

Final Report to the United States Agency for  
International Development

Development of Health Services (Syria)

Project No. 276-11-570-006

Medical Equipment Maintenance and Repair Expert

Contract No. AID/NE-C-1490

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Signature of Contractor

Stephen J. Fabricant

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## I. Background of the Project

Development of Health Services, as it was designated, was one of the first projects to be negotiated with the Syrian Government after the establishment of the AID Mission in Damascus in 1975.

Designed as a partial response to national health needs identified in a 1975 USAID Health Sector Assessment (Synchrisis) for Syria, this cover project was composed of three related, but not necessarily integrated, sub-projects. This sub-project, Medical Equipment Maintenance and Repair, differed considerably at the outset from the others (Continuous Health Survey and Establishment of a Health Planning Department) in terms of the expected applicability of results, limits on objectives, and type of services required from the contractor. Perhaps for these reasons the contract for this sub-project was negotiated separately, as a Personal Services Contract for a term of roughly two years. The sub-project's objective, as stated in the contract, was to "assist the Government of the Syrian Arab Republic to establish a centrally managed maintenance and repair system for hospital and medical equipment for the hospitals and health centers of southern Syria."

Funds for the project were allocated in 1976, and a USAID project design team assisted by an equipment maintenance expert visited Syria briefly the same year. The expert's observations and recommendations formed the basis for the project design and the scope of Contractor's services. His basic plan relied heavily on the use of a roving "hospital inspector" who would feed back information to a central office, a mobile workshop for doing routine maintenance and effecting immediate repairs, and the central workshop for major overhauls.

The process of finding a suitable contractor proved a difficult one for AID, and it was not until March 1978 that the actual contract was signed. By this time the Ministry of Health was starting to put pressure on the AID Mission to place the contractor in Damascus.

## II. History and Environment of the Project

In April 1978 the Contractor went on temporary duty to Syria. He was received warmly at the Ministry of Health and was able to assess conditions there and make arrangements for the actual start of the project

on his return in August. Most of the prerequisite conditions for the project as agreed to by the SARG two years earlier had been established, but there had also been several significant changes in the project's environment:

- a. The space which had been allocated as a Central Workshop for the Engineering Office at the new Technical Health Institute had been withdrawn with no explanation. Instead, a request had been made and approved to use part of an AID loan to purchase a prefabricated building which would be erected in Damascus on land belonging to the Ministry.
- b. At some time between AID-SARG project negotiations in 1976 and the contractor's arrival, the Ministry of Health had entered into a separate agreement with the World Health Organization for support of the Engineering Office, as the maintenance and repair facility was called. A large salary supplement was being paid to the Engineer/Director (the contractor's counterpart), bonuses to other technicians and staff, and a substantial amount of workshop equipment was to be provided each year. In addition, a vehicle was provided by WHO, although this had been appropriated by the Ministry of Health and used for other purposes.
- c. The Engineering Office had been given a second major permanent assignment by the Ministry, that of overseeing and approving major equipment contracts. While this was highly appropriate, it meant that the Contractor's counterpart was often involved in work not directly related to the project.
- d. A satisfactory start had been made on staffing the Ministry's Engineering Office. To use the nomenclature of the AID project design, the Engineer/Director had been appointed a year before (on an annual contract basis rather than as a civil servant), and was a mature man with impressive professional credentials and experience and a very positive attitude toward his job as well as toward AID assistance. The Engineer/Medical

Equipment Specialist was a young, capable graduate in electronic engineering but with little practical experience, and another engineer with similar background had been assigned to Damascus Hospital. The Engineer/X-ray Specialist was in fact a young technician who had just returned from a short training course at General Electric's X-ray Division in the U.S., but who was due to enter military service. In addition there were four young technicians at the Central Workshop, whose training and experience ranged from basic to barely adequate. Finally, a very critical position, the Hospital Inspector, had not been filled. A man who had been the Ministry's maintenance jack-of-all-trades for many years had been designated but refused to be put under the direction of the Engineering Office.

This lack of a Hospital Inspector and a lack of a reliable vehicle and driver, meant that the unit's activities had remained decentralized, and that the technicians assigned to the outlying hospitals were largely unsupervised.

- e. The Contractor also discovered that the Engineering Office had no budget of any sort except for salaries. All local purchases had to be made by a Ministry committee (a long and cumbersome process), and no spare parts were ever stocked for existing equipment.
- f. Neither the utility vehicle nor the mobile workshop van purchased for the project by AID had yet been delivered.

Intending to assure that the project would get off to a good start on his return, the Contractor reported these conditions to the AID Mission and requested that AID and the Ministry try to rectify as many of these problems as possible during his absence. The Mission agreed to provide around \$10,000 as local currency support for the sub-project for local parts and equipment purchases and equipping the mobile van. The Ministry of Health agreed that the Hospital Inspector would be put under the direction of the Engineering Office, that the USAID vehicles would be released to the Engineering Office as soon as formalities were completed, and that the Minister would attempt to have the Engineer/X-ray Specialist

transferred back to the Engineering Office as soon as he had completed the legally required minimum period of military service. The Contractor revised the first PIO/C for workshop equipment to take into account the WHO contribution, and began to gather information on prefabricated buildings. With regard to the latter, it was estimated that the soonest a building could be ready for occupancy in Damascus would be nine months after the start of the project, or April of 1979.

At this point it is instructive to compare the Contractor's explicit assumptions at the start of the project concerning key conditions for successful operation with the actual conditions, and note the ultimate effect of any deviations on results obtained. (See Table 1.)

### The First Six Months

In August 1978 the Contractor returned to begin the remaining 24 months of the sub-project. Two immediate tasks were to order necessary tools and supplies by means of an AID PIO/C, and to prepare specifications for the prefabricated central workshop. The RFP for the building was issued by AID/W in November 1978 with a bid opening date of January 26, 1979, subsequently postponed to February 26, 1979, because of lack of offers.

The other main activity during the first six months of the project was the organization of the temporary workshop space and commencement of practical training. By salvaging many pieces of non-working equipment, the staff learned how the equipment functioned, and gained confidence in disassembling and reassembly of equipment, became more familiar with shop tools and practices, and discovered that when proper replacement parts were unavailable (as was often the case), faulty components could either be repaired or replaced with other parts from unconventional sources.

During this first period the Contractor began to realize that although the Ministry of Health had not provided all the resources needed and promised for the project, and although politics and personalities were indeed at play, there was nevertheless a basic desire for the Engineering Office to improve its capability to repair and maintain equipment, and thus indirectly for the sub-project to succeed. Although the Ministry freely provided help with personal logistics, when it came down to project requirements or problems the Contractor was

Table 1

Condition	Assumption During Project Design Stage 1976	Assumption At Start Of Project 8/78	Actual Conditions	Effect On Results
1. New Central Workshop Space will be provided (at THI).	Would be available almost immediately.	Prefab building needed--would not be ready until 4/79 at earliest.	Not ready during project.	Lack of work space somewhat limited training. Expert's assistance in setting up workshop not possible. Much of contractor's effort went into building details.
2. All key staff in place. Some U. S. training needed.	Key staff appointed by start of project. Training completed for some.	a) Hospital inspector would be appointed soon. b) X-ray specialist would be returned from army in 6 months	a) Hospital inspector never appointed. b) X-ray specialist returned after 1 year.	a) Maintenance Program never became as centralized as originally designed.
3. USAID vehicle and mobile workshop present.	Available at start of project.	Available within weeks.	Utility vehicle not available for 5 months. Mobile workshop not available until 9/79.	Same as above.
4. Operating Budget for maintenance, supplies, etc. available.	No assumption made.	Would be necessary if project is to succeed.	Adequate budget was made available by AID.	Improved operations by permitting rapid purchases.
5. New technicians would be trained at Center and assigned to hospitals. Technicians already assigned would be rotated to Center for further training.	Technicians would be present in all hospitals.	New technicians would be hired for training and assignment in adequate numbers.	Actual number of technicians employed decreased until project was about 80% finished.	Too few people to justify formal training courses. Eventually staff level came up to planned level.

rarely given special treatment because he represented foreign assistance. (At the working level the Ministry was only lukewarm toward the general notion of foreign experts.) However, by making frequent and emphatic requests through official channels, "going to the top" if necessary, most problems were resolved in due time. This is not meant to exonerate the bureaucratic morass of the Ministry, but rather to take it and the general scarcity of resources into consideration when looking at the outcome of the project.

### Second Six Months

By the beginning of the second six months of the project, a start had been made on the design and implementation of a centralized management system. An important feature of the original project design, this was not given the same emphasis by the Contractor due to the exigencies of the existing situation such as shortage of administrative personnel, Ministry purchasing regulations and the higher priority put by the Ministry on other project activities. Nevertheless, a file of maintenance manuals was set up, equipment inventory and maintenance forms designed and printed, and staff given practice in their use. Practical training continued at a rapid pace, both in Damascus and on field trips to the provincial hospitals. (The AID-supplied utility vehicle was in use by now.) The staff available for training at the central workshop started to decrease in number due to transfers and military service, and several urgent requests were made to the Ministry at least to replace these personnel, if not to add more. Qualified candidates would show up in the workshop, work for several days while they tried to move their employment papers through the Ministry's administrative bottleneck, and eventually give up hope, never to return. For a while it seemed as if there was a foe in the personnel office, but it is also possible that there was a general hiring freeze in effect.

Near the end of the first year, the winning bidder was selected for the prefabricated building, about seven months behind schedule by that time. Also, by this time the AID-supplied van had been delivered and work had begun to outfit it for use as a mobile workshop.

Two staff members studied English under an AID program during the first year of the project, one in preparation for training in the U.S. The Contractor began a search for an appropriate training course since there had been some criticism of the training the X-ray Specialist had received.

### Third Six Months

The first half of the second year of the project was a rather frustrating one for the Contractor. Although a good start had been made on all phases of project activity, very few people were left in the Engineering Office to take advantage of a potentially valuable training experience. Still, the routine continued. Those technicians remaining became better at repairing equipment, and some serious problems at provincial hospitals were solved. The X-ray Specialist eventually was returned to the Ministry of Health from the army. The prefabricated building was shipped and arrived at the port of Lattakia in January 1980.

### Last Six Months

Despite an unpromising start, the last six months of the project proved to be extremely productive for the project and personally satisfying to the Contractor. Enough pieces of the puzzle fell into place to encourage one to believe that the Engineering Office might continue to grow and continue to provide effective equipment maintenance and repair services for the Ministry of Health.

Although the Contractor had repeatedly suggested that site preparation and foundation work be started well in advance, it was only the physical presence in Syria of the prefabricated building that triggered the effort. A government construction company took over this job, which was not begun until April 1980 and not completed until late June. Actual erection of the building was then started and is expected to be completed by late summer, after the end of this project.

Quite unexpectedly, a new Electronics Engineer was assigned to the Central Workshop in February 1980 followed swiftly by four new graduates of a technical course in electrical installation. There soon was a flood of new employees as these were followed by a second and third driver, a mechanic, a plumber, and the long-requested administrative clerk, transferred from another office. Unfortunately, the latter was not happy with the position and did not stay long. In an effort to train and occupy the new staff many of the small repair jobs around Damascus which had been left undone were completed, a new temporary storeroom was arranged, and many field trips taken. Some trained technicians who had been in the Central Workshop for a longer time were transferred to provincial hospitals. There were still

times when it felt like there were now too many people in the small temporary workshop, and some sniping from a Deputy Minister was forthcoming when he noticed technicians sitting around idle. However, at the close of the project there was a very healthy feeling of strength and confidence among the staff, especially the engineers and senior technicians who had learned that they were capable of dealing with most technical problems that would arise and were gaining the respect of others in the Ministry for this.

The Ministry, too, had gained confidence in the ability of the Engineering Office to keep the hospitals functioning. This was indicated by the increased staffing level, backing given to development of the new Central Workshop, and the partial relaxation of restrictions on purchase of spare parts.

### III. Project Results

#### a. Verifiable changes during course of project:

##### Start of Project

1.) Central Workshop staff consisted of 2 engineers, 3 technicians, 1 driver.

2.) Vehicles: 1

3.) Tools and Equipment: that supplied by WHO was adequate for existing operation.

4.) Workshop space: approx. 600 square feet.

5.) No file of repair manuals or equipment inventory.

6.) No repair and maintenance management system.

7.) No budget or authority to procure spare parts either locally or from foreign sources.

8.) Large backlog of repair requests at most hospitals.

9.) No maintenance personnel in residence at 5 out of 12 southern region hospitals.

10.) No system of regular preventive maintenance in operation.

11.) Approximately 75% of repairs had to be contracted out to manufacturer's agents.

##### End of Project

1.) 3 engineers, 8 technicians, 3 drivers.

2.) 2 vehicles & fully equipped mobile workshop van.

3.) Supplemented by AID for equipping new workshop and mobile van.

4.) 4000 square feet workshop and stores under construction. 500 square feet storeroom renovated and in use.

5.) All existing manuals properly filed. System for ordering new manuals in operation. Inventory for southern region approximately 60% complete.

6.) System in operation in central workshop and some hospitals and centers. Not fully integrated with Ministry's administrative system.

7.) After seeing the benefits of the cash operating budget system the Ministry gave the E. O. authority to make most local purchases. Foreign procurement still awkward but there were signs that the situation may improve.

8.) Most repairs accomplished soon after receiving requests. The major obstacle remaining is spare parts procurement.

9.) All hospitals have at least part-time qualified personnel.

10.) No centralized preventive maintenance system in operation, but local staff have become aware of the need for same.

11.) Only about 20% of repairs by manufacturer's agents, mainly equipment still under warranty.

b. Effects of the Project on  
the Health Care System

While it is not within the professional scope of this contract to evaluate how this project impinges on health sector goals, the Contractor feels he may nevertheless include his observations on this subject.

The direct impact of the project on the primary health care system was minimal. Only about 5 percent of the unit's maintenance and repair activity involved equipment in health centers, and most of that was dental equipment. Occasionally some laboratory instruments would be sent in for repair but in fact there was very little equipment in the centers to begin with. An exception were the various tuberculosis screening centers, which had an assortment of well-used radiographic and laboratory equipment, serviced frequently by the Engineering Office.

The remaining 95% of the repair unit's activity went into keeping the government's hospital system functioning. The effect can be measured either in terms of protecting the enormous capital investment in equipment, or in terms of increased efficiency of patient care. The latter being a more significant measure to the health planner, we might reasonably estimate that if the Engineering Office will now be able to increase the percentage of clinical equipment in working order from about 75% to 95%, and if 50% of inpatients require some such equipment to be used in their successful diagnosis and/or treatment, then the "treatment success rate" of the hospitals has been theoretically increased by  $0.5 \times (.95 - .75) = 0.10$  or 10 percent. In practice the most meaningful result that can be wished for from such a project is that the poor, for whom the Government hospitals are the only source of curative care, gain confidence in the public health system as fewer patients are turned away because of the non-availability of equipment, medicines, medical staff, et cetera. It can be argued that public confidence in the curative care system could

lead to increased utilization of a preventive care system, although it is more obvious that a reversal of priorities is called for in the Syrian public health system.

Given this paucity of direct effect on the health care system, perhaps the real significance of this effort lies in its demonstrating that individual small projects, adequately and flexibly supported by AID, carefully delineated and controlled, can indeed achieve practical limited objectives under fairly difficult conditions. This does suggest an alternative strategy for sector development planning which may produce more controllable outputs in some circumstances--many small projects rather than a few large ones. No implication of inherent superiority in cost-effectiveness of this approach is intended however.

#### IV. Post-Mortem and Discussion

As has been long known by USAID and painfully relearned in Syria, the mere sufficient and timely application of expertise and money to a project does not guarantee a successful outcome. What can be learned from this project is that the host government's interest in, and reasonable level of support for the project is a necessary condition for success. The goal of this project was clearly limited, practical, and easily understood in the Ministry of Health by everyone whose cooperation was required. Visible signs of progress were plentiful, and the immediate financial value of the end product, working equipment, was obvious.

This is not to suggest that the project or the Contractor were given carte blanche. Through the excellent hospitality a certain resentment of foreign experts showed through at times. (The Syrians, after all, supply skilled manpower to the rich Arab states, so perhaps there was also some resentment of policies and economic conditions which make it necessary to import technical assistance, even the free kind.) Many were the times when the refusal of requests for staff, vehicles, organizational changes, or budgets could have been interpreted as manifestations of anti-American policy. But in almost all cases these refusals turned out to be due to a real scarcity of resources, and persistent requests made by the Contractor's remarkably effective counterpart eventually produced the needed results.

Substantially more could have been accomplished during the two years if several mistakes had not been made in planning and managing the project. These are described here with the hope that they are instructive for future projects:

1. The Ministry's decision to withdraw the space previously agreed upon for the new Central Workshop and to substitute a pre-fabricated building supplied by USAID was agreed to far too easily. Either the time needed to put this building into operation was grossly underestimated or the importance of the workshop to all aspects of the project was not fully recognized. The result of this decision was that the Contractor had to devote a long, unplanned-for effort to the design and procurement of the building and had to put continual pressure on the Ministry to prepare the foundation. More important was the fact that the project had to operate in cramped temporary quarters for the entire time, thereby severely restricting training and management activities.
2. Failure of agreed counterpart staff to be appointed is not an uncommon problem in foreign assistance projects, and probably accounts for more project delays than any other single cause. But prevalence of a problem should not encourage project supervisors to condone it. Participating country officials should be informed that no project funds can be released until the resources which they undertake to provide, most importantly counterparts, are in place. The discussion and frequent conflict which accompanies the appointment of counterparts is usually helpful to the assistance project since it should force officials to closely examine the qualifications needed by the counterpart in the light of the goals and plan of operation of the project.

In the case of this project, most counterpart staff were appointed before the Contractor arrived, and were of excellent caliber. The failure to bring the Hospital Inspector into the Repair and Maintenance unit resulted only in a shift in emphasis away from centralized control, but very likely superior results would have been obtained if this counterpart had been appointed.

## APPENDIX I

## Major Direct Cost Items Of The Project

	<u>AID Grant</u>	<u>AID Loan</u>
a. Personal Services Contract AID/NE-C-1490 AIII	\$153,000	
b. Workshop tools and supplies (4-PIO/C's)	50,000	
c. Mobile van including shipping	11,000	
d. Utility vehicle	6,500	
e. Local currency budget, including modifications to van	9,000	
f. Prefabricated building		78,500
g. Erection supervisor		9,500
h. Supplement for erection supervisor	2,500	
i. Participant training for X-ray specialist	6,000?	
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Totals	\$238,000	\$ 88,000
	Grant	Loan

## APPENDIX II

Contractor's Actual Performance Compared With  
Scope of Services Specified By The Contract1. Equipment Inventory and Baseline Data

At the beginning of the project no inventory records and few manuals existed in the Engineering Office. While the importance of the equipment inventory was acknowledged by the MOH it always remained a low priority job. A new inventory form was designed and translated and files set up in the central office. Inventories were made at some, but not all, hospitals and efforts are currently being made to follow up on this task. Inventory cards are regularly prepared for equipment which is repaired by the E. O., so gradually the records will become complete. No duplicate files are maintained for the mobile van or hospitals. As far as the functioning of the E. O. is concerned the primary purpose of the inventory files is to regularize spare parts procurement and design preventive maintenance schedules. With the present level of administrative/clerical staff the maintenance of duplicate files would not be practical or necessary.

Regarding manuals, these have been collected and filed centrally. Occasionally manuals have been ordered from manufacturers but the MOH's procurement policies discourage this. Manuals are generally not available from manufacturers for old equipment. Several manuals have been translated into Arabic but this practice has been discontinued for three reasons; it is extremely expensive and time-consuming; in practice 95% of problems can be solved by looking at wiring diagrams; and someone is generally on hand to translate from English. For the reasons given above duplicate manual files have not been maintained but copies are made when it is necessary to take a manual into the field.

2. Design of a Centralized Maintenance and Repair System

At the beginning of the project only a rudimentary system of work orders existed and repairs were performed on an ad lib basis. No storekeeping system existed, and only one or two hospitals had workshop

facilities and trained technicians. During the project a system of prioritizing and assigning work orders and documenting activities was developed and put into use. Workshops in the hospitals have been equipped and technicians trained and assigned in most hospitals. Between these decentralized workshops and the central workshop there is now effective service in the southern region. The way the "system" works may not be the ideal centralized system envisioned by the project designer, but given the limitations imposed on it, it functions well enough. The following constraints have caused the less than full implementation of a centralized system:

- a. Lack of a Hospital Inspector as a management control element. Inspection tours are made only on an ad hoc basis or in response to some serious problem.
- b. Absence of centralized control over hospital workshops and their technicians and engineers. These remain under direct control of local hospital administrations and at present can only be controlled indirectly by the Engineering Office.
- c. Difficulties in establishing a spare parts store due to lack of space and storekeeping personnel.
- d. The virtual impossibility of ordering spare parts from foreign manufacturers.

Solution of the third problem is a matter of a short time, until the new Central Workshop is ready, and there appears to be some possibility of a decision to rectify the fourth being taken soon. The first two, especially the second, will require some difficult personnel and organizational decisions to be made and may not occur for a long time.

In the meantime, the system has been put into use and can be easily adapted and expanded as the necessary decisions and changes are made.

### 3. Design and Implementation of Evaluation of Project Success

An initial evaluation in the form of a report to the Minister was made in September 1979 and was re-transmitted to the new Minister in January 1980.

#### 4. Training of Systems Personnel

Since during the course of the project there has been no space available for formal training courses, the Contractor has necessarily concentrated on practical on-the-job training in repair and maintenance. Most of the technicians have had very little practical experience and it was necessary to first instruct them in the proper use and care of tools. Fortunately, a large amount of non-functioning equipment was available at all times for practice and actual repairs, of which a high proportion was actually put back into service. A second basic, but not obvious, area in which training was required, was that of finding spare parts locally and adapting them to the equipment needing repair. In most cases exact replacement parts from equipment manufacturers and their representatives was not available. Frequent recourse has been made to the local markets for electrical goods, automotive parts, and radio/TV repair. Some parts have been manufactured by local machine shops and rubber molders. For some types of equipment, such as steam generators and refrigerators, outside local specialists are called in.

In general the results of this practical training have been extremely good. At the start of the project there was little confidence that repairs on most kinds of equipment could be Executed by the Engineering Office. Now, roughly 75% of all repair requests are successfully carried out. The rest are either contracted out to manufacturer's local agents or to specialists. Over the course of the project the Engineering Office's ability to control and supervise the work of these outside contractors has greatly improved, so the quality of those repairs is generally improved also.

In terms of formal training, several self-instruction courses covering DC electricity up through semiconductor electronics were purchased under PIO/C and their translations begun locally. These will be administered by the contractor before the end of the contract on a trial basis, and then can later be self-administered.

#### 5. Technical Assistance

The contractor has provided technical assistance in most conceivable areas. Some of the major areas which have produced useful results are enumerated here:

- 1). Design and specifications of the prefabricated workshop, and serving on Ministry's Procurement Committee.

- 2). Reorganization of workshop and associated procedures.
- 3). Installation and set up of pharmaceutical packaging equipment (for oral rehydration salts).
- 4). Recommendations to the Ministry for reorganization of administrative structure of all maintenance units.
- 5). Selecting and ordering tools and equipment for Central Workshop.