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MAINTENANCE AND SERVICE OF EQUIPMENT IN THE PUBLIC SECTOR

DP/MAT/86/002

MALTA

Technical report: Strengthening of the advance  
electronic maintenance unit\*

Prepared for the Government of Malta  
by the United Nations Industrial Development Organization,  
acting as executing agency for the United Nations Development Programme

Based on the work of Rolf D. Schmidt, expert in electronics

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United Nations Industrial Development Organization  
Vienna

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1. Abstract

This report describes the progress made and the problems involved in the extensions of the Advanced Electronics Maintenance Unit ( A.E.M.U. ) during the first seven month of the present Project No.DP/MAT/86/002 . It covers the period from October 1986 to May 1987.

The situation of the A.E.M.U. in October 1986 as well as in May 1987 is given and all activities during the period are mentioned.

Finally recommendations to bring the project to a successful end are made.

## 2. Expected Progress During Projects Lifetime

The sense of the actual project is to extent the A.E.M.U., a unit to maintain and repair most types of electronic equipment in use in Government Departments which was set-up under the UNDP Project DP/MAT/83/001 'Maintenance and Servicing of Equipment in the Public Sector'. That contains to arrange an internal structure, to expand the capability for maintaining and repairing and to increase the technical knowhow of the engineers and technicians.

Therefore the signed parties, the UNDP and the Government of Malta have promised certain inputs.

The UNIDO as executing agency has to send two Electronic Engineers to Malta, which shall initiate, carry out and control the necessary activities to reach the expected outputs given in the Project Document.

The UNDP allocates funds, to make possible the assignment of short-term consultancies and the training of maltese nationals abroad.

The Maltese Government guarantees to employ all technical, clerical and supporting staff required, to agree to the organization structures of the re-organized A.E.M.U. and to provide the unit with all necessary outfit in order to reach the expected outputs stated in the Project Document.

The set-up of the unit shall follow a tentative workplan, which is part of the Project Document. Subsequently the training of the technicians and the guidance of the engineers shall start.

A particular importance shall be the training of the future head of the unit, who should be capable of taking over the duties from the U.N.Expert on his departure, especially the responsibility for the day-to-day running.

### 3. Situation Of The A.E.M.U. In October 1986

After my arrival in October 1986 I found the unit as follows:

- As regards the premises a former lecture room and an appended small chamber was available. The lecture room was used as a workshop, containing six workbenches, four cupboards and several small drawer units. The chamber was used for the stock and as an office, giving space to a maximum of two people.
- Particulary the outfit with furniture was unsatisfactorily. For the four individuals of the supervisory staff, including myself, only one desk was available. With the exception of the six workbenches and some chairs all other furniture were borrowed.
- The unit consisted of two engineers (B.Sc.), one technical officer and six technicians employed on a full-time basis.
- The technicians had a good basic electrical and/or electronical education.
- The test equipment was of a basic nature, to carry out works on electronic equipment in general. A set of tools was contained in every workbench.
- The stock was well assorted to face future basic workloads. The stock taking was handled computer controlled.
- Beyond that one could not recognize a structure of the unit anyhow. The operational staff (the two engineers and the Tech. Officer) were doing the same work. A division of labour did not take place, everyone was involded in every job. The technicians sometimes got their orders from the first engineer, the next time from the second one, which resulted in some internal problems.
- All paperwork had to be done by these three individuals themselves.

#### 4. Activities During The Last Seven Month

##### 4.1. Organization Of The A.E.M.U.

To reach the expected aim, two facts were in the way:

- there were no suitable premises available,
- there was no internal structure of the unit.

The question of premises was stressed in several meetings between the U.N. Experts and the maltese counterparts. Till today this problem is not solved due to unknown reasons.

The internal structure has been build up as far as it was possible.

Corresponding to the new introduced subdivision of the A.E.M.U. (refer Project Document Annex II.) into four sections, the responsibilities of the operational staff were arranged.

Several new procedures to make the internal running easier were introduced, for some of these new forms were created. (for forms please refer to Annex I)

For a better planning of the workload the procedure for a request for services from the A.E.M.U. had to be changed. Today the Head of the unit receives them directly and in co-operation with the engineer of the section involved he decides himself, whether the request could be accepted or not.

A system of charging for the performed service by the unit has been discussed with the Accounts Section of the Office of the Prime Minister and was later enforced.

Specifications for requested high developed test equipment were drawn up, and some of this equipment is already ordered through UNIDO.

##### 4.2. Services For Other Departments

Between September 1986 and April 1987 349 different pieces of equipment have been checked, maintained or repaired through the A.E.M.U. Some of these were simple electrical apparata such as battery chargers or pocket-receivers, but

some of these were more sophisticated items like micro-processor controlled videorecorders or e.g. a 16-channel tape-recorder.

Several tasks were fulfilled outside the unit, e.g. the repair of a truck weight bridge.

The biggest project of the unit is the design, the purchase and the installation of a Power Amplifier System for the criminal hall of the law courts. In this system a recording facility with three tape-recorders and an automatic over-switch has to be included. The completion of this job is expected at the end of July.

#### 4.3. Training Of The Staff

After the subdivision of the A.E.M.U. was done, the training of the staff regarding their special tasks in their sections started.

In detail the technical officer received support in how to extend the stock and the library, in how to find new sources of supply for spareparts and literature and how to get in touch with other companies or distributors.

The engineers were prepared for there future tasks during an on-the-job-training. The guidance of the technicians, the dealing with other departments, the methodical running of a service and the creating of additional organisation for the A.E.M.U., as far as not yet introduced, were part of it .

After the arrival of the clerk, working guide lines were prepared for her and she received a briefing on them. In detail her on-the-job-training contained:

- the proper handing of files
- the correspondence with other companies or departments
- the operating of the existing computer to prepare bills, stocklistings, forms etc.

Especially the introduction of a weekly meeting of the operational staff has improved the internal communication in the sence, that everyone becomes informed about all activities within the unit without being involded directly.

A substantial future objective of the A.E.M.U. is the



upgrading of the technical level of the engineers and technicians. Therefore the two engineers and the technical officer were directly involded in the upcoming lectures. To exercise this way of training practically, and to raise the knowledge of the staff of the unit at the same time, they were kept to prepare and give one lecture each. Since February four lecture are delivered:

Subject	Time required	Lecturer
AM/FM principles	30 h	(P.O.I)
Videorecorders	25 h	(P.O.IIA)
Color Monitors	25 h	(T.O.III)
Microcomputersystem Z-80	60 h	(U.N.Expert)

Till today in average two hours of lectures were given per day.

The lecture mentioned last, held by myself, was finished on the 22th of May.

In addition the technicians were motivated to exchange special knowledge gained during their daily work by a short lesson. Five of these lessons have already been given.

To take over the repairs on some crane-safety-systems the A.E.M.U. organized a theoretical lecture followed by an practical instruction on this system held by an expert from the parent company, who came to Malta for three days.

#### 4.3. Projects

Contemporary with the theoretical lectures some projects were started, to provide the technicians with some practical experiece, beside teh one gained during the daily work.

In detail six projects were initialized:

- three of them are part of the design and the construction of a CP/M compatible Eurocard Computer:
  - a Z-80 CPU module
  - a 64k byte memory module
  - a seriell and parallel input-output interface module.

(Due to the choice of a standardized bussystem an extension with usual computer moduls e. g. floppy disk controller at a later time is easily possible)

- Design and construction of an EPROM-Programming module
- Construction of a logic analyser on TTL-Basis to be connected to a usual video monitor and
- the building-up of a TV-Testpattern-Generator.

## 5. Present Situation Of The A.E.M.U.

### 5.1. In General

Materialwise the situation of the unit has not improved essentially since the end of the old project (DP/MAT/83/001). The unit is still in the urgent need of suitable premises, furniture and higher developed test equipment.

The present binding of the unit to the administration of the Office of the Prime Minister turned out to be impeding in some cases. Particularly the prescribed procedure for approval for the purchase of spareparts, books or other material causes in some cases a delay of up to several months in the carrying out of services.

Internally the unit shows some progress. The internal structure is settled, procedures to make the running of services easier or faster are introduced, the operational staff is instructed, and the level of knowhow of all the staff has increased due to theoretical lectures, practical projects and innumerable advices during the day-to-day activities.

### 5.2. Premises

Still the unit has to get along with unsuitable premises. Although the room next door is given to the unit for a temporary use of six month (till Sept.87), it does not meet the requirements.

Since the delivery of three desks and chairs at the end of April '87 the precarious situation of missing furniture has improved a bit. At least every engineer now has his own working area (until that time they had to use selfmade desks improvised out of old wooden plates.) An also received filing cabinett to store the files properly and a drawer cabinett for the more sensitive, electronical spareparts such as multi-pin connectors or microchips brought a visible improvement.

But still there are pending requisitions for chairs and tables for the lecture room, cupboards for the test-equipment and drawer cabinetts for the stores. Therefore the unit depends on the goodwill of other departments which are

borrowing us some furniture. From the state of a self-sufficient A.E.M.U. we are still far away.

### 5.3. Personnel

Today 16 individuals belong to the A.E.M.U.:

- one engineer (B.Sc.) Grade P.O.IIA

at the time responsible for the Television and Video-recorder section. Being the senior officer he is also acting as the de-facto head of the unit.

- one engineer (B.Sc) Grade P.O.I

due to the absence of a third engineer currently in charge of two sections, the Telecommunication and the Digital- and Microcomputer Section.

Both engineers are fully responsible for their sections as regards the guidance of their technicians, the decision whether to accept or to refuse a service and the carrying-out of a service. Together they bear the responsibility for the bills of the services to be issued.

- one technical officer Grade T.O.III

responsible for the stock-taking and the library. He handles all requisitions for spareparts and books, conducts all equipment of the A.E.M.U. and controls the handing-out of material from the stock.

- one clerk (female) Group D

in charge of the correspondence of the unit. Furtheron she helps in handling the stocklists, issues the bills and is responsible for the filing system.

- one cleaner/messenger Group B

- six technicians Group D

which are in two-men teams attached to one of the sections following on their own interests or capabilities.

- seven E.S.T.S. students

between February and September send to the A.E.M.U. during the practical phase of their courses.

- one student worker from university

send to the unit during his working-phase.

#### 5.4. Equipment

Since the beginning of this project there were only a few additions to the already existing equipment of the A.E.M.U.

For a list of equipment refer to the Final Report of the Project DP/MAT/83/001. All additions are listed below:

- a modern typewriter with an interface to the existing computer system
- a alignment tool-set for video recorders
- a drawing board for the design of circuit-diagrams and layouts and
- a refrigerator to cool special chemicals and photo-material.

The workbenches and the therein contained toolsets were complemented with special desk lamps, solder stations and some small items like screw-drivers and files.

#### 6. Activities

Some services and projects are not yet finished by the end of May. They will be carried-out by the engineers within the next months.

In detail these are:

- the installation of the law-courts PA-systems
- the repair of a truck-weight bridge

-the calibration of some bomb detectors belonging to the airport

-and some smaller jobs

The under 4.4. mentioned projects have reached different states. While two of them are already in the testing phase, the design of the lay-outs for the others have to be finished, before building them up .

## 7. Recommendations

It is advisable, that after a period of consolidation of their political directives the maltese counterparts in charge of this project have to make some decisions on the really expected set-up of the A.E.M.U. During the last six months I got the impression, that there was no clearness about the wanted set-up and the expected capability of the unit on the maltese side or the willingness to establish them was missing. There is no other way to understand the dilemma about the premises the approval of pending requisitions or the embarrassing fact that the given budget for 1987 is far below the one promised in the Project Document.

Based on an investigation made by the A.E.M.U. during the last seven month, indicating all equipment owned by Government Departments which might need a service by the unit, the set-up given in the project document should be reconsidered. Even assuming that only 50% of all the equipment was covered by this investigation, the sections seem to be too big. Some aspects are not yet covered by the present set-up.

Therefore, smaller sections with one engineer and two technicians each should be introduced. The sections should cover the following areas:

- Analog techniques including Audio Amplifiers, Receivers and Transmitters
- Videotechniques including television-sets and videorecorders (as it is today)
- Electromechanic and sensors
- Digital Control techniques
- Computer-techniques including microprocessor-techniques and computer net-works.

This recommendation is based on the experiences made during the last six month.

During the repair of some equipment the problems were not found in the electronics itself but in the understanding of how to convert physical values into electrical ones

connected to mechanical problems.

The subdivision of the Digital- and Microcomputer-techniques mirrors the development in the field of the modern electronics, where the computer technology expands to its own branch. I had to notice, the clumsiness of the staff with upcoming problems with the existing computer systems. Due to lack of knowledge several programmes were and are of no use, although they might be a good help in the daily work.

After finishing the CP/M computer project mentioned under 4.4. , this section should start to develop some simple testroutines for that. Without them, the repair of Micro-processor-controlled systems will become impossible in the future. Particularly the simulation of standard interfaces like RS-232 or IEEE as well as the 'static' testing of dynamic systems will be not possible without such a computer system and the knowhow, how to work with it properly.

One essential task of the unit will remain the training of technicians attached to the A.E.M.U. and to other departments. Such a training has to be carried out by fully qualified engineers. The preparation of such lectures need a lot of time. An extension of the A.E.M.U. with engineers, preferably young graduates from the local university with specific knowledge about advanced technologies is therefore highly recommended.

The most pressing problem is still the vacant post of the future head of the unit. Due to a necessary period of at least 12 month for the on job training the designation of such a person has to become highest priority. Eventually the building up of a young engineer should be considered. Since the on-the-job training will at least require one year, the nomination of such a person should be given highest priority.

In this regard the intensive preparation of the P.O.I already working at the unit should be drawn into consideration. This young engineer shows a high grade of responsibility together with solid knowledge, skills in planning and organising and knows how to get things carried out. After a fundamental on-the-job training under the guidance of an expatriate expert and having attended courses abroad, especially management and leadership of staff, he



can be in a position to fulfil this post satisfactorily.

Soon after a decision on the future set-up of the A.E.M.U. is made, the maltese counterparts in charge should provide the unit with suitable premises including furniture, so that the successful completion of the project is no longer obstructed.

Administrativewise the accounting matters of the unit should be dealt with easier. Especially the complicated approval procedure in ordering items such as spares or literature below an expence of LM 50 should be changed shortly.

- Appendix 1. Worksheet**  
- to be filled during a service
- Appendix 2. Permanent Parts List**  
- to be filled by the stores officer to control spare parts used for services
- Appendix 3. Temporary Parts List**  
- to be filled by the stores officer to control spare parts used for projects
- Appendix 4. Listing of Tools**  
- to be signed by the technicians after receiving their tool-set
- Appendix 5. Example of a Bill**





**I A.E.M.U. I**

**DATE 05-05-1987**

**WORKSHEET NO.:** \_\_\_\_\_

**TYPE OF WORK :** repair / maintenance / refurbishment / new

-----  
**TYPE OF SET :** \_\_\_\_\_

**SERIAL NO.:** \_\_\_\_\_

**FAULT / REASON :** \_\_\_\_\_

**OWNER / DEPT.:** \_\_\_\_\_

**NAME :** \_\_\_\_\_ **TEL. NO.:** \_\_\_\_\_

**ADDRESS :** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

-----  
**BILL NO.:** \_\_\_\_\_

**DATE OF ARRIVAL :** \_\_\_\_\_ **/ DATE OF DELIVERY :** \_\_\_\_\_

**DELIVERY SIGN :** \_\_\_\_\_









(cont.)

ITEM	QTY
16. Desoldering Pump	(1)
17. File Set Set of six (6)	(1)
18. Wire Brush (small)	(1)
19. Utility Knife (small)	(1)
20. Steel Ruler	(1)
21. Multi Meter (A.E.M.U. )	(1)
22. Prods : Self Clamping Red	(1)
Self Clamping Blk	(1)
Pointed Red	(1)
Pointed Blk	(1)
23. Crocodile Clips	(2)
24. PCB Tool (Set of 5)	(1)
25. Oscilloscope Prods (x1 x10)	(2)

SIGNATURE .....

.....  
• (Stores Officer)  
f/Head A.E.M.U.

.....

	BENCH TOOLS	( )
ITEM	-----	-----
****		QTY
		***
1.	Watchmaker's Screwdriver Set of six (6)	(1)
2.	AC Tester	(1)
3.	Screwdrivers (Flat)	(1)
	100/2.8mm	(1)
	100/4.5mm	(1)
	150/6mm	(1)
	175/8mm	(1)
4.	Screwdrivers (Philips)	(1)
	0/60	(1)
	1/80	(1)
	2/100	(1)
	3/150	(1)
	4/200	(1)
5.	Combinational Pliers	(1)
6.	Long Nose	(1)
7.	Side Cutter	(1)
8.	Wire Stripper	(1)
9.	Alignment Tool Kit Set of seven (7)	(1)
10.	Soldering Station	(1)
11.	Combinational Scissors	(1)
12.	Point Cutters	(1)
		SIGNATURE .....



- 13. Angle Pliers (1)
- 14. Tweezers (flat) (1)  
(pointed) (1)
- 15. Vice (1)

...../.....

**\*\*\*\* A.E.M.U. \*\*\*\***  
**ADVANCED ELECTRONICS MAINTENANCE UNIT**

Corradino Hill, Paola, Malta. Tel:233740

**INVOICE**

Date : 05-05-1987

TO:

NATURE OF SERVICE :

MATERIAL USED :

EXTRA CHARGES : MISCELLANEOUS  
TRANSPORT  
LABOUR COSTS

LM 0.000  
LM 0.000  
LM 0.000

TOTAL :  
DEPARTMENT CHARGES :

LM 0.000  
LM 0.000

GRAND TOTAL :

LM 0.000  
\*\*\*\*\*

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HEAD A. E. M. U.