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REPORT

to

THE ENTENTE FUND

on a

REGIONAL SPARE PARTS STUDY

Contract No. AID/CM/afr-C-73-2

October, 1973



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A. FINDINGS

1. a) Type and Amount of Equipment in Use in the Entente States

The Ivory Coast has 2,431 units of road building and highway maintenance equipment in service of principal makes which have dealer support, compared with 637 in the other Entente States. About half of the total are track-type bulldozers or crawler loaders.

<u>Type of Units in Service</u>	<u>Ivory Coast</u>	<u>Togo</u>	<u>Dahomey</u>	<u>Niger</u>	<u>Upper Volta</u>	<u>Total Entente</u>
(1) Motorgraders	397	47	34	44	55	577
(2) Bulldozers	1,227	55	34	42	40	1,398
(4) Mech. Shovels, Diesel:						
Backhoes	78	10	3	1	3	95
(5) Air Compressors, tire	59	15	7	3	9	93
(6) Wheel Tractors*	288	31	20	45	26	410
(7) Motorized Compactors	93	32	6	13	20	164
(8) Rollers	137	23	-	10	1	171
(9) Front End Loaders:						
Payloaders on Tires	215	23	13	20	22	293
Crawler Loaders	101	6	-	6	6	119
Forest Loaders	137	-	-	-	-	137
Pay Loggers	87	-	-	-	-	87
(10) Motorscrapers	78	16	-	13	10	117
Other	-	11	-	-	-	11
Total of Above	2,897	269	117	197	192	3,672

(* There are some 1,000 to 2,000 wheel tractors used for agricultural work; these have not been studied.

Some equipment was encountered in the Entente States for each of the ten equipment classifications set forth in the Studies requirements; For two of the equipment classifications - (3) mechanical shovels, track type, electric and (5) air compressors, stationary and mobile - only specialized and isolated applications were discovered and these have not been included in the above listing. The subject electric shovels were found only in Togo in the C.T.M.B. phosphate mine which had several units, mostly manufactured by Krupp of Germany. These units were supported by a complete machine shop and a staff of trained mechanics with overhauls carefully scheduled under a preventive maintenance program and parts imported from Germany. The subject air compressors were used rather little by Public Works Departments and by a very few contractors (i.e., Dragages and Viannini) who operated rock quarries for road construction. The principal dealers, all in the Ivory Coast, are CARIC, Comptoir de Mineo and C.F.A.O. (which has a tax-free entrepot for boxed units and ships to Niger and Upper Volta).

1. b) Present Level of Dealer Service for this Equipment

Dealer service for this equipment is stronger in the Ivory Coast than in the other states. In the Ivory Coast there are several different makes of this equipment represented by dealers who carry substantial stocks of spare parts, and they also operate repair shops for the overhaul and repair of this equipment, as well as field repair services by mobile repair trucks and field parts depots. In other Entente States, there is usually one major dealer with spare parts stocks, and rather less in the way of repair facilities.

1. c) Improvements Planned in the Level of Such Services

The Caterpillar dealers in Togo, Niger and Upper Volta are planning to enlarge their spare parts stocks, and are adding mechanics to strengthen their repair facilities, but in these countries major users such as Departments of Public Works and private contractors often operate their own repair shops and also may have substantial stocks of spare parts, either centrally located or at the major construction sites. Several of the major dealers in the Ivory Coast plan to enhance their stocks of spare parts, but such plans are keyed in some cases to contemplated moving of spare parts warehouses from crowded and cramped locations to new premises in the industrial zones when permitted. In the Ivory Coast, the major public enterprises concerned with agricultural development (such as MOTORAGRI, the Authority for the Development of the Bandama Valley, and SODEPALM and PALMIVOIRE) maintain field and/or central repair shops.

The level of this effort is not expected to increase in the near future.

2. Type and Amount of Equipment in use by Major End-Users

<u>Type of End User</u>	<u>Ivory Coast</u>	<u>Togo</u>	<u>Dahomey</u>	<u>Niger</u>	<u>Upper Volta</u>	<u>Total Entente</u>
Dept. of Public Works	515	86	65	102	102	870
Public Enterprises	458	N.S.	15	-	12	485
CERFER		35				35
Private (Road Bldg,) Contractors	400	109	26	77	59	671
Military (etc.)	60	16	11	-	14	101
Mining	17	17	-	12	-	46
Logging	500	N.S.	-	-	-	500
Total of Above	1,950	263	117	191	187	2,708

Note: The above includes some farm-type tractors used by Public Works and by public enterprises in agricultural development.

In the various Entente States, the Department of Public Works is generally the largest single user of the type of equipment under study,

2, Type and Amount of Equipment in Use by Major End-Users (Cont'd)

representing the following percentages of the total users surveyed: Ivory Coast - 26.5%; Togo - 32.6%; Dahomey - 55%; Niger - 53.6%; and Upper Volta - 55%. This percentage for the Ivory Coast is unique because of the scale of its logging industry.

As to make of equipment, six major brands (Caterpillar, Allis Chalmers, International Harvester, Richier, Massey Ferguson and Hanomag) account for two-thirds of the total number of units in service in the Entente States, as determined by interviews with users.

The foremost brand names of equipment in the Entente States are as follows:

	<u>Ivory Coast</u>	<u>Togo</u>	<u>Dahomey</u>	<u>Niger</u>	<u>Upper Volta</u>	<u>Entente States</u>
Caterpillar	662	117	36	95	68	978
Allis Chalmers	244	6	7	-	-	257
International	136	3	4	35	1	179
Richier	139	11	4	34	48	236
Massey Ferguson	65	23	14	-	7	102
Hanomag	59	2	-	-	-	61
Albaret	47	24	3	2	7	83
Poclain	10	5	2	1	-	18
Continental	17	2	7	1	10	37
Frisch	-	5	12	-	-	17
Michigan	<u>2</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>13</u>	<u>24</u>
Sub-total	<u>1,381</u>	<u>202</u>	<u>92</u>	<u>170</u>	<u>147</u>	<u>1,992</u>
All other	<u>569</u>	<u>61</u>	<u>25</u>	<u>21</u>	<u>40</u>	<u>716</u>
Total	1,950	263	117	191	187	2,708

3. a) Type and Amount of Spare parts on Hand at Original Equipment Dealers

There are virtually 1,500 million C.F.A. of spare parts in the warehouse stocks of original equipment dealers in the Ivory Coast, compared with 100 million in the other Entente States. Spare parts for Caterpillar

3. a) Type and Amount of Spare parts on Hand at Original Equipment Dealers (Contd)

brand units represent only 45% of the total supply in the Ivory Coast, but they are the only readily available supply elsewhere, where the needs of other dealers are met by airplane delivery. About half of the total parts supply in the Ivory Coast is in the fast-moving and routine replacement category; this component is 58% elsewhere in the Entente.

<u>Name of Importer</u> <u>(Principal Product Line)</u>	<u>Spare Parts Inventories - Millions of C.F.A.</u>				
	<u>Fast Moving</u>	<u>Routine Replace.</u>	<u>Slow Moving</u>	<u>Obsolete & Unuseable</u>	<u>Total</u>
<u>IVORY COAST</u>					
MANUTENTION AFRICAINE (Caterpillar)	180	214	133	139	666
TECHMAT DIV. of C.F.A.O. (International Harvester)	50	55	85	60	250
C.A.E.I. (Allis Chalmers)	52	70	155	70	347
HAMELLE AFRIQUE (Massey Ferguson)	8	10	8	7	33
S.A.R.I.A.C.I. (Richier)	17	5	2	1	25
C.I.C.A. Industrial Division (Hancmag)	14	21	18	19	72
C.A.R.I.C. (Atlas-Copco Compressors)	21	26	21	17	85
Total - Ivory Coast	342	401	422	313	1,478
<u>OTHER ENTENTE STATES</u>					
GASTON NEGRE - Lome	9	11	7	8	35
HAMELLE AFRIQUE - Lome	3	1	1	1	4
GASTON NEGER - Cotonou			- None -		
MANUTENTION AFRICAINE-Ouagadougou	6	10	6	2	24
MANUTENTION AFRICAINE - Niamey	7	11	17	-	35
S.A.R.I.A.C.I. - Ouagadougou	1	1	-	-	2
Total - Other Entente States	24	34	31	11	100
Total - Entente States	366	435	453	324	1,578

In the Ivory Coast, three dealers account for the major part of spare parts stocks - Caterpillar (Manutention Africaine), with about 670 million C.F.A. in spare parts stocks (mostly Caterpillar parts, but also John Deere, Albaret, and Tree Farmer) with principal stocks in the Abidjan area, and field warehouse stocks at San Pedro, Daloa, and at the diamond mine. The other large dealer stocks are with C.A.E.I. (primarily Allis Chalmers, but also Latil and Poclain), and C.F.A.O. (International Harvester, mostly). Smaller stocks - well under 100 million C.F.A. each, are kept by

3. a) Type and Amount of Spare parts on Hand at Original Equipment Dealers (Contd)

S.A.R.I.A.C.I. (mostly for Richier), Hamelle Afrique (Massey Ferguson), C.I.C.A. (Hancmag), and C.A.R.I.C. for Atlas-Copco compressors. These dealers can supply around 80% of customer requests directly from stock, in the case of the larger dealers, and upwards of 60% in the other cases. Other requests of customers can be supplied from European depots, by air, in five to ten days, but, of course, larger parts which must come by boat may take two to four months in delivery to Abidjan. In general, 29% of all parts receipts by Ivory Coast dealers come by air, and 71% by boat, but the proportion differs from dealer to dealer.

In other Entente States, rather more, around 80%, comes in by air, because the only dealer carrying much of a parts stock in these states is the local Caterpillar dealer, (which has a tax-free entrepot in Lome, Niamey and Ouagadougou, respectively). The available stocks are mostly of fast-moving and routine replacement items. Other parts are brought in by air, on special order, except for very heavy parts, which must come by boat to Lome or Cotonou, and then overland by train and/or truck to points such as Niamey or Ouagadougou. Total delivered costs, except for very heavy items, is said to be roughly equivalent by air, or by boat and overland.

3. b) Type and Amount of Spare Parts on Hand at End-Users

In the Ivory Coast, with substantial stocks at the principal dealers, users in the Abidjan area can confine their parts stocks to fast-moving and routine replacement items, if they so choose. In recent years most contractors, public enterprises, and the Public Works Department have adopted this policy, but with exceptions. These are those public enterprises which obtain fund grants or loans from foreign sources, such as Exim-Bank, USAID and European development funds and can buy equipment and the related parts with exemption from customs duties and taxes. Under these conditions, the initial purchase of equipment may be accompanied by an initial parts stock, but usually only the amount and kind expected to be used in the first eighteen months of use of the equipment, and hence running about 5% to 8% of the total equipment investment. This situation applies to SODEPALM-PALMIVOIRE, and to the new SODESUCRE plant at Ferkessodougou. But other public enterprises, such as MOTORAGRI, tend to restrict their parts stocks to fast-moving and routine replacement items, and rely on the dealers for larger and more costly items needed for overhaul and rebuild. Likewise, road building contractors in the Abidjan area tend to restrict their stocks to easily available parts of immediate need for routine servicing of their equipment, but may be forced to buy in European markets, through buying agents in those cities, their requirements of less readily available items, such as road black-topping and surfacing equipment, or poorly serviced equipment lines. Some of these road contractors are part of major European-based concerns, with central buying and management offices located in Paris or elsewhere, and tend to buy on a centralized basis from European dealers, but often call on the local dealer in the Entente States for emergency and unforeseen needs.

3. b) Type and amount of Spare Parts on hand at End-Users (Cont'd)

In all the Entente States, a road contractor with a long-term road contract, which may extend for two or three years, tends to set up field parts stock and repair shops.

In other Entente countries, there are two major classes of customers - Public Works Department and Contractors.

The Public Works departments, commonly purchase spare parts against annual budgets, with funds provided either by the Treasury of the country concerned, or the foreign source where financial assistance is being provided by a lending agency. In the latter case, the purchasing method and timing depends on the loan contract, and the needs as developed by the technical advisors where repair shops are being revamped or re-equipped, and particularly where rebuild and overhaul programs are being planned. In these cases, over-age, unsatisfactory and orphaned equipment is being phased out, and being readied for sale by auction where feasible. Delays in the availability of funds tend to slow the purchasing and procurement procedure. In most cases, the Public Works Department has surplus equipment, and is not rushed in the overhaul process, but nevertheless may encounter delays in getting parts from the suppliers where the particular model is older and the needed part is harder to locate. Such Public Works Departments try to plan well ahead for parts needs, so as to be able to get delivery by boat where possible, and avoid air costs.

Contractors in other Entente states may have substantial parts stocks, in some cases, but also tend to keep older equipment units on hand to be "cannibalized" for parts. Otherwise, the field office radios the central office in the country concerned, to obtain the needed part from the local dealer if it is in stock, otherwise the request is telexed to the European headquarters office for procurement there.

Both in the Ivory Coast, and in other Entente countries, a major contractor who gets a big new highway construction and/or improvement contract, first surveys his available equipment, to determine what is useful for the job, and what new equipment should be bought, or brought in from other countries nearby, and for this equipment supplements his spare parts stock as he finds it will be needed.

3. c) Parts Immobilization at Dealers, and the Costs Thereof

The analysis of spare parts inventories at various dealers in the Ivory Coast and in other Entente States indicates an average of 20% or more of such inventories can be classified as obsolete or unuseable. The total in this category in the Ivory Coast is 313 million C.F.A., and in the other Entente States is 11 million C.F.A., or a total of 324 million C.F.A. The breakdown of spare parts inventories in the hands of importer/dealers is as follows:

3. c) Parts Immobilization at Dealers, and the Costs Thereof (Cont'd)

SPARE PARTS INVENTORIES - Millions of C.F.A.

	<u>Fast Moving</u>	<u>Routine Replace.</u>	<u>Slow Moving</u>	<u>Obsolete & Unuseable</u>	<u>Total Inventories</u>
Ivory Coast Dealers (percent of total)	342 (23.1%)	401 (27.1%)	422 (28.6%)	313 (21.2%)	1,478
Other Entente States	24	34	31	11	100

3. d) Parts Immobilization at End Users, and the Cost Thereof

A similar situation is found with many large users, such as Departments of Public Works. Based on field observations the breakdowns are as follows:

SPARE PARTS INVENTORIES - Millions of C.F.A.

<u>Public Works Depts.</u>	<u>Fast Moving</u>	<u>Routine Replace.</u>	<u>Slow Moving</u>	<u>Obsolete & Unuseable</u>	<u>Total Inventories</u>
Ivory Coast	3.6	2.5	5.0	38.7	50.0
Dahomey	22.2	55.5	33.3	None	111.0
Togo	20.0	30.0	30.0	20.0	100.0
Niger	8.4	25.2	42.0	8.4	84.0
Upper Volta	8.0	13.2	17.2	1.6	40.0
TOTAL OF ABOVE	62.4	126.4	127.5	68.7	385.0
Percent of Total	(16.2%)	(32.9%)	(33.1%)	(17.8%)	

This amount of obsolete and unuseable parts is generally an added financial burden to spare parts dealers in the Entente States, for while sound accounting practice would dictate writing down the value of such inventory, progressively over the years, and charging such write-down to profit and loss, there is presently no financial relief for so doing, as in other countries, where deductions from income tax are permitted for such write-downs, when made under consistent and acceptable accounting policy. The single exception appears to be in Niger, where a tax credit is permissible for the costs of parts physically destroyed (e.g., by welding torch) in the presence of tax officials. On the other hand, in this same country a large user, such as the contractor Dragees, from time to time gets rid of over-age and obsolete parts by throwing them in the Niger river; this is also done in the Ivory Coast. We are recommending tax relief for such losses, which otherwise are indirectly borne by parts consumers, in the end.

4. Analysis of Spare Parts Management Practices of Dealers and End Users

a) Methods of Stock Management

In most public works departments, public enterprises, private contractors, and dealer operations, the prevailing stock control method is by unit control, kept on Kardex records by manual entry, and usually with maximum-minimum limits and order points and with a reasonably good level of unit control. This, of course, should be verified by annual physical inventory, preferably priced out to cost value. In some public works operations, a physical inventory and correction of stock records has not been made for more than a year, which is an unhealthy situation, and may indicate lack of close control and possibility of inventory imbalance. In these cases, the underlying cause seems to be lack of sufficient qualified help, with wage levels lower than the prevailing market a contributing factor.

In the Ivory Coast, electronic data processing (E.D.P.) is available, and is being used by the Public Works Department, and by at least three principal dealers. Only with some dealers are the parts inventory records being kept in units and cost value, with periodic reports on inventory position, and analysis of over-age and obsolete stocks. But we found no system which classified inventory as to type of material (rubber, steel, copper) or by model of equipment to which it applied, and there was also lacking any comparison of activity (receipts or disbursements) versus stock position, to determine inventory turnover by type of item. MOTORAGRI did have a monthly position report which developed total values of groups such as tires and major class of materials, but this was the only thing of the sort. In short, much further study and development is required to enable the application of exception-type reporting and control to parts inventories, and to pre-determine and measure performance against planned inventory positions.

4. b) Sales Contracts between Importers and End-Users

We did not find any existing, except that high volume users seemed to be able to secure discounts related to their annual purchases. On the other hand, we were informed by some lesser dealers that the Public Works Department of the Ivory Coast, in requesting bids on periodic new equipment purchases, required a guaranty by the bidder that a satisfactory stock of spare parts would be kept by the supplier, in the event that he secured the bid award; this was reported to be 15% of the value of the equipment.

4. c) Methods of Original Parts Purchase, and Provisions for Current and Replacement Stocks of Spare Parts

As previously noted, the situation on this point is one thing in the Ivory Coast, and quite different in the other Entente States. In the Ivory Coast, competitive pressures usually force the principal dealers to maintain adequate stocks of fast-moving and routine replacement parts, and

4. c) Methods of Original Parts Purchase, and Provisions for Current and Replacement Stocks of Spare Parts (Cont'd)

some of the slower-moving items used for rebuild and overhaul operations, as well as rebuilt engines and transmissions, etc. Likewise, most dealers have facilities for rebushing and rebuild of caterpillar track for bulldozers and other units, and have field service trucks for periodic service and emergency calls for units operating in the areas where logging operations, new highway construction, and land clearing operations are being conducted. In addition, major public enterprises and contractors have set up their own field service depots and repair shops in key outlying locations, which can be replenished periodically, either from field service warehouses of the dealer, or by radio call to Abidjan with delivery either by service truck of the enterprise or major logging contractor, or by field service truck of a major dealer for his products. Such trucks can also check equipment with instruments, and make repairs.

4. d) Percentage of Parts Transported by Air, and the Corresponding Price Increase, and Time Savings

Dealers reported the following proportion of value of spare parts of air freight and boat receipts:

	<u>Percentage of Parts Received</u>	
	<u>by Air Transport</u>	<u>by Boat</u>
Ivory Coast	29%	71%
Togo (mostly Caterpillar)	claim the same; but only 15% of customer orders filled directly from stock and the rest telexed to Brussels, and then by air, except for very heavy parts.	
Niger & Upper Volta	80-90%	20-10%
	(Advantage of direct Sabena flight from Brussels gives rapid air service - in 7 to 10 days.)	
Dahomey	Unascertained	

4. e) Customs Duties and Other Taxes Applicable to Spare Parts

The composite of customs duties and taxes as percentage of C.I.F. cost, as reported to us by customs authorities in the various Entente States, is as follows:

	<u>Ivory Coast</u>	<u>Togo</u>	<u>Dahomey</u>	<u>Niger</u>	<u>Upper Volta</u>
From U.S.A.	35.6%	33.0%	48.0%	5.0 - 30.0%	58.0%
From Common Market	35.7%	N.S.	38.0%	N.S.	53.0%

4. e) Customs Duties and Other Taxes Applicable to Spare Parts (Cont'd)

It is noteworthy that most parts importers in the Ivory Coast gave us a range of 50 to 65% for parts imported from the United States, and of 35% to 50% for parts from the Common Market. Since there are different rates for various types of parts, the end effect depends on the assortment or mix of types of parts. A recent schedule (1973) of Dahomey shows a very decided increase, with the total effect a combined duty and tax on spare parts imports of 159% from U. S.A. Much depends, also, on the value to which the scheduled rates are applied, so that most importers employ the best and most able customs agent they can find.

4. f) Combined Effect of Freight, Customs Duties and Taxes on Shipments by Air Versus Boat

In the endeavor to resolve this question, we presented a detailed schedule of costs, for either method, to importers in the Ivory Coast and elsewhere. The general consensus was that for shipments from Belgium, the delivered cost at Abidjan, or Niamey, was from ten to twenty percent more than by boat, and likewise for shipments from the United States. However, from the Paris area, the cost of air shipments was reported as 34% higher than the boat shipment, but these shippers use air shipments for the most part, which influences the data.

As reported by Ivory Coast dealers, the costs of parts received by air ranged from 10% more to as high as 18%, and even 25% more, than those received by boat. However, this depended in part on the location of the major European base of supply and whether it had direct access to water transportation. The clearest comparison, and the most advantageous situation, is obviously that of Caterpillar or Allis Chalmers, with major European depots at Grimbergen and Liege, Belgium, respectively, and with ready access to either water transportation or air transport via the Brussels airport. Firms with depots near Paris (such as S.A.R.I.A.C.I. for Richier parts), are better situated with respect to air transport from Orly or Le Bourget airfields, but must add overland transportation to an ocean port for any shipment by boat, with additional time required. Hence, while air transport from the above mentioned points can be provided on an average of five to ten days after receipt of Telex (and in rare and fortunate cases in two or three days), boat transport is likely to be a matter of several weeks. Where the part is obtained from the United States, the time is longer, but boat transport direct to Africa may be advantageous cost-wise; hence Allis Chalmers deliveries have become slower.

As to pricing policy for air versus boat shipments, Abidjan dealers indicate that competitive pressures, in the main, require that the same price be charged for parts received by air freight as for those received by boat, which results in a very thin margin on parts received by air, and undoubtedly some spreading of costs. It is difficult to independently ascertain this effect.

4. f) Combined Effect of Freight, Customs Duties and Taxes on Shipments by Air Versus Boat (Cont'd)

In the other Entente States, where air shipments are the rule, this cost tends to set the pattern, particularly since shipping costs by boat to the nearest port plus overland transportation is said to equal the air costs, with longer time required.

5. Determination of Costs of Various Aspects of Present Spare Parts Management

a) Annual consumption of spare parts by equipment make, type and user.

While we found no long-range comprehensive records of this sort, there were the beginnings of such studies, and some useful comparisons had been developed, mostly by Public Works Departments, or by major public enterprises.

The equipment under study falls into two or three broad classes, with different replacement parts requirements. In the first place, the major units which are automotive - that is, self-powered - have common requirements as to routine replacement items for the engine - such as filters, fan belts, etc., at intervals as measured by hours of service as recommended by the maker; regularity in so doing is a basic point of preventive maintenance. The timing of engine repairs and for transmission and/or torque converter repairs can also be so scheduled.

For units with caterpillar tread, such as bulldozers and track-cavators, or tractor-type loaders, it is necessary to change the caterpillar chains and rollers, etc., at intervals as dictated by experience. We were told by MOTORAGRI and Public Works of the Ivory Coast that they overhauled a tractor track once, rotating the bushings 180 degrees, and rebuilding the chain as needed, usually after 2,000 hours, and that the rebuilt track might then have a further service life of 1500 hours, after which a complete new track was installed. Obviously, a bulldozer which was operated 8,000 hours before a complete overhaul, including engine rebuild, might use two or three sets of new track. At suitable intervals, the various rollers which support the track are also rebuilt by welding on metal to the circumference to replace that worn away, and this is then ground to size by machine.

On the other hand, a wheel-type loader uses replacement tires, in lieu of the tracks for the other type of unit, and of course the cost factors are quite different, with much lower change time required.

b) Annual Consumption of Spare Parts by Equipment Type

A study by the Department of Public Works, Upper Volta, indicates the parts consumption per year, for certain types of equipment, but averaged over the operating life of such equipment. Necessarily, the parts cost is far higher for equipment on tracks, such as bulldozers, and those using scraper or bulldozer blades, and far lower for equipment mounted on rubber tires.

5. b) Annual Consumption of Spare Parts by Equipment Type (Cont'd)

<u>Equipment Units</u>	<u>Hours of Service Per Year</u>	<u>Cost of Parts Used</u>	
		<u>Per Hour</u>	<u>Per Year (C.F.A.)</u>
Bulldozer - 180 Horsepower	1,000 hours		
Blades and ripper teeth		322	322,000
Batteries		53	53,000
Other Parts		<u>2,269</u>	<u>2,269,000</u>
Total Parts for Bulldozer, 180 H.P.		2,644	2,644,000
Bulldozer - 65 Horsepower	780 hours		
Blades and ripper teeth		93	72,540
Batteries		53	41,340
Other Parts		<u>737</u>	<u>574,860</u>
Total Parts for Bulldozer, 65 H.P.		883	688,740
Payloader, on tires	1,200 hours		
Tires		29	34,800
Batteries		35	42,000
Other Parts		<u>915</u>	<u>109,800</u>
Total Parts for payloader, on tires		979	186,600
Motorgrader, on tires	850 hours		
Tires		20	17,000
Batteries		34	28,900
Blades		206	175,100
Other Parts		<u>738</u>	<u>627,300</u>
Total Parts for Motorgrader, on Tires		998	848,300

5. c) Annual Consumption of Spare Parts by Make

The annual spare parts consumption in the Ivory Coast, at prices paid by spare parts users is herewith estimated from various data from suppliers and users.

<u>Name of Importer (Principal Product Line)</u>	<u>Annual Spare Parts Consumption, by Users (Millions C. F. A.)</u>			
	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>
<u>MANUTENTION AFRICAINE</u> (Caterpillar)	1,179	1,102	1,270	1,411
<u>C.F.A.O., Techmat Div.</u> (International Harvester)	200	250	300	300
<u>G.A.E.I.</u> (Allis Chalmers)	462	480	500	560
<u>HAMELLE AFRIQUE</u> (Massey Ferguson)	33	66	100	125
<u>S.A.R.I.A.C.I.</u> (Richier)	9	12	55	65
<u>C.I.C.A. (Ind'l Div.)</u> (Hanomag)	55	84	115	150
<u>C.A.R.I.C.</u> (Atlas-Copco, and other)	<u>50</u>	<u>50</u>	<u>50</u>	<u>55</u>
Total of above	1,988	2,044	2,390	2,666

The predicted usage in 1973 appears to be 12% higher than 1972; this is predicated on continuation of high usage of spare parts in the logging industry in the Ivory Coast, which is benefitting from an embargo on the shipping of logs from Indonesia, and hence experiencing an unusually high level of demand. We are told that logging equipment in the Ivory Coast is presently operating at the rate of 200-250 hours per month, which means parts consumption at almost double the rate per vehicle as used in road construction and highway maintenance.

5. d) Relative Durability of Equipment

This appears to be related to the severity of use, and the regularity of preventive maintenance. For deforestation and land clearing, Motoragri finds that heavy Caterpillar bulldozers, after 8,000 hours of use, with full preventive maintenance, can still be sold at 25% of the original cost price. Other makes are said to be beyond repair, and unsaleable, after five years of such service. Similar reports come from the Department of Public Works of the Ivory Coast, which may choose to run such units as long as 12,000 hours.

5. d) Relative Durability of Equipment (Cont'd)

The relative cost of parts is a more difficult matter, for usage conditions are an intangible factor, and parts requirements vary with the age of the equipment, just as they do with an automobile or truck. In general, such units after a couple of years of service, are apt to spend two months per year in repair or service shops, and ten months in active service.

While the simplest comparison of repair costs would appear to be against the original cost of the vehicle, this is not altogether reliable. For example, a Caterpillar 12 E grader, which cost 4,160 thousand C.F.A. in 1966, cost 6,900 in 1971. But the timing of parts changes differs from make to make. For example, the track unit of a D-7 Bulldozer may be taken off for rotating the bushings after 1,500 hours, after which the track may serve 1,000 hours more, and then must be completely replaced. In comparison, track on a Continental bulldozer can be run for 2,000 hours before rotation, and then used for 1,500 hours more. With a Hanomag bulldozer, the initial track change is after 1,200 hours and full replacement after 800 more.

6. Projected Requirements of Users Over the Next Three Years

The overall growth pattern for the Ivory Coast is difficult to predict by reason of the variety of types of users and of the various economic activities using such equipment - to wit, extension and improvement of major highways, extensive agricultural development in palm and coconut oil plantations in the tropical area, the expansion of the cane sugar industry in the area around Ferkessodougou, and the broad development of the Bandama Valley with respect to cotton, rice and other products. For an order of magnitude, it would appear that spare parts sales could increase by 16% annually for the period 1973-1974-1975, as follows (in millions of C.F.A.).

<u>Actual Spare Parts Sales</u>			<u>Projected Spare Parts Sales</u>		
<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>
1,988	2,044	2,390	2,790	3,230	3,750

In other countries, the factors affecting parts demand are fewer, being for the most part the combined effect of expected orders from the Public Works Department, and the widely cyclical needs of private contractors for new highway contracts.

Public Works programs for Spare Parts Purchases in Millions of C.F.A. are:

	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>
Togo	N.S.	N.S.	37	35
Dahomey	15	96	61	16
Niger	50	65	88	93
Upper Volta	126	103	122	100

6. Projected Requirements of Users Over the Next Three Years (Cont'd)

In most cases, the planned replacement of older equipment with new units in 1973-4 will curtail expenditures for replacement parts in 1974-5, since the new equipment will only need fast-moving and routine replacement items.

Due to the multiplicity of the various plans for operations in the future and the difficulty in obtaining any detailed information or planning work on this future activity, we found it impossible to develop, within the severe time limitations and staffing limitations of the Study, any quantitative analysis of projected requirements which would be worthwhile. We would mention that nothing we saw or learned during our Study would indicate any basis upon which to recommend revision of manufacturer's life expectancies of spare parts. The condition of useage, the modes of useage, the varying climatic and soils conditions, all would indicate the possibility that life expectancy of spare parts would vary throughout the region. We have not been able to identify any bases of observations or reported experience which would allow us to delineate any such variance.

B. CONCLUSIONS AND RECOMMENDATIONS

7. Summary of Spare Parts Stocking Practices at Dealers and End Users

The Ivory Coast differs from the other Entente States in having larger stocks of spare parts for the major brands of equipment with Abidjan dealers and field stocks in the Daloa area. This permits these policies:

- i. Users can restrict their parts inventories to fast-moving and routine replacement items, dispersed in field servicing centers.
- ii. Centralizing of major overhaul and rebuild operations, thus relying on dealer stocks of parts, and avoidance of inventory costs and risks.

In other Entente States, where the dealer stocks are restricted to fast-moving and routine replacement items, and other parts are brought in by air or boat on special order, other policies are followed:

- i. Public Works Departments have relatively large stocks of all kinds for those makes of equipment they use in quantity, against their planned rebuild operations, and try to buy well in advance of their needs to assure availability of the part at the time of rebuild.

7. Summary of Spare Parts Stocking Practices at Dealers and End Users (Cont'd).

- ii. Major contractors sometimes have large central repair shops, and for a long-term highway construction contract at a location distant from such headquarters, often set up field parts depots and repair facilities, complete with parts clerks and well trained mechanics.

Nevertheless, under both conditions, there are found sizeable amounts of slow-moving, and even of obsolete and unusable spare parts in the inventories of dealers (as in the Ivory Coast) and of the contractors, as elsewhere. This adds considerably to the cost of spare parts management, particularly since there is presently no tax relief for the scrapping of obsolete parts.

a) Proposals for Improvement of Spare Parts Management - By Importers

In the Ivory Coast, where Electronic Data Processing is being installed by three major importer/dealers, and Caterpillar has been using this tool for some time, the possible improvements are:

- development of inventory classifications by type of material, and end use of the part by model and major component of the equipment concerned;
- setting of inventory objectives in terms of annual turnover and then measuring performance, from time to time, to determine changes in usage trends;
- at annual inventory points, determining the supply in excess of foreseeable requirements for slow-moving and obsolete, to develop the basis for possible value of such excess parts inventory.

These steps would provide accounting data which may be needed to support any claim for write-downs in connection with our proposals for tax relief.

In the other Entente states, some improvement is desirable in the scale and variety of dealer stocks, since Caterpillar is generally the only brand with locally available stocks of spare parts (and none in Dahomey). With some of the Caterpillar dealers, these changes may presently be implemented:

- In Lome, the management is considering centralizing in one location the now separate tax-free entrepot and the tax-paid stock, in one central location, with the inventory control records and Microfiche files.

7. a) Proposals for Improvement of Spare Parts Management - By Importers (Cont'd)

- In Dahomey, the dealer is considering setting up a stock of spare parts at Parakou, when the financing for the improvement of this road is approved.
- In Ouagadougou, increasing the stock is under consideration.
- In Niamey, where there is both a tax-free entrepot and a duty paid stock, the dealer is installing more repair facilities and adding mechanics.

7. b) Proposals for Improvement of Spare Parts Management - By Public Works Departments

The desirable steps are:

- Standardization on fewer models of the equipment that have proved satisfactory;
- Elimination of odd units and makes that lack good spare parts support; and
- Clearing out unuseable and obsolete inventories of spare parts.

While these general lines of approach are common to the Public Works Departments in states other than the Ivory Coast, the fact that each state has different technical advisors, sometimes linked with programs of financing of new facilities for parts stocking and renovation of repair shops, means that some time will elapse before greater community of equipment preference can be converted into similar holdings of equipment in quantity sufficient to make combination of parts orders worthwhile.

Meanwhile, these improvements are suggested:

- In Togo, the pressing need is for a thorough physical inventory of the spare parts stock, and correction of unit records for such inventory, followed by steps to eliminate and discard the obsolete and unuseable parts. The present lack of sufficient qualified parts managerial staff might be alleviated by the promotion of regional supervisors who have shown ability to clean up their stocks, and to maintain tight controls.
- In Dahomey, good progress is being made by French advisors to improve parts inventory controls, and plans are to replace over-age units of equipment, for which parts are not readily available, with makes with better support. But since purchases of needed parts seem to have been relatively heavy in recent years, purchases for 1973 will be rather light.

7. b) Proposals for Improvement of Spare Parts Management
By Public Works Departments (Cont'd)

- In Upper Volta, a different group of advisors is planning highway improvements, and upgrading the equipment of the Public Works Department. Some studies have been made of the relative costs of maintenance of various types of equipment, but only as a basis of daily rental charges to contractors. Here, the need is to work off a large stock of spare parts for Richards Continental units, which it is intended to replace with Caterpillar, and then to build up the stock of parts for the latter; but this may take three years or more.

Although it is not specifically in the area of spare parts management, we would recommend that a Uniform Repair and Maintenance Cost Accounting and Reporting System be inaugurated for use by the Department of Public Works of each of the Entente States. The purpose of such a system would be:

- i. To provide a basis for consistent and reliable accumulation of the costs of major types of repairs on like units of equipment, classified by major functional units or sub-assemblies.
- ii. To facilitate the comparison and analysis of such repair costs and to allow identification of the accurate repair cost-to-run of each piece of equipment.
- iii. To serve as a reliable basis for decisions as to whether to furnish or purchase repair service or to purchase rebuilt major units.
- iv. To ultimately serve as a reliable basis for decisions concerning more extensive standardization of makes, types and sizes of equipment, by helping to demonstrate which equipment over a suitable period of time experience, show:
 - a. lowest cost of upkeep;
 - b. best availability of service;
 - c. the most satisfactory relationship between repair costs and original repair costs.

It is suggested that to inaugurate and implement such a system, the Chiefs of Material of each of the Departments of Public Works should meet and commonly determine:

7. b) Proposals for Improvement of Spare Parts Management - By Public Works Department (Cont'd)

- The types and sizes of equipment to be covered; we would suggest that motorgraders, bulldozers, wheel tractors and front-end loaders would make a good starting point;
- The functional units on the usually repaired and/or replaced assemblies for which such costs accumulation and analysis is desired;
- The classification of repair and maintenance expense deemed suitable, and
- The methods of how this information is to be summarized and routinely shared among the individual members.

Under the manual accounting system presently used, a printed card would be kept for each piece of equipment to be covered, which would have a place for posting:

- Equipment make, type, model, serial number, engine horsepower and serial number, transmission, etc.
- Acquisition data for the basic equipment unit and all optional extras, including customs duty and taxes and delivery costs.
- Cost of major repairs, replacements and rebuilds (including costs and hours of service) such as:
 - truck rebuild, overhaul or replacement;
 - radiator changes, repairs or rebuilds;
 - engine repair and rebuilds;
 - transmission (or torque converter) repairs and rebuilds;
 - battery and tire replacement;
 - repairs to track frame, bushings, axles, etc.

(Cost of minor repairs and replacements should be lumped in "all other" as a balancing figure).

It is suggested that initially such cost accumulation and analysis be applied to the units of such makes, types and sizes as are deemed suitable for future standardization either within an individual D.P.W. or on a regional basis.

7. c) Proposals for Improvement of Spare Parts Management - By Other End Users

These are necessarily different for the Ivory Coast than for the other Entente states, due to (a) the different state of the spare parts supply, with dealers carrying substantial stocks of parts, in most cases,

7. c) Proposals for Improvement of Spare Parts Management - By Other End Users (Cont'd)

in the Ivory Coast, and (b) dealers elsewhere in the Entente states limiting their stocks to the fast-moving and routine replacement items.

Thus, for Public Works and contractors in the Ivory Coast, it is only necessary to carry parts of frequent replacement, and endeavor to buy these in sufficient quantity to secure price advantage.

For the public enterprises, the extension of the group buying practices of Motoragri, A.V.B. and SODEPALM-PALMIVOIRE to the other smaller enterprises could increase the purchase volume, and help these smaller enterprises costwise.

7. d) Proposals for Improvement of Spare Parts Management -
By Income Tax Relief for Obsolescence of Spare Parts

In view of the rather large stocks of obsolete and unusable spare parts found in our observations -- 21% of inventory value for the Ivory Coast dealers and 11% for the dealers of the other Entente States -- measures should be taken to furnish relief from this financial burden. Such relief will have the effect of increasing the dealer's or user's ability to maintain larger stocks of more needed spare parts within its financial limitations. We would propose the passage of appropriate legislation that would provide income tax credit relief to dealers, importers, public enterprises and contractors who destroy obsolescent spare parts in an approved and controlled manner. The administration of such an income tax credit procedure would lie in the hands of the Ministry of Finance, Department of the Treasury, of the individual Entente States and would have the following essential features:

- 1) A dealer or user, desiring to claim the said Income Tax Loss Credit, would file an "Application to Destroy Obsolete and Unusable Spare Parts" which would require the following data to be included:

manufacturer's brand name
part number
part description
quantity to be destroyed
book value
date of acquisition
total value of parts to be destroyed.

- ii) Upon receiving approval of the application, the subject parts would then be destroyed by mutilation with a cutting torch or other appropriate means in the presence of a designated Treasury (or Customs) officer, who shall note his witnessing of the destruction on the application.
- iii) A claim for income tax loss credit would then be made in the owner's next annual income tax return for the write-off related to such act of destruction, with suitable entry in the books of account in a special profit and loss account.
- iv) The total income tax loss credit should be allowed to be carried over for a certain prescribed number of tax fiscal years -- say, three years.
- v) The application to destroy shall cite and evidence the genuine but unsuccessful efforts to dispose of such parts by public auction duly advertised for at

7. d) Proposals for Improvement of Spare Parts Management -
By Income Tax Relief for Obsolescence of Spare Parts (cont'd)

least a certain specified percentage of the recorded book cost value. This percentage should be specified in accordance with the income tax rates of each of the Entente States. We would assume that the percentage should be in the ten (10) to twenty-five (25) percent range.

- vi) This mechanism should be restricted to spare parts purchased more than 4 or 5 years prior to application to destroy and which have had no actual usage for the previous two years.

7. e) Centralization

In the Public Works Departments of the Entente States there now exists a balance between: (i) decentralization of repair and service facilities and spare parts used regularly and frequently for first or first and second level maintenance service; and (ii) centralization of major rebuild and overhaul facilities, spare parts and replacement units specially ordered for planned major rebuilds and overhauls.

The pattern in the Niger D.P.W. is indicative of this decentralization-centralization and the relative amounts of stock parts and their usage can be seen in the following:

	Percent of <u>Stock</u>	Percent of <u>Issues</u>	<u>Parts Inventories</u> Millions of C.F.A.	<u>Parts Issues</u> Millions of C.F.A.	
Central Warehouse	69.5%	50.0%	87.2	87.4	
<u>Service Depots:</u>					
Naimy)	1.5	4.3	.7	8.6
Dosso		3.2	7.9	4.0	13.4
Konni		2.4	7.7	3.0	13.6
Tahua		11.3	11.0	14.3	19.1
Maradi		4.5	12.0	5.8	21.0
Zinder		7.7	3.9	9.7	6.7
Agades					
Total Serv. Depots	30.6%	50.0%	39.6	88.0	
Grand Total	100%	100%	126.8	175.4	

This type of parts management is basically sound. In the interests of keeping equipment in the field running, decentralization of repair facilities and spare parts should be encouraged to proceed as rapidly as possible. In many cases, the equipment type and size mix which exists and which must be borne with the foreseeable future may result in rather large

7. e) Centralization (cont'd)

stocks located in the service depots, with the attendant increased storeskeeping expense and loss risk; nevertheless, the benefits to be derived from keeping the equipment running will outweigh this.

The above referred to the parts management practices of the Departments of Public Works. The possibility that certain of the various D.P.W. service depots could be consolidated after proper and thorough consideration of the logistics involved and of the operations requirements certainly could exist, but any savings accomplished would be very minor. Another possibility would be consolidation of the out-land service depots of the Departments of Public Works with those of other major end users. The public enterprises are such major end users. However, they, in effect, exist to any substantial degree only in the Ivory Coast and we noted a strong reluctance at this thought. This is to be expected when the differing work locations, operations requirements and the composition of equipment mix (generally heavier) is considered. The other major end user class is the private road contractors but it is easily apparent that their operations follow the path of major construction, is of an episodic nature and it seems farfetched that they would surrender the control which is such an important part of their method of operation.

7. f) Consolidation of Orders

Consolidation of spare parts orders on a regional level would seem to be highly impractical for the foreseeable future. This is mainly due to the wide range of equipment type, size, make and origin which presently exists and which, except for an imposed standardization, will continue to exist for some time, though to a lesser extent. This prevents any reasonable consolidation of the quantity of orders which would provide the commercial strength to bypass the local dealers or motivate the local dealers to better performance. Consolidation of orders would seem feasible only at such time as a rather high degree of standardization is achieved throughout the region. As mentioned elsewhere, this standardization does not seem to be in the offing.

Another strong factor against regional consolidation of orders is the logistics of delivery within the Entente States.

Present telexing of orders to European warehouses is a relatively effective, established system. These warehouses are located in Common Market countries and provide customs duty preference to the region. With computer order processing and parts location of all European and United States stocks, location of the part desired is far more effective and rapid than could be achieved by the manual methods presently existing in the Entente States. Computer processing search and location ability would have to be in hand at such time as regional consolidation of parts ordering is attempted. Only the Ivory Coast would seem to have facilities to allow for development of this ability.

7. f) Consolidation of Orders (cont'd)

which would also require experienced programmers and data processors. In the Entente States, among the dealers, Caterpillar has some 4 to 6 years experience on this and Massey-Ferguson, Allis-Chalmers and International Harvester are just starting; Richier has not made a start. The use of computer ability by the dealers should be encouraged. One way to do this would be to make it a condition for placement of future orders.

Present shipping, clearance and airplane forwarding is organized and quite efficient. Direct shipment to any of the Entente States is made in a few days and the trend is to an improvement of service. For delivery of heavy items, development of ordering strategies allowing for adequate delivery lead time must be strengthened.

7. g) Duty-free Stocking of Dealers' Spare Parts

In view of the region-wide range of Customs duty and taxes, spare parts in-stock availability would be fostered if the various dealers had access to a practical method for stocking spare parts in bonded warehouses or duty-free zones. The resultant decrease in capital tied up in parts stock should be encouragement to stocking of larger inventory quantities, since we observed that in many cases the dealers have definite capital limitations, inherent or imposed.

There exist "entrepots hors de douane" in the Ivory Coast which are being used by Caterpillar, International Harvester, Allis Chalmers and Atlas Copes but only for assembled units and boxed major units such as compressors, engines, torque converters, etc. No entrepot or provision for handling of spare parts was found. The provisions in the Ivory Coast Customs law envision that merchandise received will not be broken down from its original packing and require the authorization of the Director of Customs for changing of location, even from shelf to shelf, or for any alteration. We understand that such authorization is rarely obtained and stiff fines are levied for any variations in location, etc. The interval for which the duty-free status can be maintained seems to be too short (18 months). The entrepot in Togo is set up in a practical way for treatment of spare parts (a restrictive requirement in the Togo regulations seems to be that only one dealer is allowed an entrepot for each class of equipment; the Caterpillar dealer has the only one now permitted for road-building equipment spare parts and has a good current stock and good control). Similarly practical entrepots exist in Niger and Upper Volta which Caterpillar maintains. The salient features of these entrepots is that a package of spare parts arriving by boat in Togo or by air in Niger and Upper Volta will be released by Customs to the dealer on the basis of a temporary bulk receipt stating total value and total weight. The dealer can take the package to his premises and unpack and check the contents against the packing list or shipping manifesto and report the detailed contents to Customs within some 10 days. Individual parts may then be efficiently

7. g) Duty-free Stocking of Dealers' Spare Parts (cont'd)

binned in a separate duty-free warehouse owned by the dealer. Parts accountability is then achieved by maintaining separate, duplicate inventory records -- one for Customs and the other for the dealer. Sale of parts to non-exempt users is reported to Customs as sales are made and the applicable duty is paid. Parts not sold within the duty-free period of 18 months are reviewed and either transferred to regular inventory (with payment of duty) or returned. It would seem that this duty-free period of eighteen months is too short since high usage of spare parts occurs in the second and third year of normal equipment usage; European entrepots are said to have almost indefinite periods of exemption.

We recommend that regulations, freeing the dealer of customs duty and of as much of other taxes as possible, be instituted which would allow for similar entrepots in Dahomey and, especially, the Ivory Coast. It is to be noted that this involves dealer entrepots. It is our observation that consolidated entrepots serving several dealers would not be of interest to the dealers because of their desire to protect their customers from other dealers and the need to have the parts in proximity to their repair shops.

The complexity and breadth of the Customs regulations of each of the individual Entente States, the nature and diversity of the practical aspects of customs clearance and the nature and extent of custom consultant expertise made available to us in the Ivory Coast precluded us from arriving at definite legislation recommendations to accomplish the above entrepot recommendations during the term of our Study. We would recommend that a study to accomplish this be made using the legislation in Togo as a model for a starting point.

7. h) Transshipment of Spare Parts Without Payment of Double Taxes

Regulations in the region presently allow and customs broker competence now exists to allow for transshipment of original spare parts purchases which are not broken down from original packing without payment of double duty and tax payments. Double taxation occurs when the spare parts are split up in their journey to ultimate user, and when there are sales between Entente States parties. This could be avoided and the dealer's in-stock capability would be strengthened if Entente State regulations would allow transfer between individual dealer duty-free entrepots as recommended above, with no duty to be paid except in the country of final non-exempt use. This would foster a regional approach to spare parts stocking by the individual dealers with its attendant economies and increase of capability.

7. 1) Training of Spare Parts Management Personnel

Training in the Ivory Coast in spare parts management is provided from time to time by the public enterprises and the Department of Public Works. This training is done on an intermittent basis and involves training in manual accounting on unit card records,

Caterpillar provides training for its own personnel and selected personnel of some of its customers but this training, which sometimes includes training in the States, is limited to equipment operators and mechanics.

CERFER (RRMIC) in Lome has been providing training to storekeepers in manual record-keeping and inventory care. The number of storekeepers from the Entente States trained in CERFER in 1972 was thirteen (13). Projections of future training is 22 for 1973; 23 for 1974 and 32 for 1975-1977. In view of the fact that the Department of Public Works and the public enterprises in the Ivory Coast perform their own training and the dealers and private contractors traditionally serve their requirements by use of their own training and/or use of expatriate personnel, this would seem to be reasonable to cover future requirements. The CERFER training seems to be fully adequate for the purposes intended and we had opportunity to observe its graduates in performance of their post-training responsibilities. However, this training is essentially for storekeepers. Training for spare parts management planning and control is being provided by the various consultant advisory teams, basically in a counterpart relationship.

With development of storekeeping ability, the growth of the Public Works Department activity and the trend which will evolve towards increasing the level of service depot activity which can be expected, there seems to be a need for initiating training of parts inventory managers in the planning and implementation of machine accounting methods and systems for needs forecasting and control of spare parts inventories both in units and in monetary value with subdivisions as to:

- a. Type of repair part (i.e. material, make, and where used in the equipment) -- aimed to develop control standards for annual turnover and usage, and
- b. Location -- to facilitate the furnishing of needed parts from stock.

These individuals would be of supervisory status and we would think that some 5 to 7 candidates per year would suffice as a start. We would think that this could be added to CERFER's curriculum and scope of activity with relative ease.

8. Economical Sizing of Equipment and Standardization

One of the requirements of the Study was to recommend, where possible, the most economical sizes within the various types of equipment. The size mix presently existing bears on this analysis and the situation as existing was investigated. Size of equipment is predicated on function and the nature of the specific major end-user and its operations requirements bears on this. The primary end-users are the various Department of Public Works. Private road-building contractors are another large class of end-users. There are no other substantial classes of major end-users except for the public enterprises and the logging industry, both almost completely located in the Ivory Coast. Our analysis was therefore restricted to the user classes of the Department of Public Works, the private road-building contractors and the public enterprises.

Analysis of the numbers of equipment within each type of equipment for these classes of users shows the following:

	No. of Units Owned by:		
	<u>D.P.W.</u>	<u>Public Enter.</u>	<u>Priv. Contr.</u>
Motorgraders	295	34	96
Bulldozers	136	176	159
Mechanical Shovels, Diesel	4	6	34
Wheel Tractors	166	166	20
Motorized Compactors	32	4	124
Rollers	103	27	37
Front End Loaders	106	31	84
Scrapers	2	16	83

From the amount of equipment as shown above, it is clear that the types of equipment worthy of study as to sizing analysis should be restricted to motorgraders, bulldozers, wheel tractors, and front end loaders. Rollers seem to make up a sizable number but this class includes three very definite sub-classes - powered, drawn and sheepsfoot - each of which have only insignificant totals. The major quantities of diesel mechanical shovels and scrapers are in the hands of the private contractors whose requirements are quite specialized and in the construction field, as opposed to maintenance, and whose choices are always quite independent.

The size distribution of motorgraders can be briefly summarized as follows:

	<u>Depts. of Public Works</u>		<u>Public Enterp.</u>	<u>Private Contractors</u>	
	<u>Ivory Coast</u>	<u>Entente States</u>		<u>Ivory Coast</u>	<u>Other Entente States</u>
Super over 200 hp.	-	-	-	4	-
Heavy - 140-200 hp.	-	-	-	15	17
Medium - 100-140 hp.	105	100	31	26	31
Light - Under 100 hp.	86	4	4		3

8. Economical Sizing of Equipment and Standardization (Cont'd)

It is apparent that the most economical size for motorgraders is in the medium range. The 86 light motorgraders have been proven to be very unsuitable as evidence by their extremely high unit repair and maintenance costs.

The size distribution of bulldozers can be briefly summarized as follows:

	<u>Depts. of Public Works</u>		<u>Public</u> <u>Enterp.</u>	<u>Private Contractors</u>	
	<u>Ivory Coast</u>	<u>Entente States</u>		<u>Ivory</u> <u>Coast</u>	<u>Other</u> <u>Entente States</u>
Giant - over 350 hp.	-	-	-	3	-
Super - 250-300 hp.	2	-	86	38	32
Heavy - 150-200 hp.	44	26	27	21	19
Medium - 100-150 hp.	9	16	29	5	6
Light - under 100 hp.	34	5	34	27	8

We did not see anything in our tour which would indicate that the sizing mix presently existing in the Public Works Departments is seriously deficient as to capacity of bulldozers in usual application. We would suggest that interests of standardization would be served by centering on only two sizes - one in the heavy range and the other in the light; range of applications would be sufficiently served by having equipment in these two ranges on hand and the medium range would be superfluous. There is a need for heavier equipment for the upper range for the public enterprises and the private contractors but this is only to be expected because of the nature of their operations requirements.

The size distribution of wheel tractors can be briefly summarized as follows:

	<u>Depts. of Public Works</u>		<u>Public</u> <u>Enterp.</u>	<u>Private Contractors</u>	
	<u>Ivory Coast</u>	<u>Entente States</u>		<u>Ivory</u> <u>Coast</u>	<u>Other</u> <u>Entente States</u>
Heavy over 100 hp.	10	-	4	-	1
Medium - 70-100 hp.	46	-	132	5	-
Light under 70 hp.	-	110	30	10	4

The present equipment rosters show a very definite difference between that owned by Public Works Departments in the Ivory Coast and those of all the other Entente States. Our observations confirmed that this difference should exist because of the varying operations requirements and applications of the equipment. The most economical size for the Ivory Coast is in the medium range and for the other Entente States in the light range.

8. Economical Sizing of Equipment and Standardization (Cont'd)

The size distribution of front-end loaders can be briefly summarized as follows (the figures in parenthesis are for loaders on trucks and the other figures are for loaders on wheels):

	<u>Depts. of Public Works</u>		<u>Public</u> <u>Enterp.</u>	<u>Private Contractors</u>	
	<u>Ivory Coast</u>	<u>Entente States</u>		<u>Ivory Coast</u>	<u>Other Entente States</u>
Super over 250 hp.	-	-	-	6	7
Heavy - 150-250 hp.	-	2	1	3(5)	6(3)
Medium - 90-150 hp.	45(2)	23(2)	9(3)	14(8)	15(5)
Light under 90 hp.	2(19)	11	24(4)	6(2)	11

The small number of front end loaders on tracks do not provide enough of a guide as to size mix distribution and we were not able to investigate their application and arrive at any assessment of the most economical size. The most economical size for front end loaders on tires is in the medium range.

Standardization as to make, i.e., managing equipment holdings so that only two, or at most three makes are represented in the equipment holdings would have some beneficent effect. The large European-controlled highway construction contractors have achieved a strong degree of standardization; they prefer medium and heavy Caterpillar bulldozers, loaders and motorgraders to the extent that in the Ivory Coast such units make up 90% of their equipment in service. However, only little standardization has been accomplished in the Public Works Departments holdings and there seems little basis for expecting any substantial increase in standardization within the next few years.

Among Public Works Departments, Caterpillar equipment is somewhat preferred, but not to any appreciable extent. Overall, the percentage distribution of number of units, and their cost value (the latter data partly estimated, except for the Ivory Coast) is as follows:

	<u>Total by make/brand</u>		<u>Percentage of total</u>	
	<u>No. of Units</u>	<u>Cost-000 \$</u>	<u>Units</u>	<u>Est. Cost</u>
Caterpillar	167	4,783	19.3%	33.6%
Richier	160	2,611	18.5	18.3
Richards Continental	32	1,045	3.7	7.3
Hanomag (Ivory Coast)	35	1,000	4.0	7.0
International Harvester	75	782	8.7	5.5
Allis Chalmers	93	829	10.7	5.8
Michigan	18	586	2.1	4.1
Massey Ferguson	56	300	6.5	2.1
Total of above	636	11,936	73.5%	83.7%
Total, incl. all other	867	14,229		

8. Economical Sizing of Equipment and Standardization (Cont'd)

Among the Entente States, standardization by make has progressed furthest in Togo, with 34 Caterpillar units of various types and age, of which 18 were new in 1970. Standardization is proceeding in Niger, with 19 Caterpillar and 29 Richier units, with 30 units of these two makes bought in 1970. At first glance, standardization appears strong by make in Upper Volta, with 47 Richier units, 8 Caterpillar, 10 Continental and 13 Michigan units, but much of this equipment is old and not compatible with current models as to replacement parts. Overall, the amount and nature of the non-standardization in effect in the Entente States can be seen in the following:

- a) Togo has 42% Caterpillar units, the Ivory Coast and Niger have roughly 19% each, Dahomey 9% and Upper Volta about 8%.
- b) Richier units are 46% of the total in Upper Volta, about 29% in Niger, 16% in Ivory Coast and 3% in Dahomey.
- c) Michigan chargers are 13% of units in Upper Volta, but only 3% in Dahomey and 2% in Niger.
- d) Richards Continental are 10% in Upper Volta, 6% in Dahomey, 3% in Ivory Coast, and only 15 in Niger.
- e) International is 7% of units in the Ivory Coast.
- f) Hanomag units are about 7% of total units in the Ivory Coast, and Allis Chalmers motorgraders are 17% of total Ivory Coast units, and 7% of Dahomey units.
- g) Otherwise, Allis Chalmers, International Harvester and Massey Ferguson units are farm type tractors on tires.

While the D.M.T.P. of the Ivory Coast has over 30 different makes represented among its 517 pieces of road building and highway maintenance equipment, six major makes (Caterpillar, Hanomag, Richier, Continental, Allis Chalmers and International Harvester) account for 69% of total units, and 79% of the total cost value. Here again, Caterpillar leads with 19.3% of units and 31% of cost value, but Richier has 16% of units and 9% of cost value, while Hanomag has only 6.8% of units and 14% of value.

The Public Enterprises of the Ivory Coast have roughly as many units as the D.M.T.P. in use by the ten (or more) such enterprises; roughly 500 or more (an exact count is difficult, since equipment is

8. Economical Sizing of Equipment and Standardization (Cont'd)

loaned and exchanged); but easily half of these units are agricultural type tractors used for cultivation. Three major enterprises engage in land clearing and deforestation - MOTORAGRI, A.V.B., and SODEPAM/Palmivoire. The favored equipment in bulldozers is Caterpillar and Hanomag, with International Harvester and Allis Chalmers also bought in quantity, and some Richier motorgraders. Future bid invitations for new units will still be competitive, but will include far stiffer performance requirements.

To experience the greatest benefit from Standardization, the standardization must be not only as to size and make but also as to model or vintage, since the equipment manufacturers tend to alter model characteristics in three-to-five year cycles. Our detailed analysis of equipment holdings among the Public Works Departments of the Entente States shows only a few of any one model, except in the Ivory Coast and Upper Volta. Likewise, the public enterprises of the Ivory Coast have numerous units of the same model (Caterpillar, International Harvester, Allis Chalmers, Richier and Hanomag), and these are mostly of recent vintage (1967-1972). The D.M.T.P. of the Ivory Coast has various units still in service bought as long ago as 1961, but these are scheduled for sale at auction where they are still reparable.

There appears to be little possibility of extensive standardization among the Public Works Departments of the Entente States for the next three to five years. Except for the Ivory Coast, each state has completed extensive renewal and replacement of their major bank of road building and highway maintenance equipment, using in many cases funds obtained from various international lending sources; plans for additional renewals to be made in the years 1973-1975, inclusive, will only slightly increase the proportion of similar units of same make.

The following recapitulates the investments recently made and those planned for the near future:

	<u>Ivory Coast</u>	<u>Togo</u>	<u>Dahomey</u>	<u>Upper Volta</u>	<u>Niger</u>	<u>Total Entente</u>
	<u>Purchases made in the four-year period 1969-1972</u>					
Number of new units purchased	190	35	Not Stated	49	79	Approx. 353
Investment in Millions of C.F.A.	891	241	223(est.)	528	332	2,215
U.S. Dollar Equiv. (000) @ 250 C.F.A./\$	3,560	965	890	2,100	1,325	8,840
	<u>Purchases to be made in the three-year period 1973-1975</u>					
Est. of Units to be purchased 1973-1975	30	3	N.S.	15	16	64
Projected Investment Millions of C.F.A.	250	42	44(est.)	246	120	702
U.S. Dollar Equiv. (000) @ 250 C.F.A./\$1	1,000	165	176	990	475	2,806

8. Economical Sizing of Equipment and Standardization (Cont'd)

In general, the following comprises the major obstacles to near-term standardization of makes and models of highway construction and road maintenance equipment among the Public Works Departments in the Entente States:

1. Different makes are favored as alternatives to Caterpillar, which is usually the most prevalent choice:
 - a) In the Ivory Coast, Hanomag, Richards Continental and International Harvester bulldozers are also used, with fairly good parts support; but inasmuch as the Richards Intercontinental is no longer manufactured, the parts outlook is poor.
 - b) Upper Volta and Dahomey face the same problem with their Richards Continental bulldozer units, but plan to phase them out gradually.
 - c) In Motorgraders, Richier and Allis Chalmers units are used by the Ivory Coast, as well as Caterpillar, but the Allis Chalmers units will be phased out because of excessive repair cost and steadily deteriorating parts support by the dealer.
 - d) In Niger and Upper Volta, Richier motorgraders predominate, but Dahomey favors Frisch and Adams units, which lack any dealer parts support except on order.
 - e) The greatest obstacle to standardization among the foregoing makes as alternatives to Caterpillar is the relative age of many of the units; earlier models are generally of lower horsepower and some suffer from earlier design deficiencies.
2. Lack of spare parts compatibility among units of the same general model designation which were manufactured in earlier years, with subsequent design change. For example, Caterpillar bulldozers are subject to model series change at three to five-year intervals, with an accompanying change of motor horsepower (and of model weight) which requires a whole new series of parts of all types. Some improvements reduce maintenance requirements, such as sealed-for-life bearings, use of longer-life steels in scraper blades, etc.
 - a) In Togo, Niger, and Upper Volta, partial replacement of older bulldozers with current models should lessen current maintenance needs, and in Niger further Caterpillar purchases are programmed for 1973-1975.

8. Economical Sizing of Equipment and Standardization (Cont'd)

- b) The Richier holding of 36 units in Upper Volta contain some earlier units with five-cylinder engines and inadequate hydraulic systems, which will be phased out with planned purchases of later Richier (improved) models.
 - c) A large stock of spare parts for a particular make, formerly favored, can become cumbersome when the make becomes an "orphan"; thus Upper Volta with 10 Continental bulldozers (two were bought in 1971), has a very sizeable stock of spare parts for this make, to be used up in renovations.
3. Another obstacle is the varying programs of equipment replacement worked out in the individual Entente States, partly influenced by different Public Works advisory teams, but also strongly influenced by money sources.
- a) In Togo, the adviser is Louis Berger, Inc., which with World Bank funds has largely renovated the heavy equipment with Caterpillar units (mostly bought in 1970, as part of a total outlay of 222 million C.F.A.); the period 1973-1975 will see three more Caterpillar units added for an estimated 38 million C.F.A.
 - b) In Dahomey, there was a Canadian advisory team (Lamarre and Valois) and there were these outlays for new equipment of all types (including trucks, service cars and possibly, new shop equipment) in millions of C.F.A.- 1970- 33.5; 1971- 353.5; and 1972- 60; with 44 further for 1973. Lacking details, we have assumed that roughly half was used for new highway building and road maintenance equipment. However, nearly half the presently available equipment is undergoing or awaiting repair, but this is in line with the newly instituted program of preventive maintenance.
 - c) In Upper Volta, there is a French advisory team of several persons, covering all aspects of highway planning, maintenance schedules and equipment replacement. Noteworthy purchases in the past three years are: 7 Caterpillar units, 21 Richier motor-graders, and 4 Michigan loaders, and more of each planned for purchase 1973-1975. Thus 55 of 78 heavy road building units were relatively new as of the start of 1973.

8. Economical Sizing of Equipment and Standardization (Cont'd)

- d) In Niger, the advisory group is also French- B.C.E.O.M. (Bureau Centrale des Etudes d'Equipement Outre-Mer), and numbers some 14 persons. The equipment renewal program of the last three years has included 8 Caterpillar bulldozers and 20 Richier motor-graders, with 4 more of each planned for addition in 1973-1975. Hence, with much of the equipment new in 1969-1972, spare parts needs should be limited for a while to fast-moving and frequently replaced items, but will also include tires and bulldozer track rebuilding in due course.
4. A major problem in a broad replacement program is disposal of outdated equipment found too costly to maintain. There is a limited used equipment market. This market should be developed and it would probably be better to institute public auctions to clear this type of equipment and its related parts from equipment rosters. This, of course, will not produce monies for any substantial replacement with new equipment, but the savings in high maintenance costs and the savings in storekeeping costs, when properly identified, would probably demonstrate the wisdom of such an approach.

For the above reasons, it would seem there is no appreciable prospect of standardization in the new future for the Entente States. For the long term replacements in the Entente States, except the Ivory Coast, should, in the interests of fostering standardization, be mainly of Caterpillar bulldozers, motorgraders and loaders with alternates of Richier graders and Michigan loaders. The equipment operation guidelines in use by the public enterprises in the Ivory Coast serve as a model towards which the varied Departments of Public Works should aim; i.e., use of equipment for five years at the most with as high a number of operating hours as possible, repair and sale of outdated equipment, and renewal of the fleets with borrowed funds. With standardization as an important part of the purchasing decision, there will be an opportunity to make bulk purchases of spare parts, resulting in savings both in the original purchase and in the storekeeping costs.

9. Feasibility of a Central Spare Parts Procurement and Supply Agency

We do not feel that a regional Central Spare Parts Procurement and Supply Agency is feasible for the foreseeable future for the following reasons:

- a. The amount of equipment in total owned by or to be purchased in the foreseeable future by all of the Departments of Public Works will not provide enough of an economic force to effectively alter the spare parts supply mechanisms presently existing in the region.
- b. The varied and wide mix of equipment type, make, size and origin serves to diminish the formation of any such effective economic force.
- c. Standardization on equipment size, make and vintage and, most importantly, standardization on a regional basis would seem to be an important prerequisite to the initiation of such an Agency. As mentioned previously, we feel that such a degree of standardization is many years away and will require a substantial effort in changing the existing equipment selection and procurement procedures and spare parts management procedures of the individual Departments of Public Works.
- d. We would expect that the Ivory Coast public enterprises would not be in a position to meaningfully participate in such an Agency due primarily to the fact that their equipment operation requirements differ in purpose and size (generally heavier) to such a degree that standardization efforts will be thwarted. Their contribution of equipment will serve to diffuse the standardized universe and will diminish the possibility of economic impact.
- e. We feel certain that the private road building contractors would not participate in such an Agency due not only to their differing equipment operation needs but, more likely, to their strongly-felt need for independence in their operations.
- f. We expect that equipment procurement will continue to be, to a certain degree, by means of foreign donation or by means of foreign loans and grants. The associated equipment and spare parts requirements as to origin of purchases would detract from the scope of such an Agency's operations.

9. Feasibility of a Central Spare Parts
Procurement and Supply Agency (cont'd)

- g. We do not feel that there are any institutional or legislative restrictions which could not be overcome to allow initiation of such an Agency and there are no insuperable logistical restrictions. It is the lack of the ability to create a meaningfully strong economic impact to alter the existing manufacturer-dealer arrangements that results in our judgment that a regional Central Spare Parts Procurement and Supply Agency is not feasible for the foreseeable future.

As a matter of conjecture, we would volunteer that, as the prerequisites for initiation of such an Agency, standardization and creation of an economically meaningful universe of spare parts requirements, are approached, we would expect that the need for such an Agency will appreciably lessen due to both an improvement in dealer support in response to the above and the improvement of parts purchasing forecasting and parts management practices which can be expected.

In our Preliminary Report, we mentioned that merging of orders for fast-moving and routine replacement parts for certain types of equipment should be done on a restricted basis by the Department of Public Works and the public enterprises in the Ivory Coast in an attempt to effect purchase cost savings and, more importantly, bulk air shipment cost savings. Nothing said above as to the feasibility of a Central Spare Parts Procurement and Supply Agency was meant to deter from the continuation of attempts to effect savings on a non-regional and restricted basis as they become apparent in the future.

EXHIBITS

EXHIBIT I

SUMMARY OF UNITS OF EQUIPMENT IN USE
ALL MAJOR USERS COMBINED - ENTIRE ENTENTE STATES

<u>TYPE AND SIZE</u>	<u>IVORY COAST</u>	<u>TOGO</u>	<u>DAHOMAY</u>	<u>NIGER</u>	<u>UPPER VOLTA</u>	<u>TOTAL ENTENTE</u>
<u>BULLDOZERS</u>						
Giant	8	-	-	-	-	8
Super	162	24	4	14	12	216
Heavy	213	8	8	19	20	268
Medium	55	13	10	7	2	87
Light	99	9	12	2	6	128
Total	<u>537</u>	<u>54</u>	<u>34</u>	<u>42</u>	<u>40</u>	<u>707</u>
<u>LOADERS ON TIRES</u>						
Super	6	-	-	-	-	6
Heavy	47	5	-	1	3	56
Medium	75	5	9	13	17	119
Light	26	13	4	6	2	51
Total	<u>154</u>	<u>23</u>	<u>13</u>	<u>20</u>	<u>22</u>	<u>232</u>
<u>LOADERS ON TRACKS</u>						
Heavy	14	-	-	1	2	17
Medium	27	6	-	5	2	40
Light	25	-	-	-	2	27
Total	<u>66</u>	<u>6</u>	<u>-</u>	<u>6</u>	<u>6</u>	<u>84</u>
<u>MOTOR SCRAPERS</u>						
Super	6	-	-	-	-	6
Heavy	47	12	-	13	9	81
Medium	25	4	-	-	1	30
Total	<u>78</u>	<u>16</u>	<u>-</u>	<u>13</u>	<u>10</u>	<u>117</u>
<u>MOTORGRADERS</u>						
Super	4	-	-	-	-	4
Heavy	35	8	-	8	1	52
Medium	167	32	34	36	47	316
Light	90	7	-	-	7	104
Total	<u>296</u>	<u>47</u>	<u>34</u>	<u>44</u>	<u>55</u>	<u>476</u>
<u>BACKHOES</u>	<u>32</u>	<u>10</u>	<u>3</u>	<u>1</u>	<u>3</u>	<u>49</u>
<u>COMPACTORS (Auto)</u>						
Roller	56	18	4	7	8	93
Vibrating	29	4	-	6	8	47
on Tires	8	10	2	-	4	24
Total	<u>93</u>	<u>32</u>	<u>6</u>	<u>13</u>	<u>20</u>	<u>164</u>
<u>ROLLERS (Towed)</u>						
Vibrating	32	6	-	-	-	38
on Tires	64	15	-	8	-	87
Sheepfoot	41	2	-	2	1	46
Total	<u>137</u>	<u>23</u>	<u>-</u>	<u>10</u>	<u>1</u>	<u>171</u>
<u>MOTOR COMPRESSORS</u>	<u>59</u>	<u>15</u>	<u>7</u>	<u>3</u>	<u>9</u>	<u>93</u>
<u>WHEEL TRACTORS</u>						
Heavy	14	2	-	-	1	17
Medium	183	2	-	2	-	187
Light	91	27	20	43	25	206
Total	<u>288</u>	<u>31</u>	<u>20</u>	<u>45</u>	<u>26</u>	<u>410</u>
<u>GRAND TOTAL</u>	<u>1,740</u>	<u>257</u>	<u>117</u>	<u>197</u>	<u>192</u>	<u>2,503</u>

EXHIBIT II

UNITS OF EQUIPMENT IN USE - BY TYPE OF USER
IVORY COAST

<u>TYPE AND SIZE</u>	<u>Public Works</u>	<u>Public Enterprises</u>	<u>Contractors</u>	<u>Forest Industry</u>	<u>Mining & Military</u>	<u>TOTAL</u>
<u>BULLDOZERS</u>						
Giant	-	-	3	-	5	8
Super	2	86	38	27	9	162
Heavy	44	27	21	116	5	213
Medium	9	29	5	12	-	55
Light	34	34	27	-	4	99
Total	<u>89</u>	<u>176</u>	<u>94</u>	<u>155</u>	<u>23</u>	<u>537</u>
<u>LOADERS on TIRES</u>						
Super	-	-	6	-	-	6
Heavy	-	1	3	39	4	47
Medium	45	9	14	6	1	75
Light	2	14	6	4	-	26
Total	<u>47</u>	<u>24</u>	<u>29</u>	<u>49</u>	<u>5</u>	<u>154</u>
<u>LOADERS ON TRACK</u>						
Heavy	-	-	5	9	-	14
Medium	2	3	8	14	-	27
Light	19	4	2	-	-	25
Total	<u>21</u>	<u>7</u>	<u>15</u>	<u>23</u>	<u>-</u>	<u>66</u>
<u>MOTOR SCRAPERS</u>						
Super	-	-	6	-	-	6
Heavy	-	4	36	-	7	47
Medium	2	12	7	4	-	25
Total	<u>2</u>	<u>16</u>	<u>49</u>	<u>4</u>	<u>7</u>	<u>78</u>
<u>MOTORGRADERS</u>						
Super	-	-	4	-	-	4
Heavy	-	-	15	13	-	28
Medium	105	31	26	12	-	174
Light	86	3	-	-	1	90
Total	<u>191</u>	<u>34</u>	<u>45</u>	<u>25</u>	<u>1</u>	<u>296</u>
<u>BACKHOES</u>						
	<u>4</u>	<u>6</u>	<u>22</u>	<u>-</u>	<u>-</u>	<u>32</u>
<u>COMPACTORS (Auto)</u>						
Roller	13	4	39	-	-	56
Vibrating	1	-	28	-	-	29
on Tires	3	-	5	-	-	8
Total	<u>17</u>	<u>4</u>	<u>72</u>	<u>-</u>	<u>-</u>	<u>93</u>
<u>ROLLERS (Towed)</u>						
Vibrating	30	1	1	-	-	32
on Tires	41	16	7	-	-	64
Sheepfoot	14	10	17	-	-	41
Total	<u>85</u>	<u>27</u>	<u>25</u>	<u>-</u>	<u>-</u>	<u>137</u>
<u>MOTOR COMPRESSORS</u>						
	<u>3</u>	<u>2</u>	<u>54</u>	<u>-</u>	<u>-</u>	<u>59</u>
<u>WHEEL TRACTORS</u>						
Heavy	10	4	-	-	-	14
Medium	46	132	5	-	-	183
Light	-	30	10	-	51	91
Total	<u>56</u>	<u>166</u>	<u>15</u>	<u>-</u>	<u>51</u>	<u>288</u>
<u>GRAND TOTAL</u>	<u>515</u>	<u>462</u>	<u>420</u>	<u>256</u>	<u>87</u>	<u>1,740</u>

EXHIBIT III

UNITS OF EQUIPMENT IN USE - BY TYPE OF USER
TOGO

<u>TYPE AND SIZE</u>	<u>Public Works</u>	<u>Carfer (RRMTC)</u>	<u>Phosphate Mine</u>	<u>Military</u>	<u>Contractors</u>	<u>TOTAL</u>
<u>BULLDOZERS</u>						
Super	-	2	12	-	10	24
Heavy	1	1	-	1	5	8
Medium	5	2	-	-	6	13
Light	-	1	-	2	6	9
Total	<u>6</u>	<u>6</u>	<u>12</u>	<u>3</u>	<u>27</u>	<u>54</u>
<u>LOADERS on TIRES</u>						
Heavy	2	1	-	-	2	5
Medium	-	2	-	-	3	5
Light	5	1	-	2	5	13
Total	<u>7</u>	<u>4</u>	<u>-</u>	<u>2</u>	<u>10</u>	<u>23</u>
<u>LOADERS on TRACKS</u>						
Medium	2	1	1	-	2	6
Light	-	-	-	-	-	-
Total	<u>2</u>	<u>1</u>	<u>1</u>	<u>-</u>	<u>2</u>	<u>6</u>
<u>MOTORSCRAPERS</u>						
Heavy	-	3	-	-	9	12
Medium	-	2	-	-	2	4
Total	<u>-</u>	<u>5</u>	<u>-</u>	<u>-</u>	<u>11</u>	<u>16</u>
<u>MOTORGRADERS</u>						
Heavy	-	-	-	-	8	8
Medium	15	11	-	1	5	32
Light	4	-	-	1	2	7
Total	<u>19</u>	<u>11</u>	<u>-</u>	<u>2</u>	<u>15</u>	<u>47</u>
<u>BACKHOES</u>						
	<u>-</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>6</u>	<u>10</u>
<u>COMPACTORS (Auto)</u>						
Roller	4	2	-	-	12	18
Vibrating on Tires	-	-	-	-	4	4
Total	<u>4</u>	<u>2</u>	<u>-</u>	<u>1</u>	<u>9</u>	<u>10</u>
<u>ROLLERS (Towed)</u>						
Vibrating on Tires	10	2	-	-	3	15
Sheepfoot	-	2	-	-	-	2
Total	<u>10</u>	<u>4</u>	<u>-</u>	<u>-</u>	<u>9</u>	<u>23</u>
<u>MOTOR COMPRESSORS</u>						
	<u>5</u>	<u>-</u>	<u>-</u>	<u>3</u>	<u>7</u>	<u>15</u>
<u>WHEEL TRACTORS</u>						
Heavy	-	-	-	-	1	1
Medium	-	1	-	-	-	1
Light	22	-	-	4	3	29
Total	<u>22</u>	<u>1</u>	<u>-</u>	<u>4</u>	<u>4</u>	<u>31</u>
<u>GRAND TOTAL</u>	<u>75</u>	<u>35</u>	<u>15</u>	<u>16</u>	<u>116</u>	<u>257</u>

EXHIBIT IV

UNITS OF EQUIPMENT IN JSE - BY TYPE OF USER
DAHOMAY

<u>TYPE AND SIZE</u>	<u>Public Works</u>	<u>Military</u>	<u>Agri. Develop.</u>	<u>Contractors</u>	<u>TOTAL</u>
<u>BULLDOZERS</u>					
Super	-	-	-	4	4
Heavy	6	1	-	1	8
Medium	4	3	3	-	10
Light	-	-	12	-	12
Total	<u>10</u>	<u>4</u>	<u>15</u>	<u>5</u>	<u>34</u>
<u>LOADERS ON TIRES</u>					
Medium	8	-	-	1	9
Light	1	-	-	3	4
Total	<u>9</u>	<u>-</u>	<u>-</u>	<u>4</u>	<u>13</u>
<u>MOTORGRADERS</u>					
Medium	27	3	-	4	34
Light	-	-	-	-	-
Total	<u>27</u>	<u>3</u>	<u>-</u>	<u>4</u>	<u>34</u>
<u>BACKHOES</u>	<u>-</u>	<u>1</u>	<u>-</u>	<u>2</u>	<u>3</u>
<u>COMPACTORS (Auto)</u>					
Roller	-	-	-	4	4
on Tires	-	-	-	2	2
Total	<u>-</u>	<u>-</u>	<u>-</u>	<u>6</u>	<u>8</u>
<u>MOTOR COMPRESSORS</u>	<u>-</u>	<u>2</u>	<u>-</u>	<u>5</u>	<u>7</u>
<u>WHEEL TRACTORS</u>					
Light	19	1	-	-	20
Total	<u>19</u>	<u>1</u>	<u>-</u>	<u>-</u>	<u>20</u>
<u>GRAND TOTAL</u>	<u>65</u>	<u>11</u>	<u>15</u>	<u>26</u>	<u>117</u>

EXHIBIT V

UNITS OF EQUIPMENT IN USE - BY TYPE OF USER

NIGER

<u>TYPE AND SIZE</u>	<u>Public Works</u>	<u>Uranium Mine</u>	<u>Contractors</u>	<u>TOTAL</u>
<u>BULLDOZERS</u>				
Super	-	5	9	14
Heavy	5	3	11	19
Medium	7	-	-	7
Light	1	-	1	2
Total	<u>13</u>	<u>8</u>	<u>21</u>	<u>42</u>
<u>LOADERS ON TIRES</u>				
Heavy	-	-	1	1
Medium	2	2	9	13
Light	5	-	1	6
Total	<u>7</u>	<u>2</u>	<u>11</u>	<u>20</u>
<u>LOADERS on TRACKS</u>				
Heavy	-	-	1	1
Medium	-	2	3	5
Total	-	<u>2</u>	<u>4</u>	<u>6</u>
<u>MOTORSCRAPERS</u>				
Heavy	-	-	13	13
Medium	-	-	-	-
Total	-	-	<u>13</u>	<u>13</u>
<u>MOTORGRADERS</u>				
Heavy	-	-	8	8
Medium	22	-	14	36
Light	-	-	-	-
Total	<u>22</u>	-	<u>22</u>	<u>44</u>
<u>BACKHOES</u>				
-	-	-	1	1
<u>COMPACTORS (Auto)</u>				
Roller	1	-	6	7
Vibrating	3	-	3	6
on Tires	-	-	-	-
Total	<u>4</u>	-	<u>9</u>	<u>13</u>
<u>ROLLERS (Towed)</u>				
on Tires	8	-	-	8
Sheepfoot	-	-	2	2
Total	<u>8</u>	-	<u>2</u>	<u>10</u>
<u>MOTOR COMPRESSORS</u>				
-	3	-	-	3
<u>WHEEL TRACTORS</u>				
Medium	2	-	-	2
Light	43	-	-	43
Total	<u>45</u>	-	-	<u>45</u>
<u>GRAND TOTAL</u>	<u>102</u>	<u>12</u>	<u>83</u>	<u>197</u>

EXHIBIT VI

UNITS OF EQUIPMENT IN USE - BY TYPE OF USER
UPPER VOLTA

<u>TYPE AND SIZE</u>	<u>Public Works</u>	<u>Military</u>	<u>Agri. Develop.</u>	<u>Municipalities</u>	<u>Contractors</u>	<u>TOTAL</u>
<u>BULLDOZERS</u>						
Super	-	-	2	1	9	12
Heavy	14	-	4	-	2	20
Medium	-	2	-	-	-	2
Light	4	-	-	1	1	6
Total	<u>18</u>	<u>2</u>	<u>6</u>	<u>2</u>	<u>12</u>	<u>40</u>
<u>LOADERS on TIRES</u>						
Heavy	-	-	-	-	3	3
Medium	13	1	1	-	2	17
Light	-	-	-	-	2	2
Total	<u>13</u>	<u>1</u>	<u>1</u>	<u>-</u>	<u>7</u>	<u>22</u>
<u>LOADERS on TRACKS</u>						
Heavy	-	-	-	-	2	2
Medium	-	-	-	2	-	2
Light	-	-	-	2	-	2
Total	<u>-</u>	<u>-</u>	<u>-</u>	<u>4</u>	<u>2</u>	<u>6</u>
<u>MOTORSCRAPERS</u>						
Heavy	-	-	-	-	9	9
Medium	-	-	-	-	1	1
Total	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>10</u>	<u>10</u>
<u>MOTORGRADERS</u>						
Heavy	-	-	-	-	1	1
Medium	36	1	-	2	8	47
Light	-	-	4	2	1	7
Total	<u>36</u>	<u>1</u>	<u>4</u>	<u>4</u>	<u>10</u>	<u>55</u>
<u>BACKHOES</u>						
COMPACTORS (Auto)	-	-	-	-	3	3
Roller	3	1	-	-	4	8
Vibrating	4	-	-	-	4	8
on Tires	-	-	-	-	4	4
Total	<u>7</u>	<u>1</u>	<u>-</u>	<u>-</u>	<u>12</u>	<u>20</u>
<u>ROLLERS (Towed)</u>						
Sheepfoot	-	-	-	-	1	1
Total	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>1</u>	<u>1</u>
<u>MOTOR COMPRESSORS</u>						
	<u>4</u>	<u>1</u>	<u>-</u>	<u>-</u>	<u>4</u>	<u>9</u>
<u>WHEEL TRACTORS</u>						
Heavy	-	-	1	-	-	1
Light	24	-	-	-	1	25
Total	<u>24</u>	<u>-</u>	<u>1</u>	<u>-</u>	<u>1</u>	<u>26</u>
<u>GRAND TOTAL</u>	<u>102</u>	<u>6</u>	<u>12</u>	<u>10</u>	<u>62</u>	<u>192</u>

EXHIBIT VII

SUMMARY OF UNITS OF EQUIPMENT IN USE
PUBLIC WORKS DEPARTMENTS - ENTIRE ENTENTE STATES

<u>TYPE AND SIZE</u>	<u>IVORY COAST</u>	<u>TOGO</u>	<u>DAHOMY</u>	<u>NIGER</u>	<u>UPPER VOLTA</u>	<u>TOTAL ENTENTE</u>
<u>BULLDOZERS</u>						
Super	2	-	-	-	-	2
Heavy	44	1	6	5	14	70
Medium	9	5	4	7	-	25
Light	34	-	-	1	4	39
Total	<u>89</u>	<u>6</u>	<u>10</u>	<u>13</u>	<u>18</u>	<u>136</u>
<u>LOADERS ON TIRES</u>						
Heavy	-	2	-	-	-	2
Medium	45	-	8	2	13	68
Light	2	5	1	5	-	13
Total	<u>47</u>	<u>7</u>	<u>9</u>	<u>7</u>	<u>13</u>	<u>83</u>
<u>LOADERS ON TRACKS</u>						
Medium	2	2	-	-	-	4
Light	19	-	-	-	-	19
Total	<u>21</u>	<u>2</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>23</u>
<u>MOTORSCRAPERS</u>						
Medium	2	-	-	-	-	2
Total	<u>2</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>2</u>
<u>MOTORGRADERS</u>						
Medium	105	15	27	22	36	205
Light	86	4	-	-	-	90
Total	<u>191</u>	<u>19</u>	<u>27</u>	<u>22</u>	<u>36</u>	<u>295</u>
<u>BACKHOES</u>						
<u>COMPACTORS (Auto)</u>						
Roller	13	4	-	1	3	21
Vibrating	1	-	-	3	4	8
on Tires	3	-	-	-	-	3
Total	<u>17</u>	<u>4</u>	<u>-</u>	<u>4</u>	<u>7</u>	<u>32</u>
<u>ROLLERS (Towed)</u>						
Vibrating	30	-	-	-	-	30
on Tires	41	10	-	8	-	59
Sheepfoot	14	-	-	-	-	14
Total	<u>85</u>	<u>10</u>	<u>-</u>	<u>8</u>	<u>-</u>	<u>103</u>
<u>MOTOR COMPRESSORS</u>						
	<u>3</u>	<u>5</u>	<u>-</u>	<u>3</u>	<u>4</u>	<u>15</u>
<u>WHEEL TRACTORS</u>						
Heavy	10	-	-	-	-	10
Medium	46	-	-	2	-	48
Light	-	22	19	43	24	108
Total	<u>56</u>	<u>22</u>	<u>19</u>	<u>45</u>	<u>24</u>	<u>166</u>
<u>GRAND TOTAL</u>	<u>515</u>	<u>75</u>	<u>65</u>	<u>102</u>	<u>102</u>	<u>859</u>

EXHIBIT VIII

SUMMARY OF UNITS OF EQUIPMENT IN USE
BY HIGHWAY CONSTRUCTION CONTRACTORS - ENTIRE ENTENTE STATES

<u>TYPE AND SIZE</u>	<u>IVORY COAST</u>	<u>TOGO</u>	<u>DAHOMY</u>	<u>NIGER</u>	<u>UPPER VOLTA</u>	<u>TOTAL ENTENTE</u>
<u>BULLDOZERS</u>						
Giant	3	-	-	-	-	3
Super	38	10	4	9	9	70
Heavy	21	5	1	11	2	40
Medium	5	6	-	-	-	11
Light	27	6	-	1	1	35
Total	<u>94</u>	<u>27</u>	<u>5</u>	<u>21</u>	<u>12</u>	<u>159</u>
<u>LOADERS ON TIRES</u>						
Super	6	-	-	-	-	6
Heavy	3	2	-	1	3	9
Medium	14	3	1	9	2	29
Light	6	5	3	1	2	17
Total	<u>29</u>	<u>10</u>	<u>4</u>	<u>11</u>	<u>7</u>	<u>61</u>
<u>LOADERS ON TRACKS</u>						
Heavy	5	-	-	1	2	8
Medium	8	2	-	3	-	13
Light	2	-	-	-	-	2
Total	<u>15</u>	<u>2</u>	<u>-</u>	<u>4</u>	<u>2</u>	<u>23</u>
<u>MOTORSCRAPERS</u>						
Super	6	-	-	-	-	6
Heavy	36	9	-	13	9	67
Medium	7	2	-	-	1	10
Total	<u>49</u>	<u>11</u>	<u>-</u>	<u>13</u>	<u>10</u>	<u>83</u>
<u>MOTORGRADERS</u>						
Super	4	-	-	-	-	4
Heavy	15	8	-	8	1	32
Medium	26	5	4	14	8	57
Light	-	2	-	-	1	3
Total	<u>45</u>	<u>15</u>	<u>4</u>	<u>22</u>	<u>10</u>	<u>96</u>
<u>BACKHOES</u>						
<u>COMPACTORS (Auto)</u>						
Roller	39	12	4	6	4	65
Vibrating	28	4	-	3	4	39
on Tires	5	9	2	-	4	20
Total	<u>72</u>	<u>25</u>	<u>6</u>	<u>9</u>	<u>12</u>	<u>124</u>
<u>ROLLERS (Towed)</u>						
Vibrating	1	6	-	-	-	7
on Tires	7	3	-	-	-	10
Sheepfoot	17	-	-	2	1	20
Total	<u>25</u>	<u>9</u>	<u>-</u>	<u>2</u>	<u>1</u>	<u>37</u>
<u>MOTOR COMPRESSORS</u>						
	<u>54</u>	<u>7</u>	<u>5</u>	<u>-</u>	<u>4</u>	<u>70</u>
<u>WHEEL TRACTORS</u>						
Heavy	-	1	-	-	-	1
Medium	5	-	-	-	-	5
Light	10	3	-	-	1	14
Total	<u>15</u>	<u>4</u>	<u>-</u>	<u>-</u>	<u>1</u>	<u>20</u>
<u>GRAND TOTAL</u>	<u>420</u>	<u>116</u>	<u>26</u>	<u>83</u>	<u>62</u>	<u>707</u>

EXHIBIT IX

ESTIMATED COST OF EQUIPMENT -
PUBLIC WORKS DEPARTMENTS - ENTENTE STATES

<u>TYPE AND SIZE</u>	<u>IVORY COAST</u>	<u>TOGO</u>	<u>DAHOMY</u>	<u>NIGER</u>	<u>UPPER VOLTA</u>	<u>TOTAL</u>
		<u>(Thousands of C.F.A.)</u>				
<u>BULLDOZERS</u>						
Giant	-	-	-	-	-	-
Super	39,769	-	-	-	-	39,769
Heavy	220,989	7,000	67,000	77,400	170,000	542,389
Medium	244,380	62,000	35,000	70,600	-	411,980
Light	132,032	-	-	4,000	32,000	168,032
Total	<u>637,170</u>	<u>69,000</u>	<u>102,000</u>	<u>152,000</u>	<u>202,000</u>	<u>1,162,170</u>
<u>LOADERS ON TIRES</u>						
Super	-	-	-	-	-	-
Heavy	-	20,000	-	-	-	20,000
Medium	211,712	-	28,500	9,500	124,500	374,212
Light	3,005	45,000	1,500	34,600	-	84,105
Total	<u>214,717</u>	<u>65,000</u>	<u>30,000</u>	<u>44,100</u>	<u>124,500</u>	<u>478,317</u>
<u>LOADERS ON TRACKS</u>						
Heavy	-	-	-	-	-	-
Medium	8,980	10,000	-	-	-	21,980
Light	80,280	-	-	-	-	80,280
Total	<u>89,260</u>	<u>13,000</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>102,260</u>
<u>MOTORSCRAPERS</u>						
Super	-	-	-	-	-	-
Heavy	21,944	-	-	-	-	21,944
Medium	-	-	-	-	-	-
Total	<u>21,944</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>21,944</u>
<u>MOTORGRADERS</u>						
Super	-	-	-	-	-	-
Heavy	-	-	16,000	-	-	16,000
Medium	517,871	103,500	84,600	133,500	334,500	1,173,971
Light	166,070	30,000	-	-	-	196,070
Total	<u>683,941</u>	<u>133,500</u>	<u>100,600</u>	<u>133,500</u>	<u>334,500</u>	<u>1,386,041</u>
<u>BACKHOES</u>						
	27,604	-	-	-	-	27,604
<u>COMPACTORS (Auto)</u>						
Roller	48,897	17,000	-	5,200	3,600	74,697
Vibrating	8,629	-	-	2,700	3,600	14,929
on Tires	7,599	-	-	-	-	7,599
Total	<u>65,125</u>	<u>17,000</u>	<u>-</u>	<u>7,900</u>	<u>7,200</u>	<u>97,225</u>
<u>ROLLERS (Towed)</u>						
Vibrating	19,968	-	-	-	-	19,968
on Tires	25,618	27,200	-	5,400	-	58,218
Sheepfoot	5,664	-	-	-	-	5,664
Total	<u>51,250</u>	<u>27,200</u>	<u>-</u>	<u>5,400</u>	<u>-</u>	<u>83,850</u>
<u>MOTOR COMPRESSORS</u>						
	6,387	13,000	-	1,500	12,000	32,887
<u>WHEEL TRACTORS</u>						
Heavy	14,792	-	-	-	-	14,792
Medium	51,126	-	-	1,500	-	52,626
Light	-	29,000	20,700	48,800	36,000	134,500
Total	<u>65,918</u>	<u>29,000</u>	<u>20,700</u>	<u>50,300</u>	<u>36,000</u>	<u>201,918</u>
<u>GRAND TOTAL</u>	<u>1,863,316</u>	<u>366,700</u>	<u>253,300</u>	<u>394,700</u>	<u>716,200</u>	<u>3,594,216</u>

EXHIBIT X

ANALYSIS TO DETERMINE EFFECT OF
CUSTOMS DUTIES AND TAXES ON SPARE PARTS COSTS

PARTS FROM U.S.A.

<u>BY AIR-</u>	<u>MANUTENTION AFRICAINE-GASTONEGRE</u>			<u>C.F.A.O.</u>	<u>SARIACI</u>
	<u>(Cater Pillar)</u>			<u>(Internat'l)</u>	<u>(Richier)</u>
to:	<u>Abidjan</u>	<u>Niamey</u>	<u>Lome</u>	<u>Abidjan</u>	<u>Abidjan</u>
Cost - at Factory	100.0	100.0	100.0	100.0	100.0
Inland Freight	<u>6.8</u>	<u>6.5</u>	<u>6.8</u>	<u>0.8</u>	<u>-</u>
Cost - at Airport	106.8	106.5	106.8	100.8	100.0
Freight & Insurance	<u>31.7</u>	<u>38.0</u>	<u>36.5</u>	<u>15.2</u>	<u>50.0</u>
Cost - C.I.F. Cost	138.5	144.5	143.3	116.0	150.0
Tax & Customs Duty	55.8	60.0	48.7	78.4	61.0
Fee & Exp. of Customs Agent	6.7	6.3	7.0) 4.0) 3.8
Delivery	<u>10.0</u>	<u>29.2</u>	<u>10.0</u>		
Cost - at Warehouse	<u>211.0</u>	<u>240.0</u>	<u>209.0</u>	<u>198.4</u>	<u>214.8</u>
Customs Duty & Tax as % of C.I.F. Cost	40%	41.5%	34%	70%	40.6%
 <u>BY BOAT-</u>					
Cost - at Factory	100.0	100.0	100.0	100.0	100.0
Inland Freight	<u>2.0</u>	<u>8.5</u>	<u>2.0</u>	<u>4.0</u>	<u>1.0</u>
Cost - at Pier	102.0	108.5	102.0	104.0	101.0
Freight & Insurance	<u>10.0</u>	<u>21.5</u>	<u>10.1</u>	<u>2.5</u>	<u>10.0</u>
Cost - C.I.F., Abidjan	112.0	130.0	112.1	106.5	111.0
Tax & Customs Duty	44.8	42.0	38.5	72.0	61.0
Fee & Exp. of Customs Agent	5.5	6.0	6.0) 2.0) 3.1
Delivery	<u>15.7</u>	<u>27.0</u>	<u>15.8</u>		
Cost - at Warehouse	<u>178.0</u>	<u>205.0</u>	<u>172.4</u>	<u>180.5</u>	<u>175.1</u>
Customs Duty & Tax as % of C.I.F. Cost	40%	32.4%	34.5%	67.5%	55.0%

EXHIBIT XI

ANALYSIS TO DETERMINE EFFECT OF
CUSTOMS DUTIES AND TAXES ON SPARE PARTS COSTS

PARTS FROM COMMON MARKET

<u>BY AIR-</u>	MAN.AFR. (CTR) <u>Abidjan</u>	C.F.A.O. (Internat'l) <u>Abidjan</u>	SARIACI (Richier) <u>Abidjan</u>	C.I.C.A. (Hanomag) <u>Abidjan</u>
to:				
Cost - at Factory	100.0	100.0	100.0	100.0
Inland Freight	<u>7.0</u>	<u>0.8</u>	<u>-</u>	<u>-</u>
Cost - at Airport	107.0	100.8	100.0	100.0
Freight & Insurance	<u>32.0</u>	<u>15.2</u>	<u>50.0</u>	<u>35.0</u>
Cost - C.I.F., Abidjan	139.0	116.0	150.0	135.0
Tax & Customs Duty	55.6	61.0	60.0	66.5
Fee & Exp. of Customs Agent	7.0	} 4.0	4.0	2.0
Delivery	<u>10.0</u>			
Cost - at Warehouse	<u>211.6</u>	<u>181.0</u>	<u>214.0</u>	<u>203.5</u>
Customs Duty & Tax as % of C.I.F. Cost	40.0%	52.5%	40.0%	46.0%
 <u>BY BOAT-</u>				
Cost - at Factory	100.0	100.0	100.0	100.0
Inland Freight	<u>2.0</u>	<u>4.0</u>	<u>1.0</u>	<u>-</u>
Cost - at Pier	102.0	104.0	101.0	100.0
Freight & Insurance	<u>10.2</u>	<u>2.5</u>	<u>10.0</u>	<u>3.3</u>
Cost - C.I.F., Abidjan	112.2	106.5	111.0	103.3
Tax & Customs Duty	44.9	56.0	45.0	47.2
Fees & Exp. of Customs Agent	5.6	} 2.0	3.0	1.2
Delivery	<u>18.0</u>			
Cost - at Warehouse	<u>180.7</u>	<u>164.5</u>	<u>159.0</u>	<u>151.7</u>
Customs Duty & Tax as % of C.I.F. Cost	40.0%	52.5%	40.0%	46.0%

EXHIBIT XII

METHOD EMPLOYED IN MAKING STUDY OF SPARE PARTS MANAGEMENT IN THE ENTENTE STATES

In making this study, we endeavored to interview and obtain pertinent data from each principal dealer/supplier, public works department, and the various kinds of major end-users such as road building contractors and public enterprises engaged in land clearing for agricultural development, logging and mining enterprises. We began with a series of personal interviews, asking questions and taking notes, and recording our observations on tours of repair shops and storerooms. Since this produced rather scanty data, and little historical trend data, we then developed a set of questionnaires in the French language for use with importer/dealers and the major end-users. After a brief field test the questionnaires were reproduced and assembled in sets as follows:

- a) For suppliers and dealers, to elicit data as to:
 1. Variety of equipment lines represented and for how long.
 2. Number of units of each principal line of equipment in use in the country, by type and size classification, and its estimated value.
 3. Unit sales for the three years (1969, 1970 and 1971) in the same detail.
 4. Estimated sales deliveries for the year 1972 in the same detail.
 5. Estimated sales and open orders for the year 1973 in the same detail.
 6. Projected unit sales for the years 1973, 1974 and 1975 in the same detail.
 7. Monetary data for 1969, 1970, 1971 and 1972 (if available) as to:
 - Total annual net sales, for the firm as a whole, and the corresponding net sale amounts for road building and maintenance equipment, and sales of spare parts related to such equipment and
 - For spare parts, monetary data as to inventories, stock receipts and issues, so as to arrive at a measure of annual stock turnover.
 8. General questions on spare parts procurement practices, the relative size of spare parts stocks in central and field depots, and the relative proportion of parts procurement by boat and air freight from European and U.S. depots.

EXHIBIT XII (Cont'd.)

9. Analysis of spare parts in inventory values, to develop the relative proportion of fast moving, routine replacement, slow moving and obsolete and unuseable items.
10. An analysis of the cost of spare parts delivered into warehouse, segregating those from the U.S.A. and from Common Market countries with each class divided as to parts received by boat versus by air freight, in the following cost detail:
 - Cost F.O B. point of origin,
 - Freight or transport cost to point of boat/air shipment, Sub-total: Cost at point of embarkment/air shipment,
 - Freight, insurance and other shipping costs by boat/air,
 - C.I.F. Cost at Abidjan (or Lome, Cotonou, Niamey/Ouagadougou)
 - Taxes & Customs Duty and Expenses of Customs Clearance,
 - Cost of delivery to warehouse, and placing in stock,
 - Total Cost at warehouse in Abidjan, Lome, Cotonou or Ouagadougou, and
 - Total List Price, and the
 - Ratio of such List Price to the Total Cost at Warehouse.

The questionnaires set as used for suppliers and dealers is included immediately hereafter as a sample as EXHIBIT XII-A.

b) For major-end users of all types (public works departments, public enterprises, and highway construction contractors) we presented the same set but without the first page (equipment lines represented) and with a different page 7 (attached hereafter as EXHIBIT XII-B), which inquired into purchases, instead of sales, for the same year as to:

- Total annual purchases of road equipment, and
- For spare parts, monetary data as to inventories, stock receipts and issues, with related measure of annual stock turnover.

Generally, the sets of forms were presented to top management of importers or dealers, to be farmed out among their accountants/managers, and to heads of public enterprises and contracting firms. In some cases it was necessary to leave them to be filled out, and then retrieve them in a final visit to the firm.

In planning interview coverage in each of the Entente States, we developed lists of the principal importers and major end-users by type of activity, their addresses and principal officers from directories and conferences with U S. Embassy Commercial Attaches, and then determined the relative priority of interview, and verified possible contacts and introductions with appropriate Public Works officials.

We found that in Abidjan that appointments for interviews were an absolute necessity; these were arranged through the help of the Entente Fund,

EXHIBIT XII (Cont'd)

at first, and then by the office of Mr. Yao, Director of Material of the Department of Public Works. To obtain interviews at the principal public enterprises, it was necessary to secure letters of introduction from the Ministry of Agriculture, which was arranged by the Entente Fund. We were able to contact the principal importers readily, with the help of Mr. Yao's office, or other introductions.

In general, our aim was to have first official contact in each capital city with the Department of Public Works, in conformity with the itinerary and schedule planned with Mr. Jean Pierre Dupressoir of the Entente Fund, and to obtain a vehicle for transportation as soon as possible; in most cases we were met at the airport by representatives of the Department of Public Works; and at our first interview they advised us of pending road construction projects, the name of the contractor concerned, and arranged our interviews at the Public Works repair shops and principal warehouse, and contacts with advisory teams.

The Caterpillar manager in Abidjan also alerted the Caterpillar agency in each other Entente Capital of our coming, and these contacts enabled us to quickly indentify the major end-users identity and the locale of their principal operation or offices, name of principal officials, and most important, the relative type and size of customer equipment holdings. Thereafter, it was usually possible to obtain interviews by telephone or by personal visit.

EXHIBIT XII - A

Questionnaires Used for
Suppliers and Dealers

THE J.G. WHITE ENGINEERING CORPORATION
USAID - Entente Fund Spare Parts Study
Lloyd C. Hoeltzel, Chief of Party

US AID - Conseil de l'Entente
Etude sur la Gestion de pièces déta-
chées d'Engins de Travaux Publics

Date de l'Entrevue

Avec M.
(Titre)

Nom de l'Entreprise
Adresse

Questions Générales

Quelles sont les marques d'engins de Travaux Publics, ou d'Industrie Forestière ou servant au développement agricole que vous avez à l'agence de _____ (pays) ?

MARQUES

FABRIQUE EN
(Ville, Pays)

AGENT DEPUIS
(Année)

Camions (Trucks)

Déchargeurs (Dumpers)

Remorques (Trailers)

Tracteurs Agricoles (Row Crops)

Autre équipement agricole

Pneus (tracteurs, ou automotrice?)

Malaxeur de ciment (toupie)

Générateurs moteurs

Date Entrevue avec
Nom de l'Entreprise
Adresse

ENGINS ACHETES CHAQUE ANNEE (Utilisateurs)
ENGINS VENDUS CHAQUE ANNEE (Importateurs)

	1969		1970		1971	
	Quan- tité	Va- leur	Quan- tité	Va- leur	Quan- tité	Va- leur
<u>BULLDOZERS</u>						
	+ de 350	Géant				
	250 à 300	Super				
	150 à 200	Lourd				
	100 à 150	Moyen				
	60 à 100	Léger				
<u>CHARGEUSE A PNEUS</u>						
	+ de 150	Lourd				
	90 à 100	Moyen				
	à 90	Léger				
<u>CHARGEUSE FORESTIERE</u>						
(Lumber Fork)	+ de 200	Lourd				
	125 à 150	Moyen				
<u>PAY LOGGER</u>						
	+ de 125	Lourd				
	100 à 125	Moyen				
	60 à 100	Léger				
<u>CHARGEUSE CHENILLE</u>						
	+ de 180	Lourd				
	100 à 125	Moyen				
	60 à 100	Léger				
<u>ROULEAUX VIBRANTS</u>						
(Rollers) Compresseurs						
Pieds de mouton						
<u>MOTOR SCRAPERS</u>						
	+ de 400	Super				
	250 à 300	Lourd				
	135 à 150	Moyen				
<u>NIVELEUSES</u>						
(Motor Graders)	125 à 140	Lourd				
	75 à 115	Moyen				
<u>PELLES OLEOMECANIQUES</u>						
(Back Hoes)	+ de 150	Lourd				
	100 à 140	Moyen				
	60 à 100	Léger				
<u>TRACTEURS A ROUES</u>						
(Wheel tractors)	+ de 200	Lourd				
	70 à 100	Moyen				
	50 à 70	Léger				
<u>DEBROUSAILLEURS</u>						
<u>COMPRESSEURS A MOTEURS</u>						
<u>AUTRES ENGINs</u>						
<u>MONTANT (TOTAL)</u>						

Date Entrevue avec
 Nom de l'Entreprise
 Adresse

PREVISION D'ACHAT (OU DE VENTE) D'ENGINS POUR

VARIETE D'ENGINS C.V. Classe

1973 * 1974 1975
 Quan- Va- Quan- Va- Quan Va-
 tité leur tité leur tité leur

BULLDOZERS + de 350 Géant
 250 à 300 Super
 150 à 200 Lourd
 100 à 150 Moyen
 60 à 100 Léger

CHARGEUSE A PNEUS + de 150 Lourd
 90 à 100 Moyen
 à 90 Léger

CHARGEUSE FORESTIERE + de 200 Lourd
 (Lumber Fork) 125 à 150 Moyen

SKID LOGGER + de 125 Lourd
 100 à 125 Moyen
 60 à 100 Léger

CHARGEUSE CHENILLE + de 180 Lourd
 (Crawler Loader) 100 à 125 Moyen
 60 à 100 Léger

ROULEAUX VIBRANTS
 (Rollers) Compresseurs
 Pieds de mouton

MOTOR SCRAPERS + de 400 Super
 250 à 300 Lourd
 135 à 150 Moyen

NIVELEUSES 125 à 140 Lourd
 75 à 115 Moyen

PALLES OLEOMECANIKES
 (Back Hoes) + de 150 Lourd
 100 à 140 Moyen
 60 à 100 Léger

TRACTEURS A ROUES + de 200 Lourd
 70 à 100 Moyen
 50 à 70 Léger

DEBROUSAILLEURS

COMPRESSEURS A MOTEURS

AUTRES ENGINS

MONTANT (TOTAL)

* Pour 1973, indiquez si le budget a été approuvé.

DONNEES SUR LE CHIFFRE D'AFFAIRE

(En millions de Frs CFA)

1970 1971 1972 1973 (estimé)

Chiffre d'Affaire annuel

Quelle part du Chiffre d'Affaire est réalisée par la vente de:

- a) Engins de Travaux Publics
 (voyez la liste détaillée SVP)
- b) Pièces détachées pour ces engins de Travaux Publics

Pourcentage en engins

Pourcentage en pièces détachées

De la vente de pièces détachées quel pourcentage est vendu au détail aux clients qui effectuent leurs propres réparations.

Des commandes de pièces détachées quel pourcentage est tiré directement du stock et est livrable sans délai ?

DONNEES FINANCIERES (de vos stocks de pièces détachées, leur achat et approvisionnement et leur rotation annuelle)

(En million de francs CFA)

1970 1971 1972 1973 (estimé)

Inventaire en début d'année

Plus: - achats en cours d'année pour le stock

Montant disponible

Moins: - retraits du stock

Balance: Inventaire en fin d'année

	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u> (estimé)
Inventaire en début d'année	-----	-----	-----	-----
Plus: - achats en cours d'année pour le stock	-----	-----	-----	-----
Montant disponible	-----	-----	-----	-----
Moins: - retraits du stock	-----	-----	-----	-----
Balance: Inventaire en fin d'année	=====	=====	=====	=====

Coefficient de rotation annuelle du stock

(Retrait du stock divisé par la valeur moyenne de l'inventaire)

THE J.G. WHITE ENGINEERING CORPORATION
 USAID - Entente Fund Spare Parts Study
 Lloyd C. Hoeltzel, Chief of Party

US AID - Conseil de l'Entente
 Etude sur la Gestion de Pièces Détachées d'Engins de Travaux Publics

Date _____ Entrevue avec _____
 Nom de l'Entreprise _____
 Adresse _____

COMMENTAIRES AU SUJET DES PIECES DETACHEES

Nombre d'articles (par ligne) en stock : _____

Montant de leur coût d'achat (millions CFA) _____

Votre stock de pièces détachées, est-il : Centralisé _____
 Éparpillé _____

Si vous avez des stocks éparpillés indiquez, s'il vous plait,
 leur localité, nombres d'articles, et leur coût d'achat :

<u>LOCALITE</u>	<u>ESPECE D'ARTICLES</u>	<u>NOMBRE (par ligne)</u>	<u>COUT D'ACHAT</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Origines principales des Pièces Détachées :

<u>MARQUES</u>	<u>VILLE</u>	<u>COUT D'ACHAT</u>	<u>POURCENTAGE</u>	<u>RECU</u>
	<u>& PAYS</u>	<u>(MILLIONS C.F.A.)</u>	<u>PAR AVION</u>	<u>PAR BATEAU</u>
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Remises données par Vendeurs (Pourcentage du Prix Catalogué) _____
 (ou Pourcentage de Montant annuel des achats) _____

Avez-vous des Contrats d'Achats avec vos vendeurs au taux de :

Remise du prix catalogue _____
 Sur le montant d'achats annuels _____
 Stockage d'articles spécifiés : Centrale _____
 Éparpillé _____

Pour la livraison des articles pour entretien d'engins en chantier,

Utilisez-vous : camionnettes _____

Camionage Commercial _____

Transport Aérienne _____

THE J.G. WHITE ENGINEERING CORPORATION
 USAID - Entente Fund Spare Parts Study
 Lloyd C. Hoeltzel, Chief of Party

US AID - Conseil de l'Entente
 Etude sur la Gestion de pièces détachées d'engins de Travaux Publics

ANALYSE D'ETAT D'INVENTAIRE

1970 1971 1972 1973 (estimé)

De l'inventaire de fin d'année
 quelle partie a été :

(Arrondi en millions de Francs CFA)

En mouvement rapide

(Pièces d'usage, c.a.d.
 courroies, filtres et
 injector nozzles)

De rechange de routine

(Routine replacement)
 (c.a.d. transmission gears, pistons,
 sleeves and sprocket, bearings)

En mouvement lent

(Slow-moving and inactive)
 c.a.d. Track-roller frames
 housing-all kinds, track
 assemblies etc.

Désuet et hors d'usage

Obsolete and unusable

Montant de l'Inventaire

=====	=====	=====	=====
=====	=====	=====	=====

Pourcentage:

En mouvement rapide

De rechange de routine

En mouvement lent

Désuet et hors d'usage

=====	=====	=====	=====
100%	100%	100%	100%
=====	=====	=====	=====

Procédure comptable de la perte
 totale de la partie désuet/
 Hors d'Usage
 (Write-off of slow-moving
 obsolete)

Traitement comptable de la
 vente de ferraille.
 Scrap sales - how treated ?

Perte totale d0 aux désuet/ Hors
 d'usage

Date Entrevue avec
 Nom de l'Entreprise
 Adresse

ANALYSE DES ACHATS POUR APPROVISIONNEMENT DE PIECES DETACHEES
 D'ENGINS DE TRAVAUX PUBLICS PAR DES IMPORTATEURS OU DES
 ENTREPRISES DE CONSTRUCTION ROUTIERE.-

(Pour l'Année 1972, en millions de Francs CFA)

Détails, Achats de Pièces Détachées	AUX ETATS-UNIS (U.S.A.) par		:	AU MARCHÉ COMMUN (Common Market) par		:	AUTRES PAIS D'EUROPE (ou entrepôt) par	
	Avion	Bateau		Avion	Bateau		Avion	Bateau
Coût (cost) F.O.B. localité (place) d'origine	- - - -	- - - -	:	- - - -	- - - -	:	- - - -	- - - -
Plus fret ou frais de transport au lieu d'embarquement	- - - -	- - - -	:	- - - -	- - - -	:	- - - -	- - - -
Montant : Coût au lieu d'embarquement	- - -	- - -	:	- - -	- - -	:	- - -	- - -
Plus Fret, Assurance Frais d'Expédition, par Avion, ou Bateau	- - -	- - -	:	- - -	- - -	:	- - -	- - -
Montant : Coût CIF ABIDJAN	- - -	- - -	:	- - -	- - -	:	- - -	- - -
Taxe	- - -	- - -	:	- - -	- - -	:	- - -	- - -
Douane	- - -	- - -	:	- - -	- - -	:	- - -	- - -
Frais de l'Agent en Douane, Timbres, et autres frais de dédouanement	- - - -	- - - -	:	- - - -	- - - -	:	- - - -	- - - -
Frais de livraison au magasin, et coût d'emménagement	- - -	- - -	:	- - -	- - -	:	- - -	- - -
Coût au magasin d'ABIDJAN	=====	=====	:	=====	=====	:	=====	=====
Tarif Catalogue (List Price)	- - - -	- - - -	:	- - - -	- - - -	:	- - - -	- - - -
Rapports des tarifs de catalogue au coût en magasin, ABIDJAN	- - - -	- - - -	:	- - - -	- - - -	:	- - - -	- - - -

EXHIBIT XII - B

Seventh Page as Used for

Major End-Users

THE J.G. WHITE ENGINEERING CORPORATION
 USAID - Entente Fund Spare Parts Study
 Lloyd C. Hoeltzel, Chief of Party

US AID - Conseil de l'Entente
 Etude sur la Gestion de pièces détachées d'engins de Travaux Publics

DONNEES SUR LES ACHATS ANNUELS

(En millions de francs CFA)

	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u> (estimé)
Montant des achats annuels (Total Annual purchases)	---	---	---	---
Quelle part des achats de Matériel est consacrée à l'approvisionnement				
a) Engins de Travaux Publics (voyez la liste détaillée SVP)				
b) Pièces détachées pour ces engins de Travaux Publics				
Pourcentage en engins				
Pourcentage en Pièces détachées				
De l'achat de pièces détachées quel pourcentage les ateliers éparpillés en obtiennent au détail pour effectuer à leurs propres réparations ?				
Des commandes de pièces détachées quel pourcentage est obtenu directement du stock sans délai.				

DONNEES FINANCIERES (de vos stocks de pièces détachées, leur achat et
 approvisionnement et leur rotation annuelle)

(En millions de francs CFA)

	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u> (estimé)
Inventaire en début d'année				
Plus : - achats en cours d'année pour le stock	---	---	---	---
Montant disponible				
Moins: - retraits du stock	---	---	---	---
Balance: inventaire en fin d'année	==	==	==	==

Coefficient de rotation annuelle
 du stock

(Retrait de stock divisé par la valeur
 moyenne de l'inventaire)

NOMBRE CONFIDENTIEL _ _ _ _ _

EXHIBIT XIII

RECAP - UNITS IN SERVICE

AND

PARTS INVENTORIES AND ESTIMATED 1973 PURCHASES

IVORY COAST

<u>AGENCY OR ENTERPRISE</u>	<u>NO. OF UNITS OF EQUIP.</u>	<u>PARTS INVENTORIES</u>		<u>EST. 1973 PURCHASES (MILLS. OF C.F.A.)</u>
		<u>(MILLIONS OF C.F.A.)</u>	<u>DOLLAR EQUIV.</u>	
PUBLIC WORKS	515	50.0	\$ 200,000	384.0
MOTORAGRI	117	73.0	292,000	250.0
A.V.B.	110	202.0	807,000	120.0
A.R.S.O.	18	5.0	20,000	20.0
SERVICE CIVIQUE	70	6.0	24,000	N.S.
SODEPALM-PALMIUOIRE	122	50.0	200,000	Sporadic
SODESUCRE (New)	<u>95</u>	<u>12.5</u>	<u>50,000</u>	<u>"</u>
<u>SUB-TOTAL</u>	<u>1,047</u>	<u>398.5</u>	<u>\$1,593,000</u>	<u>774.0</u>
<u>CONTRACTORS</u>				
COLAS	23	9.0	\$ 36,000	21.0
DRAGAGES	79	40.0	160,000	40.0
G.A.R.N.O.C.I.	60	43.0	172,000	120.0
J. LEFEBVRE	57	2.0	8,000	120.0
L.T.P.A.	36	1.0	4,000	60.0
S.A.T.P.	28	4.0	16,000	20.0
S.O.F.R.A.	48	25.0	100,000	55.0
VIANINI	<u>89</u>	<u>30.0</u>	<u>120,000</u>	<u>150.0</u>
<u>TOTAL CONTRACTORS</u>	<u>420</u>	<u>154.0</u>	<u>\$ 616,000</u>	<u>586.0</u>

EXHIBIT XIV

RECAP - UNITS IN SERVICE

AND

PARTS INVENTORIES AND ESTIMATED 1973 PURCHASES

TOGO

<u>AGENCY OR ENTERPRISE</u>	<u>NO. OF UNITS OF EQUIP.</u>	<u>PARTS INVENTORIES</u>		<u>EST. 1973 PURCHASES (MILLS. OF C.F.A.)</u>
		<u>(MILLIONS OF C.F.A.)</u>	<u>DOLLAR EQUIV.</u>	
PUBLIC WORKS	86	100.0	\$400,000	35.0
CERFER (R.R.M.T.C.)	35	54.0	216,000	8.0
MILITARY	16	5.0	20,000	15.0
PHOSPHATE MINE	<u>15</u>	<u>50.0</u>	<u>200,000</u>	<u>10.0</u>
<u>SUB-TOTAL</u>	<u>152</u>	<u>209.0</u>	<u>\$836,000</u>	<u>68.0</u>
<u>CONTRACTORS</u>				
B.O.K.A.	3	1.5	\$ 6,000	3.0
C.O.L.A.S.	24	20.0	80,000	20.0
G.T.E.	17	10.0	40,000	20.0
S.A.T.O.M.	46	33.0	132,000	50.0
S.O.F.R.A.	8	4.0	16,000	8.0
U.D.E.C.	<u>18</u>	<u>4.0</u>	<u>16,000</u>	<u>18.0</u>
<u>TOTAL CONTRACTORS</u>	<u>116</u>	<u>72.5</u>	<u>\$290,000</u>	<u>119.0</u>

EXHIBIT XV

RECAP - UNITS IN SERVICE

AND

PARTS INVENTORIES AND ESTIMATED 1973 PURCHASES

DAHOMY

<u>AGENCY OR ENTERPRISE</u>	<u>NO. OF UNITS OF EQUIP.</u>	<u>PARTS INVENTORIES</u>		<u>EST. 1973 PURCHASES (MILLS. OF C.F.A.)</u>
		<u>(MILLIONS OF C.F.A.)</u>	<u>DOLLAR EQUIV.</u>	
PUBLIC WORKS	65	41.0	\$164,000	16.0
MILITARY	11	3.0	12,000	2.2
MISC. AGRI. DEVEL.	<u>15</u>	<u>0.5</u>	<u>2,000</u>	<u>3.0</u>
SUB-TOTAL	<u>91</u>	<u>44.5</u>	<u>\$178,000</u>	<u>21.2</u>
<u>CONTRACTORS</u>				
COLAS	7	5.5	\$ 22,000	Dormant
DRAGAGES	7	-	-	"
G.T.E.	<u>12</u>	<u>6.0</u>	<u>24,000</u>	<u>"</u>
<u>TOTAL CONTRACTORS</u>	<u>26</u>	<u>11.5</u>	<u>\$ 46,000</u>	<u>-</u>

EXHIBIT XVI

RECAP - UNITS IN SERVICE

AND

PARTS INVENTORIES AND ESTIMATED 1973 PURCHASES

NIGER

<u>AGENCY OR ENTERPRISE</u>	<u>NO. OF UNITS OF EQUIP.</u>	<u>PARTS INVENTORIES</u>		<u>EST. 1973 PURCHASES (MILLS. OF C.F.A.)</u>
		<u>(MILLIONS OF C.F.A.)</u>	<u>DOLLAR EQUIV.</u>	
PUBLIC WORKS	102	42.0	\$168,000	66.0
MILITARY	-	N.S.	-	N.S.
URANIUM MINE	<u>12</u>	<u>50.0</u>	<u>200,000</u>	<u>18.0</u>
<u>SUB-TOTAL</u>	<u>114</u>	<u>92.0</u>	<u>\$368,000</u>	<u>84.0</u>
<u>CONTRACTORS</u>				
DRAGAGES	36	157.0	\$630,000	95.0
G.T.E.	-	2.0	8,000	Dormant
LAMARRE ET VALOIS	11	8.0	32,000	17.0
S.A.T.O.M.	15	22.0	88,000	18.0
S.N.G.T.N.	<u>21</u>	<u>30.0</u>	<u>120,000</u>	<u>25.0</u>
<u>TOTAL CONTRACTORS</u>	<u>83</u>	<u>219.0</u>	<u>\$878,000</u>	<u>155.0</u>

EXHIBIT XVII

RECAP - UNITS IN SERVICE

AND

PARTS INVENTORIES AND ESTIMATED 1973 PURCHASES

UPPER VOLTA

<u>AGENCY OR ENTERPRISE</u>	<u>NO. OF UNITS OF EQUIP.</u>	<u>PARTS INVENTORIES</u>		<u>EST. 1973 PURCHASES (MILLS. OF C.F.A.)</u>
		<u>(MILLIONS OF C.F.A.)</u>	<u>DOLLAR EQUIV.</u>	
PUBLIC WORKS	102	40.0	\$160,000	60.0
MILITARY	6	3.0	12,000	4.0
AGRI. DEVEL.	12	5.0	20,000	8.0
OTHER GOVT.	<u>10</u>	<u>4.0</u>	<u>16,000</u>	<u>5.0</u>
<u>SUB-TOTAL</u>	<u>130</u>	<u>52.0</u>	<u>\$208,000</u>	<u>77.0</u>
<u>CONTRACTORS</u>				
BOURDIN & CHAUSSEE	41	50.0	\$200,000	105.0
L. T. P. A.	<u>21</u>	<u>5.0</u>	<u>20,000</u>	<u>35.0</u>
<u>TOTAL CONTRACTORS</u>	<u>62</u>	<u>55.0</u>	<u>\$220,000</u>	<u>140.0</u>

EXHIBIT XVIII

ANALYSIS OF EQUIPMENT MAKES & SIZES

IN USE PUBLIC WORKS DEPARTMENTS - ENTENTE

BULLDOZERS

<u>SIZE OF EQUIPMENT & UNITS BY MAKE</u>	<u>IVORY COAST</u>	<u>TOGO</u>	<u>DAHOMY</u>	<u>NIGER</u>	<u>UPPER VOLTA</u>	<u>TOTAL</u>
<u>BULLDOZERS</u>						
<u>CATERPILLAR</u>						
Super - D8	2	-	-	-	-	2
Heavy - D7	20	1	2	4	4	31
Medium - D6	-	5	2	7	-	14
Light - D4	8	-	-	-	4	12
	<u>30</u>	<u>6</u>	<u>4</u>	<u>11</u>	<u>8</u>	<u>59</u>
<u>CONTINENTAL</u>						
Heavy - CD8 ^{E/D}	8	-	2	1	10	21
Medium - " C	9	-	2	-	-	11
	<u>17</u>	<u>-</u>	<u>4</u>	<u>1</u>	<u>10</u>	<u>32</u>
<u>HANOMAG</u>						
Heavy K16E	4	-	-	-	-	4
" K15E	12	-	-	-	-	12
Light K8E	5	-	-	-	-	5
	<u>21</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>21</u>
<u>ALLIS-CHALMERS</u>						
Heavy H16D	-	-	2	-	-	2
	<u>-</u>	<u>-</u>	<u>2</u>	<u>-</u>	<u>-</u>	<u>2</u>
<u>J. I. CASE</u>						
Light - 850	-	-	-	1	-	3
	<u>-</u>	<u>-</u>	<u>-</u>	<u>1</u>	<u>-</u>	<u>3</u>
<u>INTERNATIONAL HARVESTER</u>						
Light TD9B	17	-	-	-	-	17
	<u>17</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>17</u>
FIAT - Light AD7	2	-	-	-	-	2
	<u>2</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>2</u>
<u>TOTAL BULLDOZERS</u>	<u>89</u>	<u>6</u>	<u>10</u>	<u>13</u>	<u>18</u>	<u>136</u>
RECAP - SUPER	2	-	-	-	-	2
HEAVY	44	1	6	5	14	70
MEDIUM	9	5	4	7	-	25
LIGHT	34	-	-	1	4	39

EXHIBIT XIX

ANALYSIS OF EQUIPMENT MAKES & SIZES

IN USE PUBLIC WORKS DEPARTMENTS - ENTENTE

LOADERS ON TRACKS & ON TIRES

<u>SIZE OF EQUIPMENT & UNITS BY MAKE</u>	<u>IVORY COAST</u>	<u>TOGO</u>	<u>DAHOMY</u>	<u>NIGER</u>	<u>UPPER VOLTA</u>	<u>TOTAL</u>
<u>LOADERS ON TRACKS</u>						
<u>CATERPILLAR</u>						
Medium	-	2	-	-	-	2
<u>INTERNATIONAL HARVESTER</u>						
Medium - 175B	2	-	-	-	-	2
Light - 150	15	-	-	-	-	15
<u>FIAT</u> - Light - FL8	2	-	-	-	-	2
<u>MASSEY FERGUSON</u>						
Light - MF3366	<u>2</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>2</u>
TOTAL ON TRACKS	<u>21</u>	<u>2</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>23</u>
<u>LOADERS on TIRES</u>						
<u>CATERPILLAR</u>						
Heavy - 966	-	2	-	-	-	2
Medium - 930/950	-	-	2	-	-	2
Light - 920	-	5	-	4	-	9
<u>MICHIGAN</u>						
Medium - 55A	1	-	1	2	13	17
Light - 35AF	-	-	1	-	-	1
<u>ALLIS CHALMERS</u>						
Medium	-	-	5	-	-	5
<u>PETTIBONE</u> - Light	-	-	-	1	-	1
<u>HOUGH</u> - Light	2	-	-	-	-	2
<u>DAN POWER</u> - Medium	30	-	-	-	-	30
<u>HANOMAG</u> - Medium B8b	<u>14</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>14</u>
TOTAL ON TIRES	<u>47</u>	<u>7</u>	<u>9</u>	<u>7</u>	<u>13</u>	<u>83</u>
TOTAL LOADERS	<u>68</u>	<u>9</u>	<u>9</u>	<u>7</u>	<u>13</u>	<u>106</u>
RECAP - HEAVY	-	2	-	-	-	2
- MEDIUM	47	2	8	2	13	72
- LIGHT	21	5	1	5	-	32

EXHIBIT XX

ANALYSIS OF EQUIPMENT MAKES & SIZES

IN USE PUBLIC WORKS DEPARTMENTS - ENTENTE

MOTORGRADERS

<u>SIZE OF EQUIPMENT & UNITS BY MAKE</u>	<u>IVORY COAST</u>	<u>TOGO</u>	<u>DAHOMY</u>	<u>NIGER</u>	<u>UPPER VOLTA</u>	<u>TOTAL</u>
<u>MOTORGRADERS</u>						
<u>CATERPILLAR</u>						
Medium - 120	14	9	-	-	-	23
" - 12F	<u>56</u>	<u>10</u>	<u>-</u>	<u>2</u>	<u>-</u>	<u>68</u>
	<u>70</u>	<u>19</u>	<u>-</u>	<u>2</u>	<u>-</u>	<u>91</u>
<u>RICHER</u>						
Medium - N530	<u>31</u>	<u>-</u>	<u>2</u>	<u>20</u>	<u>36</u>	<u>89</u>
<u>ALLIS CHALMERS</u>						
Light - DD	<u>86</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>86</u>
<u>ADAMS</u>						
Heavy - 550	-	-	4	-	-	4
Medium - 440	<u>-</u>	<u>-</u>	<u>7</u>	<u>-</u>	<u>-</u>	<u>7</u>
	<u>-</u>	<u>-</u>	<u>11</u>	<u>-</u>	<u>-</u>	<u>11</u>
<u>FRISCH</u>						
Medium - 138W	<u>-</u>	<u>-</u>	<u>12</u>	<u>-</u>	<u>-</u>	<u>12</u>
<u>WAKEFIELD</u>						
Medium - F210	<u>3</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>3</u>
<u>RMV</u>						
Medium - 125W	<u>-</u>	<u>-</u>	<u>2</u>	<u>-</u>	<u>-</u>	<u>2</u>
<u>GALION</u>						
Medium - 116	<u>1</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>1</u>
<u>TOTAL MOTORGRADERS</u>	<u>191</u>	<u>19</u>	<u>27</u>	<u>22</u>	<u>36</u>	<u>295</u>
RECAP - HEAVY	-	-	4	-	-	4
- MEDIUM	105	19	23	22	36	201
- LIGHT	86	-	-	-	-	86