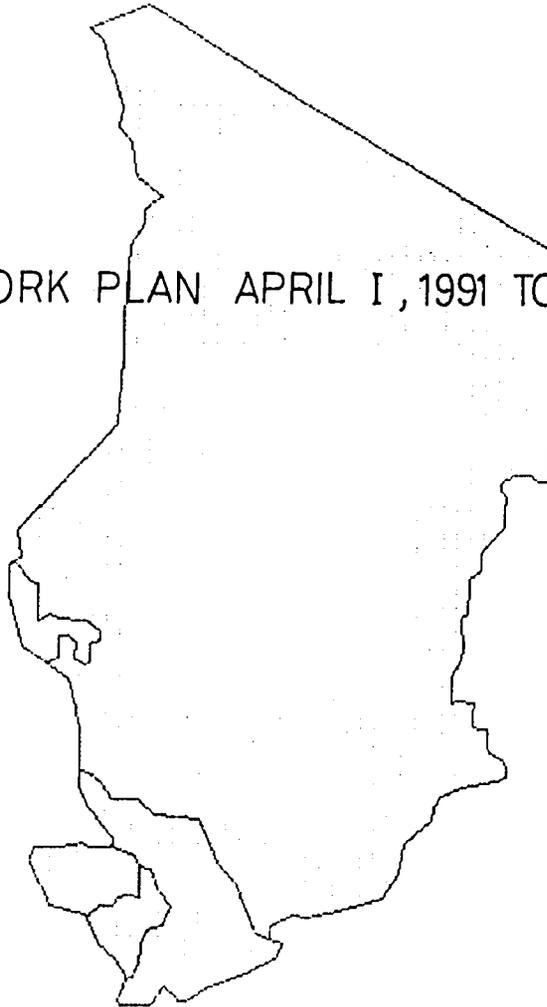


U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT  
N'DJAMENA, CHAD

**STRENGTHENING ROAD MAINTENANCE PROJECT**  
**CONTRACT N° 677-0050-C-00-0010-00**

DETAILED WORK PLAN APRIL 1, 1991 TO MARCH 31, 1992



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B.P. 413 N'DJAMENA

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CHAD STRENGTHENING ROAD MAINTENANCE PROJECT**WORK PLAN**

APRIL, 1991 TO MARCH 31, 1992

**AA. General : Project Management**

The purpose of this document is to describe in detail the principal tasks and measurable milestones outlined in the Work Plan covering the period from April 1st, 1991 to March 31, 1992.

The elaboration of this Work Plan is essentially based on assessment of the tasks that can be realistically accomplished in the remaining portion of the present contract N° 677-0050.

The overall objective of this project is to assist the Government of Chad (GOC) in developing a technically competent and financially responsible organization for the maintenance of the Chadian highway network. The N'Djamena Agency is the pilot project for the design, testing and initial implementation of a comprehensive road maintenance system.

**BB. Key objectives include:**

1. Conducting a condition survey of the N'Djamena Agency road network,
2. Reviewing and determining road service levels and planning criteria,
3. Developing appropriate performance standards and preparing annual work programs and budgets,
4. Establishing labor, equipment and material resource requirements to carry out the program,
5. Assisting in analysis of current in-house and private contract performance to identify opportunities for improvement,
6. Analyzing scheduling practices and implementing a systems approach to road maintenance management,
7. Conducting training for system users to give them confidence and a thorough understanding of the use and benefits of the system,
8. Providing guidance, information and support to select and implement the necessary computer software for the system,
9. Preparing system manuals and assisting in the updating of the system; and
10. Documenting and analyzing the effectiveness of the OFNAR/BCEOM current system.

Upon completion, the N'Djamena Agency will have implemented a comprehensive and integrated system which will enhance the abilities of staff to effectively manage their resources and operations.

## I. Road Maintenance System at N'Djamena Agency

The Agency presently has elements of a maintenance system (sub-system tasks and reports) but has nothing yet in-place which would constitute a functional maintenance management system. The LBII Work Plan through March 31, 1992 will be dedicated to this end. A number of discrete tasks, i.e. road inventory, etc. must be refined or brought current as a basis for planning and budgeting, and refinements to standards for work activities, performance and work quality properly defined.

The concept of road Level of Service must be introduced and defined as the basis for planning and budgeting. Over-refinement of the management system is not warranted at this time, considering limitation in equipment and levels of personnel skills, therefore the objective of this work plan is to put all of the maintenance systems elements in place and to integrate the sub-systems into a whole. The process will involve training, training and more training at all levels until it is clear to senior management staff that the system is valid and the only rational method for managing the resources of the Agency for effective and cost efficient maintenance.

### I.1. Road Inventory

Two teams will have to be fielded to inventory the Agencies road network in a reasonable time period and define its present condition as a prerequisite for determining (quantifying) maintenance to be performed to bring the network up to a defined Level of Service for the various classes of roads. It is not enough to say that "all roads need maintenance". The initial or up-dated inventory leads to quantification of network requirements and determination of the resources and budget required on a planned basis with established objectives and priorities, rather than on an ad hoc basis of "lets see what we can do with what we presently have available". The essence of systems management is quantifying requirements for desired Levels of Service from which following essentials depend:

- resource requirement
- budget requirement
- analysis of shortfalls
- annual program.

### I.2. Development of Activities Standards

Activities Standards will be developed for relatively simple, and separable maintenance tasks for various classes of roads and their type of surfacing. For example, the standards to which ditches and shoulders are to be maintained. As newly asphalt surfaced roads re-enter the Agency's road inventory the requirement for appropriate Activity Standards for their maintenance must also be defined.

### I.3. Performance and Quantity Standards

Performance Standards must be developed to indicate the estimated average productivity for a Standard Activity utilizing a standard work crew, be it a mechanized brigade or a labor gang cleaning

culverts. The daily anticipated accomplishment per activity and per crew with defined equipment and work methods will be estimated and reviewed periodically for refinement. These standards will describe to the work foreman:

- crew size
- equipment assignment
- materials requirement
- daily anticipated production.

#### I.4. Work Planning and Scheduling

The annual Work Plan (Program) is the sum of maintenance requirements determined from the Road Condition Survey and defined Level of Service to be sustained. Work requirements will be planned according to frequency of operations, which may be described as follows:

1. Routine Operations including drain clearance, ditch cutting, brush cutting, etc. which are likely requirements regardless of class of road or traffic density, hence, routine or "fixed cost" activities.
2. Recurrent Operations including pothole repair, road and shoulder grading, and asphalt surface maintenance. Depending on many variables these operations may reoccur several times a year to sustain a defined Level of Service for a particular section of road.
3. Periodic Operations which take place at longer intervals include recharging earth or gravel road surfaces, and the resealing of paved surfaces at intervals ranging from three, five or seven years. Periodic Road Condition Surveys "predict" the intervention interval to maintain a defined Level of Service for a road segment.
4. Extraordinary Operations are those not foreseeable but which can be anticipated and must be carried out on urgent basis to restore service, or for safety reasons. These may consume as much a 20% of an annual budget and must be allocated for in the an Annual Work Program.

#### I.5. Annual Budget

The is sum of the requirements to produce and sustain defined Levels of Service for the road network assigned to the Agency. It must be produced in time for review, modification, and approval for each fiscal year. As previously noted, approval of work plan and budget constitute the Agency's authorization to execute the work.

#### I.6. Work Accomplishment, Control and Reporting

These are the "feedbacks" required to complete systematic management of road maintenance and are quantified and summarized on a series of standards forms and reporting methods. Accomplishment, as verified by inspection (Control), is summarized for annual reporting purposes to OFNAR. Crucial to this process are thorough periodic inspection by the Maintenance Engineer to review

thorough periodic inspection by the Maintenance Engineer to review effectiveness of planning and scheduling, work quality, and the extent to which instructions have been understood and carried out. During these inspections the Level of Service being provided by current maintenance operations is determined and compared the defined Level of Service to:

- improve work methods and procedures and
- adjust work quantity planning values to sustain the defined Level of Service, or to define a new Level of Service.

Inspection by the Maintenance Engineer will also provide the basis for progress reports to OFNAR.

### I.7. Equipment Maintenance at N'Djamena

The basic reporting forms for planned equipment maintenance and condition equipment reports are in place but not yet fully effective. This work plan incorporates the necessary indoctrination to implement Equipment Inspection and Condition Survey to provide a basis for scheduled repair and overhaul as a critical element of the annual road maintenance program and budget. The need for emphasis on this aspect of Management System cannot be overstated owing to the depleted condition of more than half of the Agencies assigned fleet. Motor graders and some of the rubber tire rollers presently cannot be reliably programmed owing to uncertain past history and present mechanical condition. These units are essential to the maintenance of earth surface roads which form the largest part of the Agency network.

The detailed elements of the Equipment Maintenance Plan are described in Section 2 of this Work Plan.

#### I.7.1. Equipment Deployment Plan

A Deployment Plan for programmable equipment is derivative from equipment survey and condition reports. These reports not only schedule repairs, they also inform the maintenance Engineer which units can "Programmed", i.e., are capable of sustained service, and when to anticipate withdrawal from program for scheduled repair. The Equipment Deployment Plan allocates present or anticipated programmable equipment in the accomplishment of an annual work Plan. The consultants work plan anticipates formulation of an Equipment Deployment Plan for the Agency by mid-June. The results of this will assist in planning requirements for private sector intervention in road maintenance and may lead to the temporary contraction of the two mechanized brigades presently fielded by the Agency into one brigade while scheduled repairs are being carried out. The objective being to arrive at two fully programmable brigades by March, 1992, plus sufficient private sector road maintenance contracts to fulfill current and subsequent annual road maintenance program.

## II- Central Workshop

### II.1. Repair Shop Production Control

Shop production control procedures are being introduced into the OFNAR equipment management process. These procedures aim at using preventive and scheduled maintenance inspection to reduce the number and intensity of unscheduled repairs. Properly implemented, these procedures result in a more efficient public works operation due to:

- fewer breakdowns,
- reduced downtime,
- longer equipment service life, and,
- lower maintenance and operation costs,
- more efficient road maintenance.

Production and control procedures can be manually operated by using a standard repair order form to diagnose required repairs and to record material and labor costs. A single LBII standard form is completed by a mechanic, lessening the paperwork and leaving more time free for maintenance of the fleet. The elements of an equipment maintenance management system and techniques to be implemented with close cooperation of OFNAR/BCEOM are described below:

- Step 1. Formulate management goals and objectives for mechanical maintenance and deployment of equipment. Set basic policy to introduce scheduled repairs and preventive maintenance practices.
- Step 2. Define mechanical maintenance activities and establish work units appropriate to measure quantities of work for each activity.
- Step 3. Compile an equipment inventory and condition survey to quantify and quality for maintenance, repairs, and scraping
- Step 4. Develop work performance standards for each activity and of equipment. Define proper crew size and person hours for each activity.
- Step 5. Establish average annual quantity planning values for each type of equipment by maintenance activity
- Step 6. Define and implement procedure for work reporting and performance using standard daily maintenance and repair reporting forms
- Step 7. Participate in Developing an Equipment Deployment and Mechanical Maintenance Work Program on the basis of the equipment condition survey and road maintenance annual work plan
- Step 8. Develop a program for major repairs and scraping
- Step 9. Participate in developing a performance-based budget.

The completion of these steps will result in the introduction of a basic equipment fleet management system.

## II.2. Inspection of Equipment

An Equipment Inspection will be implemented at the Agency. This will provide a permanent inventory of equipment condition, including a record of current and past assignments for each unit in the highway fleet. A listing of all units will be maintained, recording assigned equipment control numbers, temporary transfers, new purchases; and permanent reassignments. A master listing of all equipment currently in the inventory, with their assignment as well as general mechanical condition, will be updated periodically on standard forms, i.e. Equipment Inspection Form and Equipment Control Record already introduced by LBII/BCEOM. Methodology is anticipatory in that progressive deterioration is monitored for repair scheduling and work load forecasts.

## III. Finance And Procurement

### III.1. Finance

#### 1. Implementation of Accounting System at the N'Djamena Agency

In reviewing the N'djamena Agency existing accounting records, we found the following documents in use:

- cash disbursement journal
- register for OFNAR payments
- order forms.

Although these records provide some basic accounting data, we are in the process initiating new records and procedures, based on the "OCAM" system of accounting records/documents which is currently being used by OFNAR. Current OFNAR account numbers and OCAM procedures will remain the same. This manual system will include the following:

#### a. Accounting System

##### a.1. Accounting Records

- Cash disbursement journal
- Check register
- Payable register
- Allowance register
- Asset register

##### a.2. Accounting Procedures

- Internal control
- Petty Cash
- Depreciation
- Inventory

#### b. Budget

##### b.1. General

##### b.2. Budget performance

c. Reports

Once the manual system is functioning effectively and OFNAR is ready to implement the SARRI (Software General Accounting) Program, plans will be made to implement the automated system at the N'Djamena Agency. It is anticipated that the implementation of the "SARRI" Program will begin in approximately 12 months.

2. Monitor Project Inventory Records at N'Djamena Agency

The parts inventory system will provide a permanent record of issues and procurement of all spare parts stocked. The reports produced by this system should include a periodic listing of parts and inventory on-hand and unit prices. Determining and maintaining an economic inventory level for spare parts and ensuring their replenishment are integral parts of the inventory system. In order to maintain and update the inventory, the issues and incoming stock will be systematically recorded.

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3. Supervise Maintenance of the OFNAR Project Related Accounts

Procedures will be implemented to insure that OFNAR receives and records in a timely manner copies of all Project transactions including disbursements made directly by USAID. Currently, some of the direct USAID payments are not being properly recorded and therefore increase supervision will be necessary to insure proper recording of these transactions.

4. Prepare Project Disbursements

A revised procedure is being evaluated to insure a more rapid and efficient disbursement procedure for the Project funds. With the recent disbanding of the Control d'Etat, the elapsed time required for approving disbursements as well as receiving and paying for purchases has been greatly reduced. A key factor in the procedure is to insure that the disbursements, including documentation is being tracked and recorded/maintained by OFNAR.

5. Prepare Project Financial Reports

The following reports are being prepared and submitted to USAID

- Blanket order purchases
- Financial report on OFNAR USAID Project fund disbursements
- Status of Recurrent Costs

An attempt will be made to update the OFNAR/USAID Project Fund disbursements for those made by Gannett Fleming between April and July 1990 but not submitted to USAID. Future reports will include N'Djamena Agency Financial Reports to OFNAR.

III.2. Procurement

1. Monitor Procurement of Parts, Tools etc. for Project

Procurement of parts, tools, equipment, etc. are being closely monitored and made using the following methods of payment:

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- Blanket Orders
- Direct USAID Payments
- OFNAR/USAID Project Funds.

An additional method of payment through the Technical Assistance Contract, will be initiated in the next thirty to sixty days.

## 2. Advise OFNAR on Procurement Procedures

Revised procurement procedures are being implemented. The recent disbanding of the Control d'Etat has significantly simplified the procurement process. This Government of Chad entity was directly involved in approving at various stages of the procurement process all purchases. A major effort will be placed on improving the tracking and control of the documents throughout the procurement process.

## 3. Implement New Procedures for Handling Project Procurement Funds through the Technical Assistance Contract

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The Amendment to the Technical Assistance Contract approving additional funding for Project Procurement has not been formally approved as of May 23, 1991. Once approved, procedures will be implemented to insure rapid, efficient purchase of parts, tools, equipment etc. within USAID regulations. This procurement procedure will replace the Blanket Orders.

## IV - Promotion of Local Private Sector Maintenance

Promotion of private sector interest and capability is a specific objective of the Strengthening Road Maintenance Project. Reasons for this acknowledge that the deteriorated state of the Chad road network exceeds the remedial resources of the Ministry of the Public Works and Transports, the OFNAR, and specifically the N'Djamena Agency in any reasonable time frame. Within the N'Djamena Agency alone there are some 3,800 kms roads and tracks (400 kms of which presently designated primary roads) for which there is equipment capability to field only two mechanized maintenance brigades. Brigade efficiency is constrained owing to necessity to mix relatively new heavy equipment with seriously overaged and worn out units in order to field each brigade with the minimum balance of dozers, loaders, dump trucks, graders, rollers, fuel and water trucks. Supplemental rental of private sector watering equipment is already necessary and the Agency is critically short of motor graders, rollers and transport equipment capable of sustained usage.

### IV.1. Private Sector Specialist

The consultant is scheduling the arrival of the Private Sector Specialist during the month of September for the a three month study. The study will include :

- analysis of the existing situation and regularity of the road maintenance market,

- analysis of administrative and financial procedures, regulations, and modalities,
- strategy and promotional action program.

#### IV.2. Immediate Private Sector Objectives

In view of the present maintenance equipment constraints, the consultant will concentrate on the following near-term objectives:

1. execute at least one private sector road maintenance contract.
2. investigate possibilities for supplemental equipment rental of :
  - motor graders
  - potable water trailers
  - equipment transporters
  - others as required.

#### V. Institutional Development/Milestone

##### V.1. Development progress

The consultant has stressed the necessity to test not only the road Maintenance Management System as a part of the organizational development process but points out the fact that the Equipment Maintenance Management System should also be tested from an operational management stand point in order determine optimum equipment fleet. The description of the components of a simple performance budgetary road maintenance management system is shown in the general work plan.

Each step of the implementation phase has been designed to provide rapid and useful results at each test site. This means reporting real data and analyzing the feedback as shown in the road inventory condition survey step of the system. The impact of this operation has enhanced the perception of the quality of the road network, thus distinguishing from routine, and periodic road maintenance as well as construction. As soon as the results are obtained from the test site the Agency's Engineers will be called in to review the inventory and budgetary process recommended by IBII/BCEOM, in order to identify problem areas and make modifications in view of a total system implementation.

##### V.2. Management Training

A large measure of the success or failure of road maintenance management projects can be attributed to the actions of field operations personnel and their understanding of the new concepts involved in performance budgeting. OFNAR Engineers will be involved in the development of the initial procedural manual and the establishment of work standards. This will be accomplished through organized management workshops to be held periodically, such as :

Management Workshop;

- . Road Maintenance Management;
- . Equipment Maintenance Management.

The importance of adequate management training becomes the bottom-line of the road maintenance and equipment fleet management concept. Experience has shown that failure to implement totally modern management concepts can be attributed to inadequate training and to weak management support. Introduction of these concepts will be accomplished through :

- 1) Extensive participation of key personnel during the early period of development of the systems.
- 2) Development of practical and understandable management guide manuals that define the components elements of road maintenance namely :
  - . Road Maintenance Management Manual
  - . Equipment maintenance management manual
  - . Organization guide manual.

The consultant considers the organization development milestones mentioned essential to implementation and continuation of an adequate road maintenance system. However, in view of the time remain in the contract, it's beyond the scope of the present work plan.

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#### VI. Development of a Management Information System

The objectives of the LBII technical assistance Management Information Specialist are to be concentrated in the initial phase of computerization study on:

- Assessing the present state of the existing system
- Prospecting the local availability of suitable computer software packages
- Recommending an appropriate course of action for the computerization of existing OFNAR systems.

The implementation of the LBII/BCEOM management systems is considered to be a straight forward task but requires the assistance of a specialist if approached in stages, i.e. using N'Djamena Agency as a pilot test site. It is important to note that this system development process has nothing to do with computerization per se, but is a question of well-defined functional organization and sound management practices, i.e. concerns the training of people and their interactions. The computer can neither create this necessary framework nor operate the system. What the computer can do is simplify the routine operational tasks and in general help realize the full benefits of an already operational management system. A computer is only a tool, albeit a very powerful one. Conversely, a computer is of no use whatsoever if a functional well-defined system does not exist. The confusion between means and end as regards to the role of computer has been a major factor in many unsuccessful attempts at introducing management systems.

It is useful to list the various stages that go into the system development process:

	( 1. Feasibility	- research into the possibility of developing a solution to a problem
	(	
	( 2. Object	- definition of objectives of news OFNAR system
	(	
Functional	( 3. Information	- analysis of information requirements of the system
	(	
analysis	( 4. Processing	- study of the flow and processing of data
	(	
	( 5. System study	- provides sources information to enable choice between alternative system solutions
	(	
	( 6. detailed system study	- provide source information to enable detailed system component design.
design	(	
separately	( 7. system component design	- detailed design of routines and procedures.
for	(	
each sub-sys-	( 8. system implementation	- installation of new system and start of production.
tem of	(	
module	( 9. post-implementation study	- monitors effects of newly implemented system and prepares modifications.
	(	

The introduction of microcomputers into the N'Djamena Agency would have a significant impact on the modernization of Agency operations, particularly the management of decentralized activities. Payroll, personnel, accounting, and other administrative activities are made more efficient through microcomputers in each phase of the road development process - in policy and systems planning, programming, location, design, tendering, construction and maintenance.

## VII. Training and Personnel Management

### VII.1 - Training

Following the basic model used for road maintenance, a planning, programming, and reporting system will be introduced by a personnel Management Specialist for the Management Training. Again, this system is divided into five phases, or work modules, which are interconnected, task flow and system feedback. Included are:

- Skill Assessment.
- Training Assessment
- Program Development.
- Training Scheduling
- Training Monitoring.

These phases are relatively self-explanatory following the discussion in the preceding section for road maintenance planning. Briefly, the training planner matches an analysis of required skills to quality standards, and then the work method and other requirements are determined on the basis of established training standards.

The process continues with the development of the training plan, scheduling and finally, monitoring and evaluating the actual instruction. Unit costs for training are obtained in a matter similar to that used for road maintenance, but the process is somewhat simplified in the case of class-room training. On-the-job training is more complicated to cost; it must take into account a discount for productivity of the trainees. Alternate methods and

approaches to training, including the feasibility of introducing certain new methods or proposals, can also be determined on the basis of cost and effectiveness, but there is always potential for subjectivity in the evaluation of training.

#### VII.2. Personnel Management

The activities that comprise the personnel management system of the OFNAR can be divided for the purpose of examination and analysis into the following components:

1. Determination of manpower needs,
2. Recruitment and selection from among available candidates for appointment,
3. Placement of appointees and employees in specific jobs (including initial assignment, promotion, and transfer),
4. Provision of a salary and other benefits in exchange for the employee's services,
5. Instruction and on-the-job experiences that complement prior education and enable employee to perform assigned tasks more effectively; or prepare them to carry out more difficult and complex duties; and,
6. Definition and enforcement of employee duties and obligations.

Complementary to these six fundamental functions are two other matters of concern. The first is the assignment of responsibility for the above activities within the operational unit and among the ministerial or agency personnel units and the central personnel offices and finance authorities. The second is the fact that each of the six activities involves the creation and maintenance of an efficient personnel information system. Files and reports are needed so that personnel decisions can be based upon information regarding the employee's characteristics and employment history.

The training expert to carry out the above activities is programmed to intervene for three months starting 1 September 1991. A improvement in general personnel policies will be formulated with the appropriate changes in administrative regulations.

#### VIII. Work Reporting

The "Work Reporting", is primary to the entire feedback mechanism and provides the basis of a management information system. It

requires the preparation on the basis of a standardized system quantification of:

- the type of work performed
- how much work was performed
- identification of the personnel involved in the work
- the amount of time provided by each person per type of work
- the type and amount of equipment used
- the type and amount of material used
- the unit total cost of resources used.

Usually there is also a monthly summary prepared which includes:

- the total daily accomplishment of all crews
- daily resources costs
- daily units costs
- daily sums expended by road
- monthly summaries of the above.

Information extracted from these summaries provides a basis for assisting the adjustment of quality and production standards when they have been unrealistic or inaccurate.

**CHAD STRENGTHENING ROAD MAINTENANCE PROJECT  
GENERAL WORK PLAN**

TECHNICAL ASSISTANCE PROGRAM	1992											
	A	M	J	J	A	S	O	N	D	J	F	M
<b>I-Road Maintenance System at N'Djamena Agency</b>												
1. Road Inventory <i>— this is July — is it done by whom?</i>												
2. Development of work activities standards												
3. Performance Standards, quantity standards												
4. Work planning/scheduling												
5. Budget												
6. Work accomplishment, control and reporting												
7. Equipment maintenance at N'Djamena												
- Equipment inspection												
- Deployment plan												
<b>II-Central Workshop production control system</b>												
1. Equipment inspection												
2. Job order system (BCEOI)												
3. Computer application												
<b>III-Financial and Procurement</b>												
<b>Finance</b>												
1. Implementation of accounting system including a budget at N'Djamena Agency												
2. Monitor project inventory records at N'Djamena Agency, Central warehouse												
3. Supervise maintenance of the OFIAR Project related accounts												
4. Prepare project disbursements												
5. Prepare project financial reports												
<b>Procurement</b>												
1. Monitor procurement of parts, tools etc for project												
2. Advise OFIAR on procurement procedures												
3. Implement new procedures for handling project procurement funds through the technical assistance contract												
<b>IV-Promotion of Local Private Construction Sector</b>												
1. Analysis of existing situation												
2. Analysis of administration and Financial procedures												
3. Strategy and promotional action program												
<b>V- Institutional Development/Milestone *</b>												
1. Management workshop												
- Road Maintenance management												
- Equipment maintenance management												
2. Road Maintenance management manual												
3. Equipment maintenance management manual												
4. Organization Guide Manual												
<b>VI-Development of a Management Information System</b>												
1. Preparation of a master plan												
2. Selection and implementation of systems and software												
3. Preparation of systems manuals												
<b>VII Training and personnel Management</b>												
1. Manpower assessment												
2. Training needs/programs												
<b>VIII-Reporting</b>												
Progress reports												

05/25/91

- Legend :
- Implementation
  - Monitoring
  - ♦ Scheduled for next phase of project
  - ▴ General system
  - ◇ Quarterly report
  - △ Milestones: Annual Work Plan of Road and Equipment Maintenance

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