For these, an exercise cycle has been installed in the lab.

IN THE WARMER seasons, a raft is kept moored above the lab. In the winter, when the lake is frozen over, an open hole is maintained in the ice.

The lab was used frequently last winter. Thanks to the warm wetsuits worn by the divers, no one suffered any ill effects from the cold water, which varied in temperature from near freezing to 40 degrees. People walking the streets of Madison, in fact, were considerably colder.

One of the best kept secrets about that hole in the ice is that it is probably the best ice fishing spot on Lake Mendota—owing to the large amount of oxygen that the lab and the divers generate.

At least one of the students will be able to make use of it. He has invented an automatic fish-catching machine.

THE FUNCTION OF the class is not merely to invent things but to make students aware of engineering as more than just a dull technical subject—indeed, as a field as creative as any of the fine arts.

There are no assignments, daily lessons, or dreary lectures. The students simply—and not so simply—hit upon ideas and then set about trying to make them work.

"I allow them to do anything they want," said Prof. Ali Seirig, who thought up "Introduction to Engineering Design" 16 years ago when he was at Marquette University. He brought it with him to Wisconsin when he transferred there five years later.

THE CLASS, which is required for all sophomore mechanical engineering students, serves another purpose: separating those who are really interested in engineering from those who ought to be studying something like animal husbandry.

"Those who do well here generally continue all the way through," Seirig said. "They get very enthusiastic. Many in the class find themselves going to the library for the very first time."

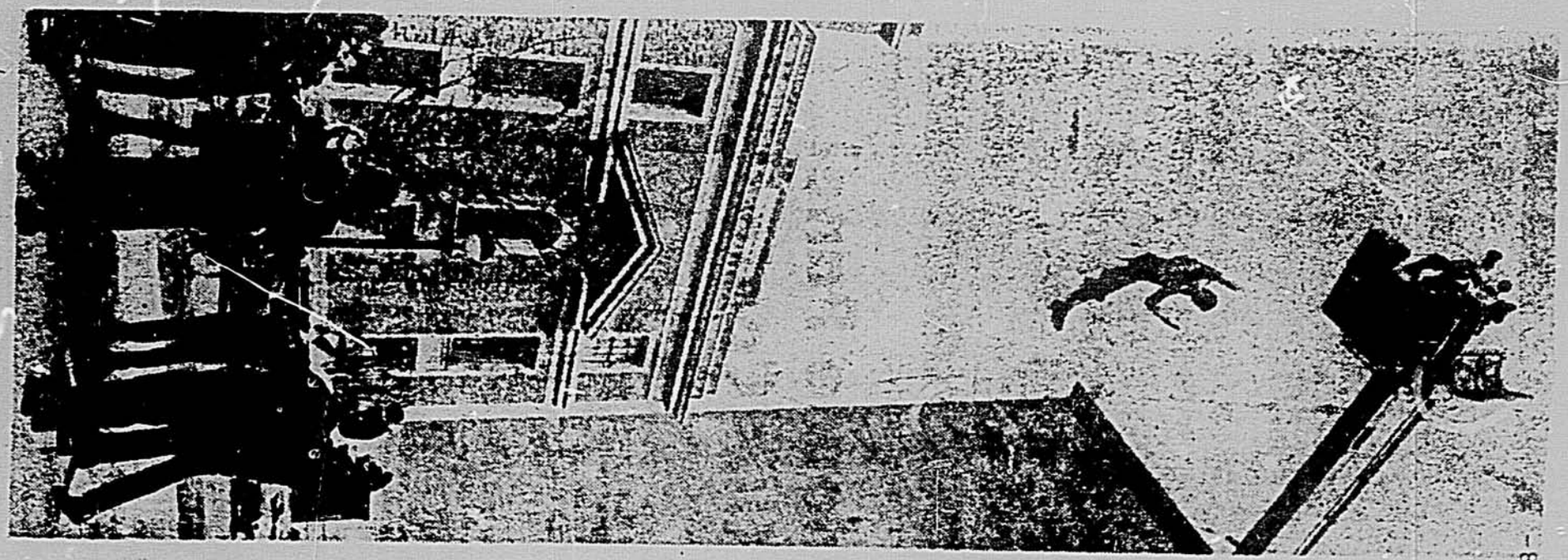
Some of the students' projects, such as designing trailers for bicycles, are rather mundane, but often they put their minds to more difficult challenges and more compassionate purposes.

HAVING HEARD of the plight of a man who was quadraplegic and blind, they invented the special phone which he could activate and dial by generating electrical impulses with the movement of his head.

In another case, they came to the aid of a young boy who was quadraplegic except for very slight use of his left arm. Coupling the leverage principle with intricate gearing, they produced a go-cart which he could propel with simple motions of his left hand.

The battery-operated walking machine for paraplegics, which employs a computer, weighs 70 pounds and is somewhat bulky. But, with it, a paralyzed person can escape the wheelchair and move about with comparative ease.

SUCH FEATS have won Seirig's students awards, patents, and even entries in the Guinness Book of World Records. They have also contributed to international friendship. At the moment, 13 of the students are developing a water pumping system for Nepal which employs tubes made of bronze—the only kind of metal that primitive country can produce.



LOOK MA, NO HANDS — Fred Stanek, Wauwatosa, enjoys a carefree descent from a fire ladder with the aid of an emergency cable-harness system he and two other UW students developed.
—State Journal Photos by Edwin Stein

One Great Leap—for Safety

By DENNIS E. CURRAN
Lee Press Service

A group of University of Wisconsin-Madison engineering students has come up with something to make even the streakers look up.

They jump off ladders and tall buildings.

But their derring-do is hardly another springtime college fad. It's part of a far more serious effort to improve fire safety.

THE LEAPING engineers are working on a cable-harness system which can be used to escape fires in high-rise buildings.

Their project and two others being developed by UW-Madison engineering students will be entered in a national contest dubbed "Students Against Fire" in Marinette, May 1-4.

Engineering students from 27 American and Canadian colleges will compete in the contest, which is sponsored by a student-run non-profit corporation called SCORE (Student Competitions On Relevant Engineering).

THE PRIMARY purpose of the competition is to find new ways of reducing the 12,000 deaths and $11-billion in property damage caused by fire every year.

According to the students sponsoring the contest, the United States has the highest per capita fire loss of any industrialized nation.

UW engineering sophomores Steve Urbanowski, Sellery Hall, Tom Smart, and Fred Stanek, both Wauwatosa, developed the cable-harness escape system, which consists of two shock absorbers and a pulley fastened to a parachute-type harness. The shock absorbers allow a gradual descent.

"THERE'S NO limit on how you jump or from where you jump," explains UW engineering Prof. Ali Seireg, the students' adviser.

The other two projects being developed by UW-Madison students are fire detection systems for residential homes and for barns and silos.

The barn and silo alarm system, developed by UW student John Palmer, Green Bay, measures temperatures of stored hay and alerts farmers to the danger of spontaneous combustion, the most common cause of barn fires. The warning system has the advantage of alerting farmers to areas of spoilage also, according to Seireg.

THE HOME warning system, developed by UW students Gary Meyer, Loganville, and Dean Kohn, Gillett, combines a gas and smoke detector with a loud alarm which warns occupants and neighbors.

The fire safety competition will be held at the Ansul Co. Fire Technology Center in Marinette, where a wide variety of fire conditions can be simulated.

Front Page
Wisconsin State Journal
April 6, 1974

markets
financial news
stock listings
Wisconsin State Journal, Sunday, July 7, 1974, Section 5, Page 1

2 UW Students Design Barn, Silo Fire Alarm

United Press International

The University of Wisconsin - Madison said two of its engineering students have designed a fire alarm system specifically for barns and silos

The UW said Stephen Frenkel and John Palmer developed the device in a project coordinated by mechanical engineering Prof. Ali Seireg The system allows early detection of rapidly rising temperatures within mounded hay.

There are about 900 barn fires that cause $1-million in damage in Wisconsin every year, the UW said. They are caused by the spontaneous combustion of baled hay stored at about 30 to 40 per cent moisture content.

Heat is generated by the decomposition of organic material by bacterial action, the UW said, and the system detects that heat before a fire actually occurs

To detect the heat, aluminum probes are plunged about 5½ feet into the hay mounds Each probe consists of a heat sensitive sensor encased within the metal

The highly conductive aluminum conducts heat away from any hot spot that may be present to a sensor, which is wired to an electrical circuit

An alarm system is activated when temperatures exceed 150 degrees The alarm consists of both a bell in the barn and an external horn that can be heard throughout the area

The UW said a one-probe barn fire system costs about $21 50 Each additional probe adds $7 to the price of the system

Capital Times July 14 77

Power plant for the home wins UW engineering award

A small electrical generating plant that could heat your home while also producing electricity has won a University of Wisconsin College of Engineering award for innovative designs using organic fuels.

The system, according to Engineering Professor Ali H. Seireg, burns powdered coal or other organic matter (even garbage) in a combustion chamber and blows the hot gases into a low-speed turbine to spin an electrical generator. The leftover exhaust gases are then diverted through a heat exchanger to warm the house.

A team of three UW students, headed by graduate mechanical engineering student Kenneth W. Kriesel, 1324 Fish Hatchery Road, designed and built the project for the Student Competitions on Relevant Engineering (SCORE) program based at the Massachusetts Institute of Technology. Kriesel worked with undergraduate students Dennis J Hilgendorf, 1809 Rutledge St., and Charles L. Stewart, Wisconsin Rapids

Their project won first place as the most innovative designed in the organic fuels category in this year's SCORE program.

It was impossible to scale down a huge commerical coal power plant to the size that would supply a household or farm's needs, Seireg said, because high-speed turbines cannot avoid friction losses Using a low-speed vaned turbine instead, he said, the team was able to get 95 per cent mechanical efficiency.

The design is scaled to produce down to 1½ kilowatts at 5½ cents a kilowatt.

If put into quantity production, Seireg estimated the system would cost a

A home coal furnace that compares favorably with oil and natural gas heat has been developed by a team of engineering students at the University of Wisconsin-Madison. The furnace is clean, convenient, and cheaper to operate than an oil furnace.

Beginning with a commercially available oil furnace, the students added a mechanical system that allows the furnace to burn powdered coal. The students say that such a conversion would only cost the average consumer about $200 and would save that much in fuel bills during the first winter. "No such conversion system is available to our knowledge," emphasizes Ken Kriesel, student in charge of the project. "But there are no reasons why systems shouldn't be produced. Technically it's pretty simple."

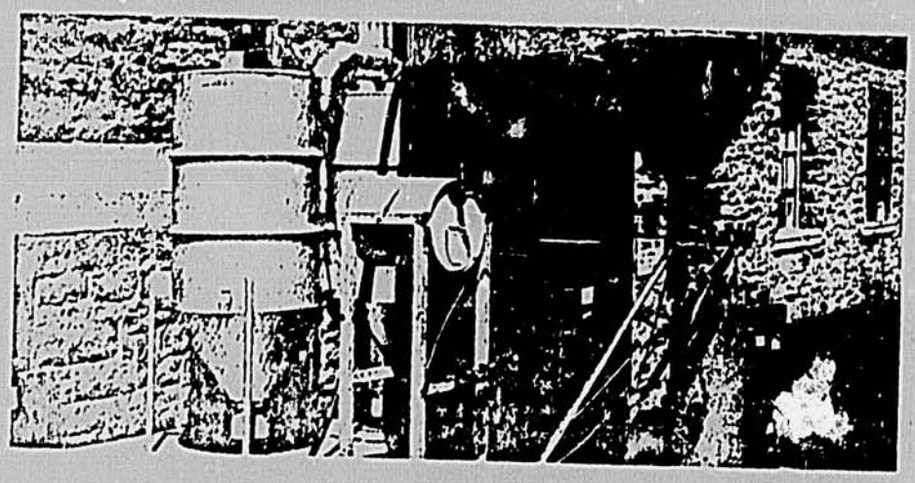
With oil prices rising and future shortages promising to be severe, the conversion to coal is an attractive prospect. By supplying all energy needs from domestic coal sources, the United States could be self-sufficient for at least two hundred and possibly five hundred years.

The new furnace is convenient because it requires no attention beyond setting the thermostat. When the thermostat demands heat, the furnace uses an oil flame to ignite the coal, and mechanically feeds itself from the bin. Ashes collect in a residue container, which the coal supplier would empty on each delivery visit.

The furnace is clean because the coal is handled internally. The delivery truck would pump coal into the bin through an airtight opening, and the ashes would be pumped out in a similarly sealed stream of water. Air pollution through the chimney would be negligible. When the coal feed is shut off after each burn, the oil flame comes on again for 30 seconds to burn away most of the remaining gases. The air is then passed through "scrubbers" and cleansed by a fine spray of water. The oil required to start each heating cycle and do the final cleanup burning would amount to only five gallons of water per winter. 1975

Last September the Wisconsin research team won the first prize for coal use at an international competition in Albuquerque, New Mexico. This confirmed their conviction that such a furnace could lift a large energy burden from weakening petroleum reserves.

"The only real problem is the coal distribution system," says mechanical engineering professor Ali Seireg, who worked with the students on the project. "Right now there are no coal suppliers that deal in powdered coal, and it's too inconvenient for everyone to pulverize coal in their homes." Services grow to meet demands, however, and Dr. Seireg believes that powdered coal delivery services can be as commonplace as oil distributors or water-softener maintenance industries.



Professional Engineer

Paralyzed Boy Drives Go-Cart

Jeff Erlanger is almost totally paralyzed. But that doesn't keep him from driving a go-cart.

Paralyzed from birth except for partial use of his left arm, Jeff, 4, had been unable to get around until one recent afternoon when three strange men walked into his home in Madison, Wis.

They were mechanical engineers from the University of Wisconsin and they had a strange-looking vehicle with them. They told Jeff they were looking for a test pilot, and did he want to be one.

Jeff took one look and replied with an enthusiastic nod. And what little boy wouldn't, for the go-cart is, in one word understood by little boys everywhere, "neat."

It's about four feet long with a cushioned seat and backrest. The controls are within easy reach of Jeff's left hand, and by working them, he can propel the cart at a speed of three-quarters of a mile an hour.

Beside the seat is the joystick, an upright metal bar Jeff pumps back and forth to build and maintain engine power.

Tilting the stick to the left or right turns the cart. And a lever the size of a pea-shooter can be nudged forward or backward to drive ahead or back up.

It's a lot of fun for Jeff. But the object is to provide more than fun. For when Jeff works those controls that enable him to go carting on his merry way, he's also strenghtening and developing coordination in his left arm.

The arm has only a few functioning muscles. It's weak. So ways must be found to encourage him to exercise it.

"Just look at him," Jeff's mother, Mrs. Howard Erlanger, explained to a MIDNIGHT reporter. **"Therapists beat their brains out looking for activities that will motivate him to exercise the right muscles in his weak arms.**

"Now he's working as hard as he's ever done, and without even thinking about it."

According to Norman Miller, who developed the cart with the help of Bob Sandberg and Don Stroud, it could be produced for as little as $200 to $300. An electrified wheelchair, by comparison, costs $1,000 or more.

JEFF and his pit crew, Norman Miller, left, and Bob Sandberg, take a break.

SOLUTION TO PUZZLE ON PAGE 12

STANLEY CUP

-85-

New Science Station Sits On Floor of Lake Mendota

Capital Times Nov. 4, 1975

Scuba divers and engineers launched the Sea Grant Underwater Habitat in Madison's Lake Mendota last Tuesday Designed and built by University of Wisconsin students in Mechanical Engineering, the habitat will be used for teaching and a variety of underwater studies. Ali Seireg, UW mechanical engineer and project director, believes it will be the first underwater facility to remain in place under winter ice

Working closely on the project are David Engeseth, University diving officer, and Fred Middleton, project engineer

"One of the unique aspects of the year-old project is that it was carried out entirely by undergraduates operating on a shoestring budget," says Engeseth.

Looking much like a space capsule, the twelve by seven foot stainless steel habitat will be used as a submarine experiment station, explains Seireg It will remain permanently 28 feet below the lake surface about 60 yards north of the lake's largest peninsula, Picnic Point

The habitat is suspended by cables between a metal basket on the lake bottom and a raft floating on the surface. Both basket and raft are held in place by concrete weights Inside the station's main compartment are a control panel, emergency life support equipment and seating for several divers Three port holes provide a view of the surrounding environment

A generator and compressor on the raft above supply the habitat with electricity and air In winter the raft will be replaced by a portable structure on the ice A four-way communication system can maintain continual contact between the raft, habitat and two divers Since the capsule is in only twenty-eight feet of water, divers will experience no decompression problems.

Potential uses for the habitat include teaching and research. Both Seireg and Engeseth emphasize that the facility will continue to be available to undergraduate students.

"An important use for the habitat," says Engeseth, "will be training scientists to do their own underwater research instead of relying on divers to do it for them "

The habitat will be available to University scientists and possibly to outside agencies. Research may include studies of lake fish and plants, underwater physiology and effects of underwater conditions on equipment. Scientists will be able to analyze data on the spot inside the habitat.

Originally the engineers envisioned a smaller underwater tank for training divers However, they expanded the project into a complete experiment station using an 800 gallon stainless steel milk tank as the main chamber. Engeseth sees the habitat as a pilot for a larger, more versatile facility.

Moving the habitat to its permanent location was difficult due to low water levels and high winds The project team eventually floated the 6,000 pound capsule and towed it over a mile to its destination — a flat shelf on the lake bottom.

Tours of the habitat will be available in the future. Arrangements must be made prior to the visit with Seireg at the UW-Madison Mechanical Engineering Department.

The UW Sea Grant College Program, which sponsored the project, is funded jointly by the National Oceanic and Atmospheric Administration in the U.S. Dept. of Commerce and by the state of Wisconsin.

Unique telephone opens his world

By ANN BITTER

Jim Summers was 5 years old when his father was stricken with multiple sclerosis, a disease of the central nervous system. There wasn't much a young boy could do then.

Now, at the age of 19, Jim's interest in electronics has enabled him to construct a window to the world for his father.

James Summers, 47, of rural Onalaska, Wisconsin, is bedridden, totally blind, and nearly immobile below the neck.

Thanks to his son Jim, now an electrical engineering student at UW—Madison, Summers holds an advanced amateur radio license and is able to make phone calls.

When his father began to take an interest in becoming a ham radio operator in 1974, Jim and his family pitched in to help him learn his lessons. His daughter put much of the information from the license manual on tape. And Summers practiced sending code for short intervals each day.

"Learning the code isn't hard," Summers said. "But maybe I have more time than most people. I seem to have more time than anything."

One of the requirements for the novice license (the first license a ham operator is issued) is the ability to send and receive code at the rate of five words a minute or faster.

The conventional method of sending Morse code involves the use of a hand-operated telegraph key. Summers, who has almost no voluntary use of his limbs, overcame the problem by a unique method. His son Jim rigged up a sender which Summers operates with his mouth; he taps out the code by clenching and unclenching his teeth.

Summers says it is not unusual to communicate by radio with people halfway around the world. One of his early voice conversations was with a woman in the South American nation of Peru. "She came back to me just as plain as if she was in the room," he said.

But even though Summers could converse with people halfway across the world, he still could not talk to his next door neighbor without having someone else dial and hold the phone for him. This concerned his son Jim. "At times it is necessary to leave my father at home alone for short periods, in the event he requires assistance, he must wait until someone is available to help."

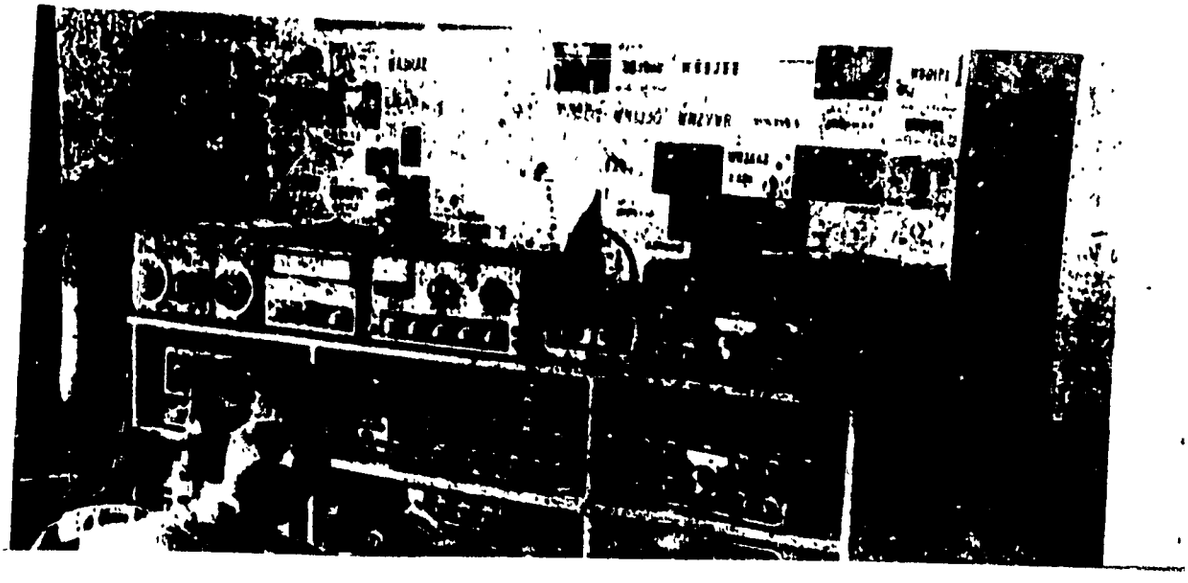
That help came in the form of an idea Jim conceived in a mechanical engineering course entitled "Theory of Design." The emphasis in this unique tutorial-project course is on learning by doing. Jim's assignment was to identify a problem, suggest a solution, and then design and build a working model to test that solution. Under the direction of Professor Ali Seireg, Jim set out to help his father send and receive phone messages.

Using an adapted telegraph key, Jim constructed a device which now allows his father to call the operator, his neighboring in-laws, or any other programmed number. The "Phone Aid" is operated by a switch which is opened and closed by head movement.

When a call comes in, Summers moves his head to activate a switch placed on his pillow. After hearing a tone from a nearby speaker, he can start talking via a microphone next to his pillow. Summers releases the switch three times with his head when he wishes to hang up.

To dial a programmed number, Summers closes the switch three times. After about six seconds the first number in the dialing sequence is dialed. Then in another 1.5 seconds, the second number is dialed. The process repeats itself until the last number in the sequence has been dialed.

Even though this was an ambitious project for a beginning engineering student, young Jim Summers feels that "it was a rewarding experience that was more fun than work."



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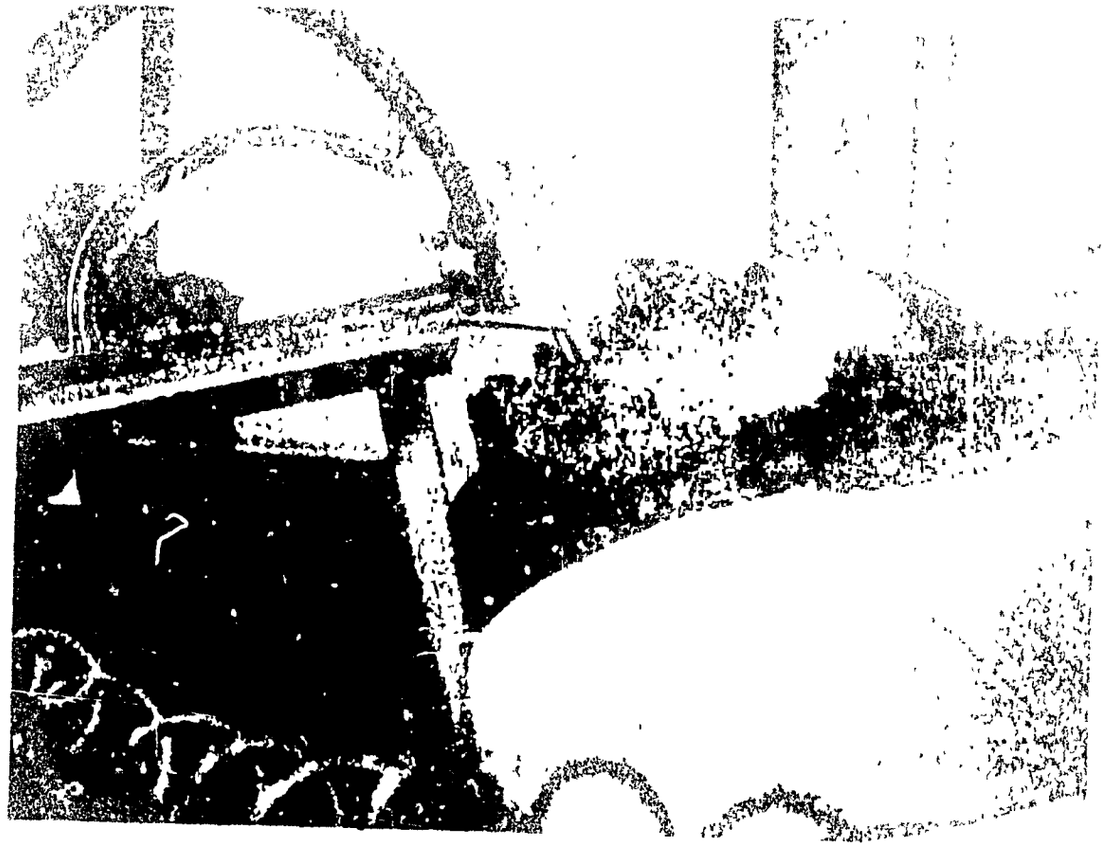

James Summers, blind and bedridden in [illegible] shown operating telegraph key with his mouth.