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AIRLINE MECHANIZATION FOR MAINTENANCE AND ENGINEERING APPLICATIONS

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ABSTRACT

Talking about the subject of material, production, maintenance, and repair technologies of ASAT first conference, EGYPTAIR will not propose a new invention or a complete new mechanized system, completely designed by EGYPTAIR computer center, but to introduce the new philosophies of maintenance & engineering operation & controls used now by Airlines, to ensure fleet airworthiness, optimise airline services, and minimise maintenance costs.

The purpose of this paper is to share EGYPTAIR's experience in selecting suitable online maintenance & engineering software package, and to provide details of EGYPTAIR profile, selection process, phases & achievements of M&E mechanization plan, package existing functions & new functions, DATA BASES, analysis effort for communication aspects, documentation, and benefits.

Computerization attitude is not just to provide massive information with lots of printouts but to prevent problems with timely and selective information on potentially critical areas.

The design of such a system cannot be purely technical to be successful you must take into account social values, such as job satisfactions, stimulating cost consciousness, making people work better with more interest.

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INTRODUCTION

Like most airlines, AGYPTAIR have a history of accumulating batch systems which were independently justified. Such application as inventory control (expendables), taxfree shop, revenue accounting, offices accounting and personnel.

When EGYPTAIR needed to establish an online computer system for maintenance & engineering area, experience showed that inhouse development was expensive & lengthy (suitable package will cost about \$ 20 milion). so EGYPTAIR strategy was to acquire software package, integrated system, using database /data comm techniques.

Source of guidance was IATA sub-committee papers, airlines community researches, and IBM airlines application program catalogue .

EGYPTAIR computer services committed to mechanize all the airline activities using a master plan approach. First priority was for in house seat reservations, departure control, fares, and automatic ticketing. Second priority is to mechanize all the activities of the technical division. consecutively the other airlines applications such as flight planning, taxfree shop, airline services, ground services, cargo activities, personnel & other areas. Fig.1

After long survey in the int'l market we found that common s/w packages for maintenance & engineering subjects were for managing material, and/or reliability, and/or production planning & control, and /or engineering.

EGYPTAIR PROFILE

General information:

EGYPTAIR the national carrier of EGYPT operates scheduled services to MIDDLE EAST AREA, FAREAST, AFRICA, EUROPE, and domestic flights, covering more than 50 cities around the world carrying around 3 Million passengers (apout 75000 flying hours).

EGYPTAIR operates 27 aircrafts comprising of 6 B707, 7 B737-200, 8 AB-300, 3 F-27, 3 B 767-200, 1 747 (rented). fleet will increased by 2 747 during 1985.

Maintenance information:

Maintenance of the fleet carried out at our main base in CAIRO AIRPORT. As well as maintaining our own fleet we also maintain aircraft for other operators.

Number of spare parts:

125,000 - inventory item level.

30,000 - serial number level.

With around us \$ 70 Million investment in spare parts.

DATA processing information:

Patch systems are running on the old computer room by IBM 370/115 machine using DOS/VSE operating system . During the conversion process EGYPTAIR had two IBM 4341 group 2, 'OSORIS' is mainly for reservation application using IBM DOS/VSE sipo E, MENA is mainly for the maintenance & Engineering applications using MVS operating system and IMS data base / data communications . When EGYPTAIR M&E will be running, the IBM 4381 will be used as backup for both OSORES & MENA systems . Fig.2,
(total real storage = 25 MB)-(total storage = 20 GB). No. of terminals connected to EGYPTAIR D.P centre RES=500, M&E=200, others =300, & local =50, with 24 hours 7 days operations.

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SELECTION PROCESS:

- Intensive investigation and wide survey done in the technical division to achieve detailed study, which was discussed & approved by the user's side.
- The selection team consisted from 5 members representing different areas of technical division and 2 specialists from data processing.
- Detailed definition of the user requirements and priorities to be executed were approved formally by the head of technical division.
- Investigation and survey the outside market for suitable system was done and we believed that if there was a system in existence which would fulfil a high percentage of our functional requirements due to priorities, this system will be selected taking in considerations EGYPTAIR's strategy previously mentioned.
- The team started to contact a good many airlines & other consultancy houses.
- The selection of the system was not only made after visits to several airlines but the requirement documents were also checked off and compared with the airline system. Some airlines arranged visits to CAIRO present their systems.
- Selection team narrowed the field to two systems which appeared to match our requirements.
- To make sure that both systems are running successfully in other airline operating them, additional visits were done to discuss all areas of problems during the implementation phases.
- Proposal presented to steering committee for approval & it was approved in principle.
- The evaluation of the system took considerable length of time for the following reasons .

- The complexity of such systems .
- The different methodologies used in design.
- The status of each system concerning implementation stages of development phases.
- The geographical factors affecting supplier operations reflected different ways of mechanization priorities and policies.
- Each member from user side believed that his technical areas was the most important one, and the decision should consider that, forgetting sometimes EGYPTAIR priorities and policy. The committee spent long time discussing items related to that kind of details.
- Data processing members stressed on comparing the technical aspects and supplier support, in addition to the system functions.

Steps for decision :

- Regarding that none of packages in the outside market had a complete integrated system for the whole activities, the selection depended on priorities of user requirements to be executed and the team committed to complete mechanization of the activities jointly with the vendor.
- By using scoring technique we reached the preliminary decision on the following bases:
 - 60% for functions required divided to :
 - 36% for material management functions.
 - 12% for snag management functions.
 - 6% for engineering functions.
 - 6% for production planning & control.
 - 20% for tech support.
 - 5% for previous experience.
 - 10% for the price.
- Finally a decision was reached to purchase ALITALIA "MEMIS" system after passing the legal procedures which considered the following factors:
 - Price , implementation period , technical support ,
 - previous experience , terms of payment , and technical recommendations.
- The contract was signed with ALITALIA in august, 1984.

PHASES & ACHEIVEMENTS OF MM & E MECHANIZATION PLAN : Fig.3

Experience of other custmers of MEMIS showed that such a package needs from two:four years to be implemented .

Top management recommendation was to condence the period of implementation to 15 months by affording resources and capabilities.

It is planned to cutover the system functions on DEC,1985.

Dilemma arises now is to decide:

- .Either to cutover the system by data of all owned A/C.
- .Or to cutover the system by one type of A/C then schedule the other types of A/C's data .
- .Or to cutover the system by one type of A/C's and standard items data.

A sample of data required for initial loading will be captured to estimate resources,duration,and types of A/C's to find a solusion .

The situation of MS executed implementation plan is that after 7 months of the begining,all phases and activities is on schedule .
as a result of the efforts done during planning,development,and implementat-
ion of the project.

Special attention was given to :

- the training of data processing staff in new S/W,and package.
- Organization,deligation,and progress control.
- The need for gradual change from manual to automated procedures within the user organization.
- The H/W installation (vedeu and printer) .
- The estimated time required for data selection to build the data bases.
- Organizing relations between EDP & user .

M & E MECHANIZATION PLAN

Team education:

PHASES	DURATION	INVOLVED TEAM	REFERENCES	REMARKS
Familiarization course	1/11/84 : 26/11/84	Key users- EDP- TLCS		Two groups
Functional specs study	15/11/84 : 3/ 2/85	Key users- EDP	MAA-02 functions specs	In house training
Package specs study	13/ 1/85 : 30/ 1/85	EDP	MAA-18 package specs	In house training
			MAA-20 description of codes	
Function review	4 / 2/85 : 21/ 2/85	Key users-EDP	Questionnaire	
DB functional training	" " " "	Key users-EDP	MAA 24	
DB functional study	8 / 2/84 : 10/ 3/85	EDP	MAA-05- data file specs	In house training
			MAA-05- data base desc	
			MAA-06- file record desc	
			MAA-06- data base segment	
			MAA-07- macro specs	
			MAA-08- programming tech	
Tech. aspects illustration	25/ 3/85 : 29/ 3/85	EDP		Library maintenance programming tech data base tech
Test cases	2/ 3/85 : 16/ 3/85	Key users	Test data Test cases	In house training

Remaining phases: Test Cases 2 & 3 and offline procedure course

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Software environment setup:

PHASES	DURATION	INVOLVED TEAM	REFERENCES	REMARKS
Pilot system generation	4/12/84 : 8/12/84	system programmers	MAA-18- implementation guide	
Items unpacking	8/12/84 : 22/12/84	DBA- analyst	MAA-18	
Pilot system setup	23/12/84 : 2/ 1/85	DBA- analyst	MAA-18 s.s	
Pilot system maintenance	2/ 1/85 :	DBA- analyst	description of codes test cases	

Remaining phases: training system generation and follow up

User environment setup:

PHASES	DURATION	INVOLVED TEAM	REFERENCES	REMARKS
Analysis for comm.aspects. User enviroment setup	15/ 1/85 : 15/ 3/85 2/ 3/85 : 2/ 6/85	EDP- Key users Key users	NAA-func specs . Detailed study func. Func specs . Existing system doc.	Approved from AZ . committe to suggest new procedure.

Remaining phases: End user training, Managers approval, and terminals in site.

Data capture & loading;

PHASES	DURATION	INVOLVED TEAM	REFERENCES	REMARKS
ILO package study Data analysis Data loads system design Data capture procedure	9/ 3/85 : 9/ 6/85	Team of keyuser & Team of EDP	MAA-06 MAB-02- func specs MAB-06 file specs	coordination of teams

Remaining functions :Static & dynamic data collection, test D.B, and online data capture.

THE ANALYTICAL STUDIES FOR TERMINALS CONFIGURATION'S EVALUATION.

1- Purpose:

- 1- 1 To calculate the expected number of vdu's and printers' to be utilized by users.
- 2- To decide the locations of vdu's and printers.

2- Elements of studies:

·Package:

- 1- Main functions.
- 2- Sub-functions.
- 3- External transactions covering each sub-function.
- 4- Functional specification for each transaction.

·User environment:

- 1- Main functional areas (departments) covered by the system.
- 2- Sub-functional areas.

·Relationship between package functions and user functional areas.

- 1- Function transactions for each main functional area.
- 2- Function transactions for each sub-functional area.

3- Basic factors:

- 1- Transaction daily frequency.
- 2- Average duration per transaction.
- 3- Working time .
- 4- Peak hours.
- 5- Back-up procedurs.
- 6- Average number of characters transmitted (in-out).
- 7- Number of agent per location.

MEMIS DB OVERVIEW

To solve problems arising from data handling, recovery problems as well as message transmission, the IBM package called 'INFORMATION MANAGEMENT SYSTEM' (IMS), was chosen as the technical support for implementing the M&E package. The IMS uses the data base / data communication features. The DB feature gives the advantages of better security, integrity and maintenance, without data redundancy, in addition to the better core utilization and higher programme-ers productivity.

In M & E package we can divide the data bases used to fine different areas containing in total 17 data bases, the types of organizations used are 'HIERARCHICAL DIRECT ACCESS' (HIDAM), using OSAM access method.

Referring to appendix Fig.4, we can group the M & E data bases as follows:

Management area:

- ORD : Orders DB.
- SDT : Line stations, deposits & third parties DB.
- FOR : Suppliers DB.
- IAZ : Stock number index DB.
- PNC : Manufacturer's part number DB.

Technical area:

- TAG : Tag number DB.
- AIN : Rotable interchangeability number DB.
- ILS : Index of special limit task DB.
- TAM : Aircraft type DB.
- INA : Aircraft tail number segment.

Support area:

- IX : Miscellaneous DB.
- TAB : DB tables.
- STA : on- line terminals DB.
- ADS : Understock situation DB.
- PRV : Provisioning DB.
- PAF : Provisioning finalizations DB.

Data dictionary area:

- GHI : Data dictionary DB.

In addition to the well known functions of DB and to resolve conflicts in the way the application programs accesses the previously mentioned DB, the package use the bidirectionally virtually paired logical relationship function to connect different data bases.

Also the field level sensitivity function is used to increase the data independence by isolating application programs from any future change applies to data, in addition to enhance the data security by limiting the application to its only required fields and to control update operations.

PACKAGE AUTOMATED FUNCTIONS: Appendix 1

- Workshop repair.
- Data base maintenance.
- Material storing.
- Order management & material receipt.
- Marketing research.
- Reorder procedure.
- Warranty management.
- Material request issue.
- Removal / installation.
- Policy definition.
- Demand forecast.
- General aspects & accounting system.
- Initial provisioning.
- Overstock management.
- Fleet activity control.
- Component & A/C limit analysis.
- Component reliability monitoring.
- Utilities.

PACKAGE NEW FUNCTIONS:

Snag management system: Fig.5

The purpose of the snag management system, in brief, is to record and manage all the snags occurring on each A/C of MS fleet.

By snag, it is meant any unexpected defect which may happen during the flight or just before take-off (or, sometimes during maintenance checks, on ground).

The snags are recorded in the A/C logbook by the flight engineer and approved by the captain. Then the action (s) taken by the maintenance engineer is also recorded in the A/C logbook .

The basic functions of the snag management system will provide the following:

- Record of A/C logbook & including all inform. about the flight, snags and all the actions taken.
- Record of open items (deferred snags).
- Enquiries, reports to display & print snags according to different A/C's .
- Other reports related to the oil consumption calculation & reliability reports.

BENIFITS:

- Component management: most airlines constantly have a number of dismounted component dispersed throughout many locations. Some of this are relatively of high value and many may be in an unservicable condition to total components. Any management action, there fore that directly improve the ratio of servicable by speeding up the flow through the repair & overhaul shops of the unservicable ones. this contribution will be reflected in reduced AOG costs, reduced cost of component storage, and improved ontime departure reliability.
- Ensuring on time completion of work, minimizing queues of work centers, setting realistic due dates, resolving the relative job priorities, and avoiding idle time.
- Speed & accuracy of data collection.
- Resource optimization & provide a tool for improving employees performance and job satisfaction.
- Effective use of statistics reduce clerical paperwork, improve quality of management, and prductivity.
- Reduction in capital cost of inventory investment.

Intangible benifits:

- Monitor forecasts, simulate various situation varying the factors in order to study the effect before taking firm decisions.
- Respond to situation more quickly, as a result of having up to date information on all aspects of compents & parts by inquire into the system .
- Saving time spent communicating with other departments regarding M & E data.
- Saving lost time due to inaccurate and/or outdated records.

-PACKAGE AUTOMATED FUNCTIONS: APPENDIX (1)

- Workshop repair:

- Ful 1 - work process follow up ,
- Ful 2 - Completed work data collection.
- Ful 3 - list of online situation.

- Data base maintenance:

- Var 1 - lists management.
- Var 2 - tables management.
- Var 4 - single aircraft variation.
- Var 5 - position on aircraft.
- Var 7 - part number changes.
- Var 8 - inventory item insertion and deletion .
- Var 9 - translation between inventory items.
- Var A - serial number insertion/deletion.
- Var B - line station changes. ,
- Var C - life limits - part unnumber changes.
- Var D - A/C type insertion/deletion.
- Var I - change of material class.
- Var E - change in warehouse location for parts.
- Var H - for parts A/C transfer between A/C.
- Var F - inventory item variations.
- Var G - change to workshop area.
- Var K - deletion of A/C or not stocked item.

- Material storing :

- Cha 1 - material return (from external locations)
(station, deposits, loans).
- Cha 2 - return after excessive or wrong request.
- Cha 3 - return after repair (non serialized).
- Cha 4 - returning finalization.
- Cha 5 - reception of non- ordered material.
- Cha 6 - storing finalization.

- Order management and material receipt:

- Ord 1 - order issuing .
- Ord 2 - order acknowledgement.
- Ord 3 - order cancellation.
- Ord 4 - order receipt.

Ord 5 - AWB insertion :

Ord 6 - order expedition.

Ord 7 - order printing

Ord 8 - material receipt:

- Marketing research:

Mkt 1 - printout on request for RPO's.

Mkt 2 - ordering processing data.

Mkt 3 - insertion & updatation of purchasing data.

Mkt 4 - selection of preferred vendor.

Mkt 5 - display and updating of vendor data.

- Reorder procedure:

Rdr 1 - reorder parameter evaluation.

Rdr 2 - pilot times evaluation.

Rdr 3 - stock analysis (reorder level check).

Rdr 4 - understock situation set up on request.

Rdr 5 - understock situation resolution.

- Warranty management:

Gar 1 - standard warranty management.

Gar 2 - repair warranty management.

- Material request issue:

Req 1 - material request from workshop or hanger.

Req 2 - request for material to be shipped.

Req 3 - reservation and expedition (request).

Req 4 - shipping list management.

Req 5 - transfer from line station to line station.

Req 6 - requested material issue.

Req 7 - material issued (without prior request).

Rwq 8 - scrap of material.

- Removal / installation :

Rmi 1 - removal / installation on the A/C :

Rmi 2 - simple installation on A/C :

Rmi 4 - installation of an assembly on ground .

Rmi 7 - disassembly .

Rmi 8 - document printout for ser. parts.

Rmi 9 - document printout for not serialized parts.

Rmi A - maintenance programs .

Rmi B - unserviceable parts on ground .

- Rmi C - movement to ground equipment
- Rmi-D - enquiries on serialized items.
- General aspects of an accounting system:
 - Acc 1 - accounting online transactions (inventory rectifications)
warehouse accounting
 - Acc 2 - internal online accounting processing (inventory item
management formula)
 - Acc 3 - balance procedures
 - Acc 5 - quarterly procedures (memory printouts)
- Overstock management:
 - Sur 4 - issuance of data to ATA on own surplus stock
- Initial provisioning:
 - Inp 1 - ATA 200 data acquisition.
 - Inp 2 - provisioning master file updating and printouts.
 - Inp 3 - provisioning inventory item insertion.
 - Inp 4 - provisioning.
- Overstock management:
 - Sur 4 - issuance of data to ATA on own surplus stocks.
- Fleet activity control:
 - Flt 2 - manual fleet activity updating.
 - Flt 3 - independent time activity updating.
 - Flt 4 - maintenance check limits.
 - Flt 5 - maintenance check schedule updating.
- Component and aircraft limit analysis:
 - Lim 1 - store limit and loan control.
 - Lim 2 - insertion of temporary limits.
 - Lim 3 - change and deletion of temporary limits.
 - Lim 4 - enquiries on limit task.
 - Lim 5 - automatic removal and maintenance check list preparation.
 - Lim 6 - operation's simulation for time limits check.
 - Lim 7 - maintenance check list on request.
 - Lim 8 - material availability check.
 - Lim A - end of works.
 - Lim B - short terms limits.
- Component reliability monitoring:
 - Rel 1 - parts applicability on fleet types.
 - Rel 2 - data collection.

Rel 3 - parts activity evaluation.

Rel 4 - online evaluation or reliability management.

Rel 6 - reliability reports.

Utilities:

Uty 1 - I/O mgmt.

Uty 2 - input data mgmt.

Uty 3 - mix management.

Uty 4 - D.B sta management.

Uty 5 - time initiated processing.

Uty 6 - D.B. data display / change.

Uty 7 - Various printouts.

Uty 8 - security management.

Uty 9 - time control management.

Dem 1 - demand forecast.

Gen 1 - operation research aspects,

Accounting aspects.

Gen 2 - appendix 1 inventory item code.

Gen 3 - appendix 2 job account number table pilot time forecast in
material area.

- Policy definition and control:

Pol 1 - simulation package - expendable material.

Pol 2 - policy control.

Pol 3 - service level control.

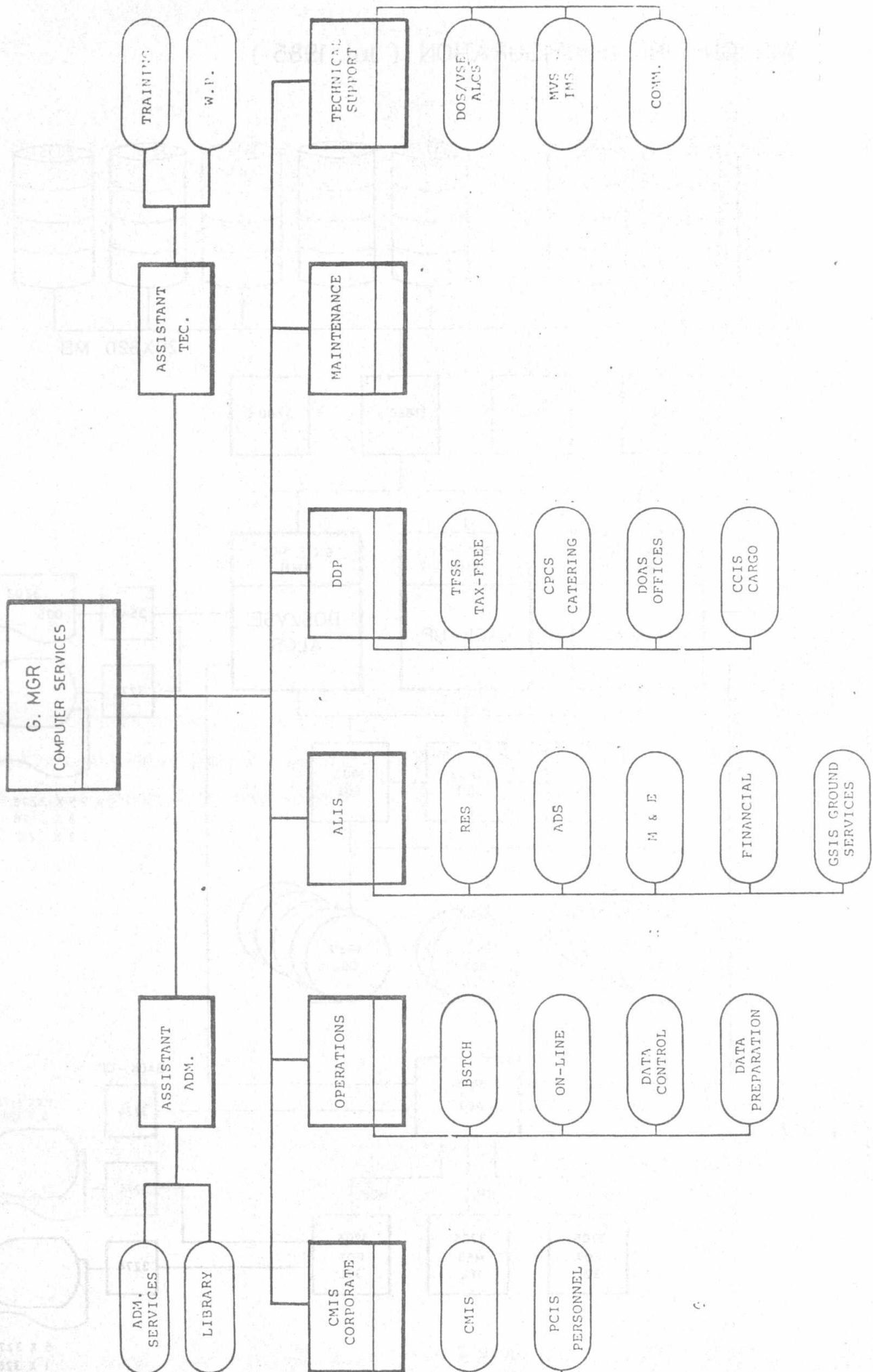


Figure 1

EGYPTAIR ON-LINE CONFIGURATION (Jul. 1985)

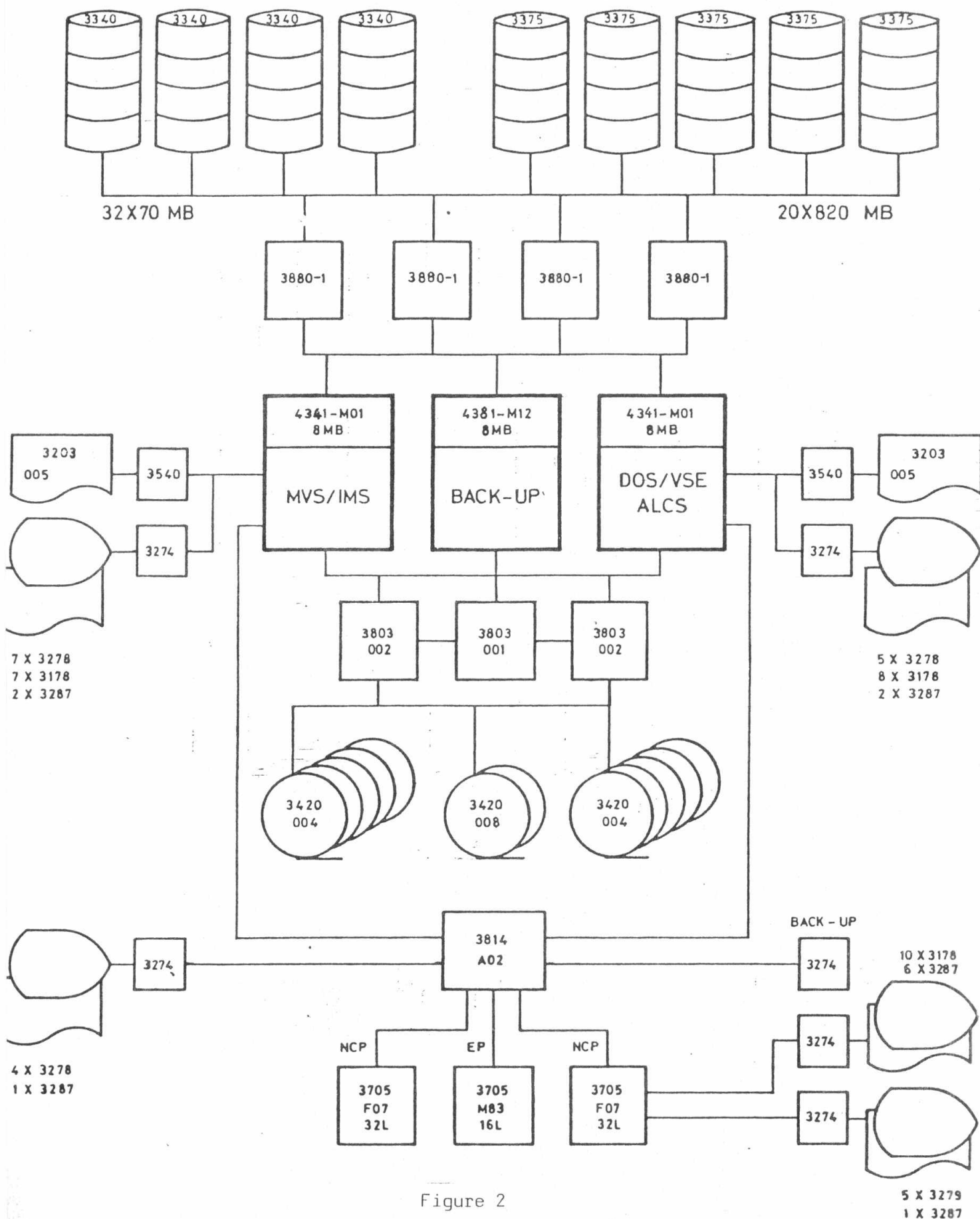


Figure 2

MAINTENANCE & ENGINEERING MECHANIZATION PLAN

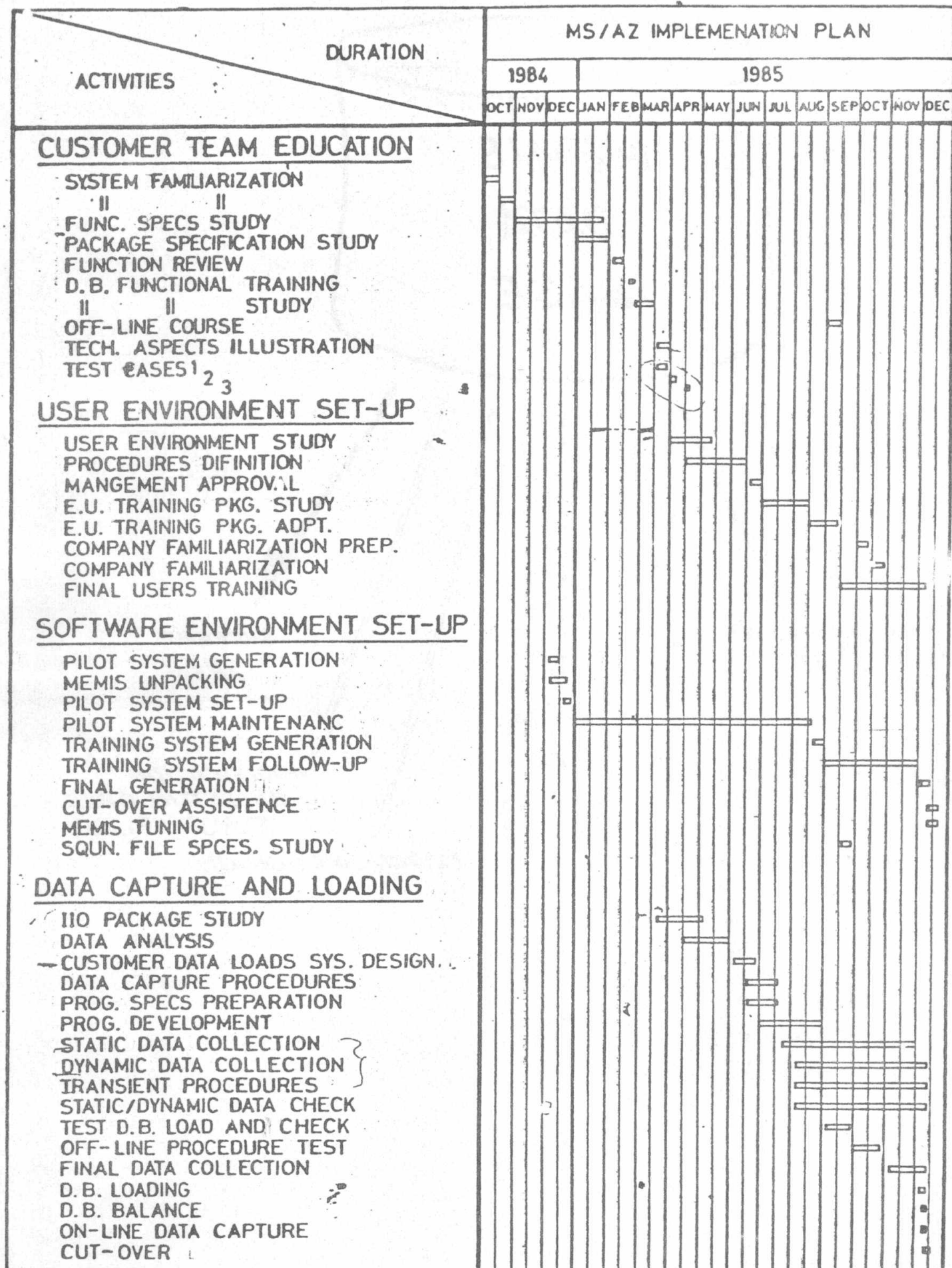


Figure 3

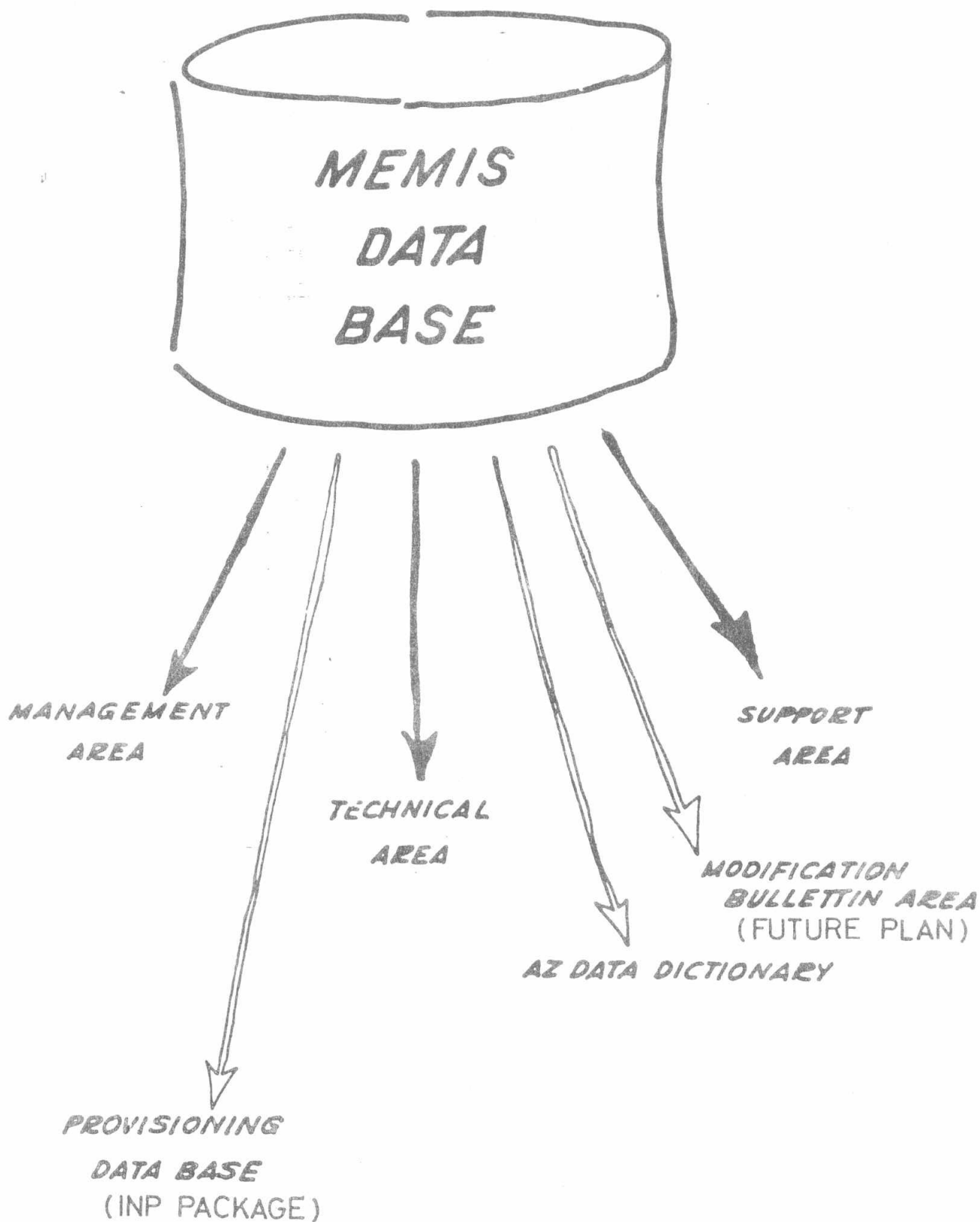


Figure 4

SNAG MANAGEMENT SYSTEM IMPLEMENTATION PLAN

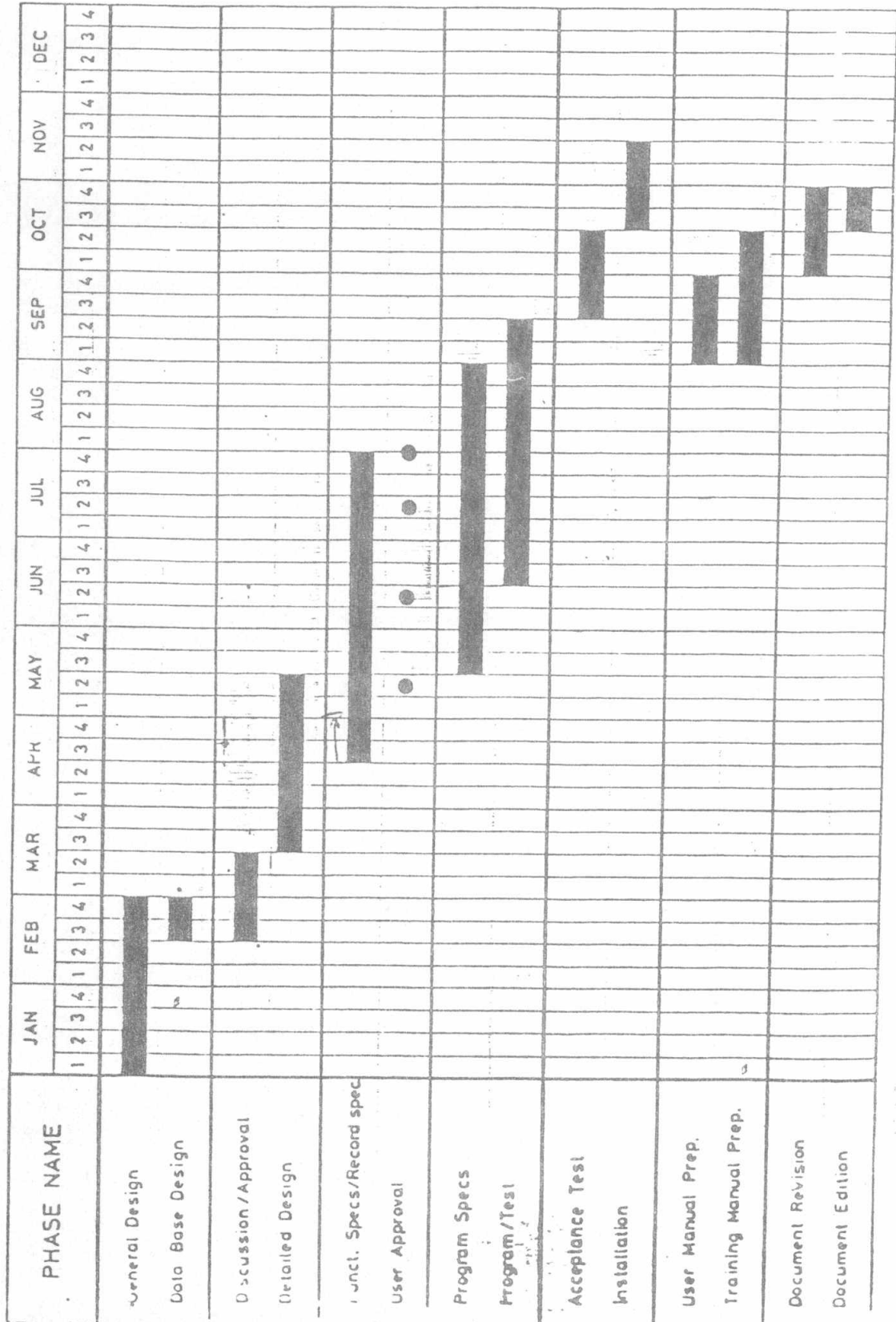


Figure 5