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PHASE 1 - ROLLING STOCK MAINTENANCE EXISTING SITUATION

Objective

To update assessment of the rolling stock maintenance existing situation so as to be able to make sound and feasible recommendations.

Method of Work

The Consultant's Rolling Stock Engineering and Maintenance Expert and the Workshop Management and Equipment Expert will collect, review and analyze the existing data in cooperation with the TRACECA Local Staff.

TASK 1 - DATA COLLECTION AND REVIEW

Objective

To review all available, reliable and updated data which will be used as input to all tasks of Phase 1.

Approach

Being the first team member on the site, the Project Manager will initiate the data collection process by meeting the TRACECA Counterparts involved in the project. He will gather documents, reports, maps, charts, graphs and other relevant data and statistics from the rail Companies, Ministries of Transport, rail-related Institutions and organizations.

He will obtain data from the different projects performed by the Consultant in the TRACECA region since 1992. They include: Central Asia Outline Transport Strategy, the TIMOG Project in Georgia, Governmental Advice to the railway Department and Training in Armenia and Turkmenistan. All these projects provide a relevant and up to date basis for the present project.

The Consultant's team will also examine all the reports that have been prepared by the financial institutions as TACIS, EBRD or UN. These include:

Rail Management Restructuring Studies (Armenia, Turkmenistan, Azerbaijan TACIS)

Rail Sector Survey (Russia, Ukraine, Kazakstan & Bielorussia EBRD)

Roads & Road Transport Study (Russia, Ukraine, Kazakstan & Bielorussia EBRD)

Central Asia Outline Transport Strategy (Kazakstan, Kyrgyzstan, Turkmenistan, Uzbekistan EBRD/TACIS)

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Caspian & Black Sea Port Studies (Georgia, Azerbaijan, Turkmenistan, Uzbekistan EBRD/TACIS)

ESCAP Studies (Asia UN)

The Consultant will also review the following TRACECA projects. Its preparation of tenders and eventual involvement in some of them will greatly expedite this task:

Regional Traffic Forecasting Model, Review of International Route Capacity
Corridor Feasibility Study Europe-Asia
Forwarding-Multi-modal Transport Systems
Infrastructure Maintenance - Railways
Inland Terminals - Railways
Trade Facilitation, Customs Procedures, Freight Forwarding
Transport Legal Reform

Finally, specific TRACECA Projects are expected to start shortly, from which the Consultant will draw upon the findings and results so as to avoid duplication of data collection and loss time. Other related projects which may be expected to start within the time frame of the present project will also be examined.

Each Expert will carry out site investigation in every TRACECA country and will complete the abovementioned data collection by meeting his local counterparts.

Task 1 Responsibility

The Consultant's experts, each in his specialty, together with TRACECA Local Staff and counterparts.

TASK 2 - EXISTING ROLLING STOCK FLEET

Objective

Identify for each state the size and categories of the operational fleet, whether currently in use or not. Specify the performance characteristics, current usage and maintenance standard for each major category. Identify infrastructure restrictions for rolling stock usage. Make a synthesis for the TRACECA region. This task will be input to Phase 2 Task 9.

Approach

The Consultant will first review the characteristics of the railways of each state: number of lines, length, gauge, number of sections in tunnel and above ground, and distance between stations, so as to have a broad knowledge of the existing capacity of the region.

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In dealing with the rolling stock fleet and its maintenance standard, the Consultant will scrutinize on-going studies and plans to record the following main issues:

- Ø The size of the fleet, divided into main categories
 - Motive power:
 - Electric/diesel locomotives;
 - Electric/diesel railcars or multiple units;
 - Shunting locomotives
 - Carriages
 - Passenger coaches
 - Freight wagons

The inventory will be broken down into main categories.

For each main category a data sheet will be drawn up, containing:

- Number of vehicles
- Performance characteristics
- Age and maintenance condition
- Maintenance facility currently responsible for maintenance
- Current usage
- Whether part of transnational or international pool
- Need for short term repair & maintenance
- Possibilities for refurbishment or modification
- Other relevant information

These data sheets will be developed per main category for each of the TRACECA States

In cooperation with the Workshop expert, the current maintenance techniques and strategies will be recorded per state, as well as the maintenance methods applied in the previous united states.

Furthermore, the infrastructure dependent restriction on the usage of rolling stock will be identified. By this is meant the restrictions stemming from stabling areas, shunting facilities, platform lengths, workshop lay-outs etc.

Task 2 Responsibility

As Task 2 and Task 5 are very integrated tasks, the Consultant's Rolling Stock Engineering & Maintenance Expert and the Workshop Management & Equipment Expert will work together with the Project Manager in cooperation with TRACECA Local Staff especially Rolling Stock and Maintenance specialists of each state.

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TASK 3 - EXISTING TRANSPORT DEMAND

Objective

To assess the current modal split and future trends and growth both for freight and passenger traffic so as to establish relevant services and sound financial projections. This task will be input to Phase 2 Task 10.

Approach

The Consultant's Transport Planning Expert will take full advantage of the opportunities offered by the Regional Traffic Forecasting Model Project results and findings.

The Consultant's Operations Expert will work on the available calibrated traffic model and will select rail passenger and freight data. Freight commodities will be broken down by major commodities and analyzed individually.

The Consultant will also perform site visits and field investigations in order to get the relevant O/D matrices for each state, for both passenger and freight (per commodities) and between the different states (passenger and freight) so as to have a regional approach. This traffic analysis will be used to make traffic forecasts and projections simulating mobility, modal choice and modal split.

Task 3 Responsibility

Rail Transport Planning Expert together with TRACECA Local Staff and the successful tenderer's Transport Planners and Modelers for the Regional Traffic Forecasting Model and Route Capacity TRACECA Project.

TASK 4 - CURRENT OPERATIONS ISSUES

Objective

To assess current operational characteristics and results and specify the most significant and critical aspects both for passenger and freight operations. This task will be input to Phase 2 Task 11.

Approach

The rolling stock useful life depends on parameters related to operations methods: time per day, maximum speed, rate of loading, train formation and especially distances covered per annum. These factors will influence the maintenance cycles which in turn are required for the sizing of the maintenance facilities.

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Reorganizing the freight traffic schedules is certainly fundamental, imperative and highly symbolic for states switching from a centrally managed economy to a free-market. Setting up flexible and responsive traffic schedules will help meet the present customers' needs and therefore attract future customers (passenger or freight).

Through documents, visits and on site investigations, the Consultant will examine the following items:

- timetable principle (traffic pattern) for passenger and freight trains
- train loads compared to the capacity of the line and stations (length of passing loops)
- number and power of locomotives in relation to train weight and longitudinal profile and curvature of the line which in turn influence the running times of the freight trains
- procedures for technical and commercial inspection of the freight trains
- train operations management procedures (remote control, train radio etc.)
- procedure for transferring information on rolling stock failures from the train to the workshops
- technical facilities for detection of rolling stock failures (hotbox detectors, dragging equipment detectors etc.).

With this data the Consultant will establish (per state and for the whole region) the different existing traffic patterns, test their compatibility in the perspective of regional rail services and build a sound basis to establish future traffic patterns for passenger and freight operations.

Task 4 Responsibility

The Consultant's Rail Operations Expert together with TRACECA Local Staff (mostly rail operations specialists in each state).

TASK 5 - CURRENT MAINTENANCE ISSUES

Objective

Survey of existing overall maintenance policy & organization per state. Survey of all facilities and equipment for each state. Input to Phase 2 Task 12.

Approach

Rolling stock maintenance has high demands. It depends on the rolling stock design, its implementation, staff qualifications, maintenance procedures, appropriate equipment and tools and internal regulations of the workshops. Operating regulations require an ever increasing level of safety for rolling stock and infrastructure. Therefore, regular and thorough checking and maintenance have to be carried out on vital equipment to ensure

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safety of operation. On the other hand, the maintenance of rolling stock and equipment is one of the major items of expenditure in the operation of railways and it is important to optimize its cost to increase economic performance of the railways. Maintenance planning and control are given special attention by railway management so that to optimise the maintainability parameter encompassing availability of the rolling stock, reduced costs of spare parts, staff, time and equipment.

The maintenance procedures and practices currently in use in the TRACECA Railways have been inherited from the Soviet Railways. They are quite comprehensive but deal only with prescribing the work to be carried out and its frequency and are based on the Russian railway experience. It is probable that, for the purposes of the TRACECA Railways, some of these procedures need to be modified to reflect their own operating circumstances and the particular needs of their own fleet.

Therefore, the Consultant will review in each state the basic elements of the maintenance planning and control systems, the specification of the work to be done to the rolling stock, its frequency and the technical performance of the equipment in service operating under the prescribed maintenance standards.

For the Strategy and Organization

The Consultant will:

- Examine the present systems of maintenance planning and control. These systems inherited from the former Soviet Union are basically sound, however, the technical input to develop the strategy took place centrally in Moscow. Therefore the Consultant will survey the overall maintenance policy to measure the performance of the vehicles in service. Reliable and efficient units will be identified at the depot level from driver reports, maintenance work records etc, recorded for each individual vehicle and assembled for the whole fleet for each state. The main information gathered will include: type of maintenance and frequency, number of locomotive breakdowns, number of repeated failures of major parts and causes, number of removal of a carriage or wagon from a train, etc.

A summary table will show the units and components that may require a higher level of maintenance.

The Consultant will also:

- Examine the availability of engineering technical capacity, manpower and facilities to undertake the development of the maintenance strategy either locally in each state or in the region

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- Examine the present system for materials and spares procurement including sourcing, the forecasting of future needs, the identification of new items and identification of impending obsolescence
- Establish the extent of the management information systems (MIS) available and their use in the monitoring and control of the rolling stock fleet performance and maintenance costs and its general mechanical condition.

Strengths and weaknesses of current maintenance strategy will be assessed as well as comparisons to western practice. Current problems and the experience in the new economic environment will be also assessed.

A summary will be made for the whole TRACECA region.

For the Maintenance Facilities

97% of the workshops for major rolling stock repairs are located in Russia with a few in the Ukraine. Through their TRACECA counterparts, the Consultant will locate all maintenance facilities of reasonable size in the TRACECA states. In addition these counterparts will perform a fact finding, in order that a rough outline of the rolling stock inventory per state is available before the Consultant arrives in the TRACECA region. This inventory will include the principal responsibility for each category of stock to be maintained in the maintenance facilities.

The Consultant will make a survey of the available facilities in the TRACECA states, resulting in a set of data sheets for each facility covering the following:

- Location
- Size, number of employees and other main characteristics
- Current categories of rolling stock being maintained
- Layout of facility and other restrictions on categories of rolling stock to be maintained
- Major equipment
- Maintenance strategy
- Technical standard of facility
- Maintenance standard of facility
- Management standard of facility
- Estimate of capacity and capability
- Main suppliers
- Major problems
- Current environmental impact

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Based on these sheets, a compilation will be developed, summing up the situation for the maintenance facilities in the TRACECA States, either all encompassing, or divided into groups with similar characteristics.

In cooperation with the rolling stock expert, the maintenance needs and the maintenance capacity will be compared, in order to develop a recommendation on the future strategy for rolling stock maintenance and maintenance facility development.

Task 5 Responsibility

The Consultant's Workshop Management Expert and Workshop Engineering & Equipment Expert together with the Spare Parts & Manufacturing Expert in cooperation with TRACECA Local Staff (mainly Workshop Counterparts of each state).

TASK 6 - MANUFACTURING FACILITIES/SPARE PARTS & COMPONENTS

Objectives

To survey the manufacturing sector of the TRACECA region. This task will be input to Phase 2 Task 13.

Approach

The Consultant recognizes that world-wide competition between motive power suppliers has led to the development of quality equipment with high reliability and availability in addition to having minimum maintenance needs. However, it is likely that the TRACECA railways will have to operate and maintain their mainly Russian locomotives and wagons for the short to medium term, given the 30 year life span of rolling stock. The Consultant recognizes this reality. It will help the railways efficiently maintain their present fleet, even though the procurement policies for future fleet acquisition are likely to be adapted to what is available on the world market.

In this perspective, the Consultant will examine for each TRACECA state:

Manufacturing Facilities

The Consultant will first set up for each state an inventory of the existing and planned manufacturing facilities. A distinction will be made between passenger and freight (wagons) production. The country and place of the existing and projected facilities will be identified as well as its equipment and organization.

The Consultant will prepare a summary table to have a global view of the existing problems in the TRACECA region deriving from the existing situation and choice for

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future localization, type of manufacturing facilities (passenger/freight), equipment and organization. Each state will be analyzed separately so as to take into consideration its specific economic environment and status of modernization. A summary of the existing situation will include the common features that can be used for further detailed analysis.

Spare Parts & Components

Spare parts and materials are a source of problems in fleet maintenance. Spare parts problems are linked to manufacturing issues.

The Consultant will identify and classify the numerous categories of spares ranging from high consumption items such as brake blocks to complex parts such as engine parts which are normally made by specialist suppliers -the engine builders or their suppliers-. The problems of spares supply will be carefully examined with an objective of alleviating the present difficulties e.g. by local sourcing or by seeking substitute items.

Spare parts and components will be examined for each state to take into consideration the economic environment and status of modernization.

Task 6 Responsibility

The Consultant's Rolling Stock & Spare Parts Manufacturing Expert in collaboration with TRACECA Local Staff (mainly the Rolling Stock and Spare parts Manufacturing counterparts in each state).

TASK 7 - TRACECA COOPERATION AND POOLING

Objective

To survey present grounds of cooperation and pooling between TRACECA states in terms of rolling stock manufacture, major repairs and operations.

Approach

Cooperation and pooling between the different TRACECA states will be examined on economic and financial grounds. Presently there is no economic justification in setting up technologically sophisticated manufacturing processes which imply a considerable financial commitment for each of the TRACECA countries.

However, each country intends to develop its own output, become self-sufficient and sell to his neighbors. This can be envisaged for manufactures for which there exists a large local demand and which do not require capital intensive technology (e.g. concrete sleepers or spring rail fastenings).

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For heavy industry products, the Consultant will survey and analyze for each state, the economic, financial and commercial problems related to rolling stock maintenance, spare parts and manufacturing aspects. Presently, the cost to send a locomotive or a carriage to Russian and Ukrainian repair workshops amounts to 50% of the repair cost, with an average of a four-month immobilization time for the round trip. The Consultant will determine what the states have to do to create the related heavy industry base (locomotive and carriage major repairs for instance) for the whole region.

At the same time, the Consultant will examine the financial validity of the reconverting and privatization opportunities that exists in the transitional situation of the region. It will review for each state the different projects, make an inventory and applied economic, financial and commercial criteria for the analysis.

Lack of data in any of the states will make it impossible to define grounds for regional cooperation in these fields.

However, the creation of large scale construction and repair facilities will take time where as the need is urgent. Besides, it requires expensive equipment (especially for modern rolling stock) and permanent use by highly qualified staff. The Consultant will therefore look for interim solutions which will provide a quicker answer to the supply and spare part shortage and at the same time prepare for longer term solutions.

Task 7 Responsibility

The Consultant's Rail Transport Economics Expert in full cooperation with TRACECA Local Staff.

TASK 8 - CASE STUDY

Objective

Know-how transfer to TRACECA Local Staff of western practices in economic & commercial aspects by studying and resolving specific problems related to rolling stock maintenance and spare parts in two selected states -Georgia and Kazakhstan- of the TRACECA region.

Approach

The Central Asian countries have less than 5% of major rolling stock repair workshops, very few spare parts factories and no major railway manufacturing facilities. Local production calls for industrial options which use foreign technologies and investment to expand and modernize resources belonging to the railways. It is planned to set up joint ventures which would actually entail privatizing manufacturing industries which are at present an integral part of the railway.

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The Case Study will be carried out in parallel to all the tasks for all phases of the present project. On the basis of the data already gathered, the Consultant has selected whether Georgia and/or Kazakhstan as possible states for common maintenance and spare parts services respectively for the Caucasus and Central Asia regions. The Consultant will consider the possibility to transform an existing workshop or to built a new one in the country which will meet the hereunder selection criteria, in particular economic and financial criteria.

These options will be reviewed in light of the situation the Consultant faces when this project starts. To determine the location of a possible future maintenance workshop and/or manufacturing services, the Consultant will take into account the following elements:

- equilibrium between Caucasian and Central Asia countries
- relationships with Russia
- access characteristics and potential of the sites
- need to increase repair capacity of wagon or passenger carriages and repair shops
- progress of on-going projects for major repair works and manufacturing services
- other planned major repair shop projects

He will carefully examine all the economic and financial aspects and characteristics of these projects in close cooperation with the TRACECA Local Staff and especially with rail counterparts and officials. His approach will be based on the findings of the data collection analysis included in Phase 1 and will take into consideration the future development options. Hereafter is included a list of railways projects in Kazakstan, Turkmenistan, Uzbekistan and Armenia. The Consultant will finalize this list with Georgia, Azerbaijan, Kyrghystan and Tajiskistan railway projects.

Finally, the Consultant will review the present proposal to determine the most suitable site to implement the Case Study.

The Case Study will include three aspects:

- solving of specific problems (at least partially)
- training with hardware/software supplies
- recommendations for future development

Immediate solutions for specific problems could be immediate recommendation for the implementation of possible common maintenance services.

The training will focus on optimised maintenance organisation and spare parts management. For this purpose, softwares developed by SNCF will be used. Emphasis will be put on organisational and financial aspects.

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The participants will be selected jointly with Rail and National Authorities. They will be rolling stock maintenance specialists whether workshop managers or spare parts specialists.

Recommendations for future development will include TRACECA cooperation and pooling aspects as well as maintenance subcontracting potentialities or spare parts manufacturing privatisation possibilities. In addition, the Consultant will look for the possibility to extend the present maintenance periodicity in line with a reviewed maintenance and spare parts arrangement. Quality assurance for the maintenance aspects and spare parts will also be part of the Case Study.

Task 8 Responsibility

The Consultant's Project Manager together with the Rolling Stock and Spare Parts Manufacturing Expert and TRACECA Local Staff.

PHASE 1 DURATION AND REPORTING

Phase I will be for 3 months. After 2 months an Inception Report including an executive summary will be issued and submitted to TRACECA CU and TRACECA Management Team in Brussels.

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SUMMARY OF THE RAILWAYS PROJECTS

(Extracts from EBRD Project Central Asia Outline Transport Strategy)

KAZAKHSTAN

- Coach manufacturing plant in Almaty
- Diesel locomotives repair and re-engineering
- Wagon manufacturing and repair plant, particularly for tankers
- Heavy repair facilities for locomotives
- Heavy repair facilities for coaches
- Spare parts manufacturing and repair plant, particularly for tankers

Carriage works

This project is the Railway Department's priority project and has been included in the plan drawn up by the ministries of transport and finance at a figure of 6.6bn tengeh (USD 133m), without however releasing any State funding to date.

The passenger stock stands at 2264 coaches, some 50% of which are over 15 years old. In addition, it is badly maintained, 65% of coaches having come from East Germany (DWA), and there is a shortage of spare parts. The Alma-Ata network, which alone accounts for 50% of the fleet, is still running 300 coaches which would normally have gone for scrap. Making allowance for scrapped stock and a growth in traffic, over 200 coaches will be required annually until 2007, 60% being for the Alma-Ata network alone. The requirements of the other Central Asian countries are also estimated at 200 carriages a year. And coaches will also be needed for the Alma-Ata underground.

The cost of a coach is extremely high (DM 1,110,000); only 32 coaches could be bought from DWA by barter in 1993 and 40 in 1994. Negotiations have already taken place with the Germans, the Turks and, on 17 October, the Japanese, who promised a transport loan of USD 60m.

The Alma-Ata site has been selected for an initial phase which would consist of finishing-work on bodies imported from Germany or Russia (TVERS), with an output of 100 coaches a year. Subsequently, manufacture of rough bodies could be undertaken by the Dzhambul structural engineering workshops. The economic feasibility study, which anticipates investment amortisation over 5 years, will have to be rewritten in line with criteria matching current standards.

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Major repair works for diesel locomotives

Russian diesel sets are of very ancient design and are at the limit of wear in the case of 200 dual-set diesel locomotives, there being thus 400 engines to deal with. Furthermore, with continuing electrification on the other networks the plan specifies that the west, which is not electrified, is to carry out major KR1 and KR2 repairs on diesel locomotives for the other two networks, which have 200 diesels between them. The selected site is the Kazalinsk depot near Kzyl Orda. Negotiations have begun with Deutsch-Aerospace (Germany) and its subsidiary CEMT (France) concerning exchange of engines in return for old rough bodies which would then be reconditioned.

Wagon works and repair shops

Although almost 50% of wagon stock is in a state of disrepair, it is adequate for normal requirements given the fall in traffic, and there is no immediate need to increase repair capacity. On the other hand there is a shortage of certain types of wagon for specific needs, such as hopper wagons, grain wagons and, above all, tank wagons.

Of the railways' 13,000 tank wagons, approximately 3000 are immobilised. The demand is enormous (a figure of 30,000 tank wagons has been suggested), since Kazakhstan's oil output, which is currently around 5m tonnes, is expected to rise over the next few years to 20m tonnes in the Ural'sk, Aktyubinsk and Kzyl Orda regions. Despite the construction of two refineries at Aktau in addition to the refinery at Tengiz, crude oil is carried by rail all the way from Aktyubinsk to the Chimkent and Pavlodar refineries.

The project consists in using tanks built in Kazakhstan and mounting them on surplus flat wagons. Czech tenders for construction designs and a licence are under consideration. A final choice has not yet been made between the Aralsk (Kzyl Orda region) and Atirau sites. The possibility of interesting oil companies in funding such a project has not yet been examined and should be explored by the expert in charge of the feasibility study.

Other planned major repair shops

Major repairs to electric locomotives are carried out in Russia and cost 300 million roubles payable in advance for one machine. The locomotives are unavailable for four months because of the journey time, and the transport itself is very costly. Half of the electric engine stock is immobilised. There is an urgent need to undertake major KR1 and KR2 repairs locally. However, each of the networks is fighting to have its own site chosen, and a decision has not been taken. An audit to determine the most suitable site might be useful, but the Railway Department is clearly not in a position to push this through.

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The situation was the same for carriage repairs, and a "decision" was taken to expand the repair capacity of the Alma-Ata depot, which is to be the site of a future carriage works for all the networks. This seems a dubious decision.

Thus at present there seems to be no possibility of action in these two areas, which are nevertheless extremely significant.

Manufacture of spare parts

Demand is substantial, especially for spring rail fastenings (for which Kazakhstan does not have the necessary steel technology) and for everything involving electrical equipment and wiring, air-conditioning, cooling for refrigerator wagons and diesel sets, brake gear, etc.

TURKMENISTAN

TECHNOLOGICAL PROBLEMS

Track supplies are inadequate, especially as regards rail and sleepers purchased in Russia. Tank wagons are repaired in the Ukraine. Establishment of the repair shop in Kazakhstan should allow journeys and repair times to be cut substantially. The crucial problem is major repairs to diesel locomotives, which are currently carried out in the Ukraine - where five locomotives have been immobilised for two years failing payment. The transport cost amounts to CHF 0.36 per axle-kilometre over distances of 5000 km.

The following solution seems to suggest itself:

- **Conversion of the TR3 repair shop at the Ashkhabad engine depot into a major repair shop**

Despite the thirty-three 6000CV diesel locomotives purchased in Lugansk in 1993, 64% of the locomotive fleet is over 20 years old. Thirty-nine locomotives are currently immobilised waiting for spare parts. The major repairs made necessary by the condition of the fleet and by the backlogs will therefore be considerable over the next few years. When the USSR was in existence, the Ashkhabad repair shop carried out major repairs for a number of republics. It has retained a skilled workforce and supervisory staff. Its buildings and space will enable a major-maintenance shop to be set up.

A rough overall estimate for modern new equipment, based on the requirements set out by the Director of Maintenance, amounts to USD 22m. However it might be possible, and even desirable, to delay considering excessively sophisticated numerically-controlled equipment for a workforce which has not been trained in its use and which also has

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manual skills nowadays lacking in workers who are accustomed to these machines. With renovated secondhand equipment which is well-designed and in good condition but not numerically controlled, the cost of certain machinery could be cut by over half.

The immediate equipment priorities are the foundry and forge costing around FF16m and FF5m respectively, followed by the engineering workshop and diesel workshop for FF18-20m each.

TRACK MAINTENANCE PROBLEMS AND USE OF NEW TECHNOLOGIES

Track maintenance has been deferred through lack of rail and sleeper supplies. As regards the latter, the establishment of a production unit for twin-block concrete sleepers in Turkmenistan (cf Section 3.6 (1)) would probably satisfy local requirements.

Mechanisation of light track-maintenance as specified in Section 3.6 (2) was the subject of an application from Turkmenistan to TACIS in 1993. This approach has not yet had any result but remains highly relevant.

CAPACITY-ENLARGING INVESTMENT

Of the various projects listed in Appendix T7, two seem worthy of consideration:

- Rebuilding of the railway bridge over the Amu Darya in the Chardzhou area.
- Construction of a transshipment station at Serakhs as part of the Tedzhen-Serakhs link.

These two projects concern the southern branch of routes between Japan and China on the one hand and Europe, via Iran and Turkey, on the other. They are therefore discussed again in Section 4 as part of the Eurasian and Transasian projects.

UZBEKISTAN

PROBLEMS IDENTIFIED

The few problems which have appeared after such a fragmentary examination merely concern some technical aspects, since it was not possible to assess the overall situation of the railways.

Track

There is a backlog of 1000 km of track maintenance for want of sleepers and rails, which are all imported. The modernisation of a sleeper works in the Uchkuduk area, as

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mentioned in Section 3.6 (1) -of the abovementioned document- partially solve these problems. Like Turkmenistan, Uzbekistan filed an application with TACIS in 1992 for a training site for mechanised light track-maintenance. This application is still relevant and has not yet received a reply.

• Rolling stock

There is difficulty in buying electric locomotives, which cost 2 billion roubles. There is an electric locomotive repair shop 30 km from Tashkent, but it appears unable to carry out heavy repairs.

A tank-wagon works and repair shop planned in collaboration with Mitsubishi would solve current problems.

There is great difficulty with passenger-stock maintenance, since the railways do not have any workshops for major KR1/KR2 repairs. These are carried out in Russia and the Ukraine, which is very expensive in view of the distance. It appears that fifty carriages are immobilised in the Ukraine, mainly for default.

Given the shortage of coaches, a loan to resolve matters would undoubtedly be welcome and would undoubtedly contribute to improving relations with Uzbekistan's railways.

Certificate
LOCOMOTIVE STOCK OF THE ARMENIAN RAILROAD

Locomotive Depot of the city of Gyumri:

Electric Locomotives VL-10-U	Total number	13
	Out of this number:	
	In good working condition:	3
	Must be repaired:	5
	To be disposed of:	7
VL-10-	Total number	42
	Out of this number:	
	In good working condition:	8
	Must be repaired:	27
	Disposed of:	7
Diesel Locomotives:	Total number	45
	Out of this number:	
	In good working condition:	8
	Disposed of	1
	Must be repaired::	36
MVS (cars of international type)	Total number	13
	Out of this number:	
	In good working condition:	6
	To be disposed of:	7

Locomotive Depot of the city of Yerevan :

Electric Locomotives :	Total number	61
	Out of this number:	
	In good working condition:	31
	Disposed of:	20
	Must be repaired:	10
Diesel Locomotives:	Total number	77
	Out of this number:	
	In good working condition:	13
	Must be repaired:	54
	Disposed of:	9
MVS (cars of international type)	Total number	11
	Out of this number:	
	In good working condition:	9
	To be disposed of:	2

Certificate

CAR STOCK OF THE ARMENIAN RAILROAD (the availability of cars in the Republic)

Total number 240

Out of this number:

To be repaired : 66
In good working condition: 174

(the availability of cars outside of the Republic)

Total number 59

Out of this number:

To be repaired : 5
In good working condition: 54

Тепловозы	Общее количество	77
	из них:	
	исправные	13
	подлежат к ремонту	54
	выписаны	9
МВС (вагоны международной категории)	Общее количество	11
	из них:	
	исправные	9
	подлежат к ремонту	2

С П Р А В К А

вагонное хозяйство железной дороги
Республики Армения

О наличии вагонов в республике)

Общее количество - 240
из них:
подлежат к ремонту - 66
исправны - 174

О наличии вагонов вне республики

Общее количество - 59
из них:
подлежат к ремонту - 5
исправны - 54

С п р а в к а

Локомотивное хозяйство железной дороги

Республики Армении

Локомотивное депо
города Гюмри:

Электровозы ВЛ-10-У Общее количество 13 штук

из них:

исправные - 3

подлежат ремонту - 5

подлежат к выписке - 7

ВЛ-10 Общее количество 42

из них:

исправные 8

подлежат ремонту 27

выписаны 7

Тепловозы - Общее количество - 45

из них:

исправные 8

выписаны 1

подлежат к ремонту - 36

МВС (вагоны - Общее количество - 13

международной
категории)

из них:
исправные 6

подлежат к выписке 7

Локомотивное депо
города Еревана:

электровозы - Общее количество 61

из них:

исправные 31

выписаны 20

подлежат к ремонту 10

B.2. METHODOLOGY

PHASE 2 - FUTURE REQUIREMENTS AND SCENARIOS

Objectives

To assess future rolling stock fleet requirements and provide recommendations to solve existing problems.

Method of Work

Requirements and recommendations will be made in the following fields and will include for each of them future quality assurance requirements:

TASK 9 - ROLLING STOCK FLEET REQUIREMENTS

Objective

Based on the results from tasks 2, 3, 4 & 12, the Consultant will estimate a required future rolling stock fleet divided into categories and per state and for transnational pool service.

Approach

The Consultant will take the following factors into consideration:

- Present rolling stock inventory and condition (from Task 2)
- Traffic forecasts for passengers and freight (from Tasks 3 and 10)
- Pooling possibilities (from Task 7 and 14)

A recommendation will be developed for transforming the current fleet of vehicles into a fleet that suits the future demands.

This recommendation will contain:

- Development of the need for rolling stock over a span of years (from tasks 10 & 11)
- Maintenance needs for this fleet (task 12)
- Possibilities for refurbishment of current categories of vehicles
- Possibilities for modification of current categories of vehicles
- Need for procurement of additional vehicles
- Need for scrapping existing vehicles

Where new or rebuild categories of rolling stock are being considered, the economic advantages of modern western categories of rolling stock, with its high availability and utilization capabilities will be considered against the restrictions due to usage characteristics, infrastructure and current maintenance practices and other limitations.

Based on the recommendations for the development of the rolling stock fleet, an overall maintenance strategy will be developed, covering all the TRACECA states.

B.2. METHODOLOGY

This strategy will then be broken down into sub-strategies, each covering a state, or part of a state, and will take the possibilities and limitations of the present maintenance facilities into consideration.

Depending on the results from task 7, the sub-strategies will contain recommendations for consolidating major parts of the maintenance work at specialized facilities of transnational nature.

This may for instance mean that one maintenance facility specializes in bogie overhaul, another for traction equipment overhaul, another in bodywork, each taking on assignments from several of the TRACECA states.

Further the possibilities for outsourcing work will be investigated and recommended if feasible.

In these recommendations, political considerations will be taken into account, to the extent that they can be clarified. This will also mean that in developing the distribution of maintenance specialities, it will be of major importance that the amount of work is distributed such, that the "import/export" balance for each state is neutral.

Responsibility

The Consultant's Rolling Stock Engineering and Maintenance Expert together with the Workshop Management and Equipment Expert in close collaboration with TRACECA Local Staff.

TASK 10 - TRAFFIC PROJECTIONS

Objectives

Make an estimate of future trends and development in terms of mobility, modal choice, modal split. This task will be input to Tasks 9 and 11.

Approach

The Consultant will essentially base its work on Task 3 findings and on the scenarios proposed in the TRACECA Project: Regional Traffic Forecasting Model, Review of International Route Capacity.

In particular, the Consultant will consider data related to rolling stock fleet such as availability of freight wagons, passenger coaches and locomotives. Operations scenarios will be established on the basis of the fleet requirements (Task 9). Drivers' scheduling and rolling stock fleet rotation will be optimised. Another important point is the training of operations staff and drivers. This point will be tackled by the Consultant.

B.2. METHODOLOGY

Task 10 Responsibility

The Consultant's Rail Transport Planning Expert together with the Transport Planner and Modelers of the successful tenderer in close collaboration with TRACECA Local Staff.

TASK 11 - OPERATIONS FUTURE SCENARIOS

Objectives

To propose different possible operations scenarios both for passenger and freight services.

Approach

Based on the findings from Tasks 4, 9, 10, 12 and 14, the Consultant will propose:

- alternative scheduling principles to optimize utilization of the rolling stock
- possible changes in the existing procedures for technical and commercial inspection of the freight train
- possible changes in the train operations management procedures
- possible changes in the procedures for transmission of information on rolling stock failures from the train crew to the workshop
- new technical facilities for detecting rolling stock failures

Each scenario proposed whether for passenger or freight rolling stock will result in an estimated required fleet and therefore will be input/output to Tasks 12, 13 and 14.

Task 11 Responsibility

The Consultant's Rail Operations Expert in coordination with Transport Planning Expert and Spare Parts & Manufacturing Expert together with TRACECA Local Staff.

TASK 12 - MAINTENANCE REQUIREMENTS

Objective

Provide guidance to establish a viable and efficient rolling stock maintenance and rehabilitation within the overall framework of a market oriented railway system.

Approach

Based on the findings of tasks 5 & 9, the Consultant will perform two duties in this task:

- 1) The overall maintenance strategy and the alternative sub-strategies for states and areas, will be developed and adjusted according to the reactions from the participating recipient railway organizations and from the further findings of the other experts.

Further, recommendation on a supporting trans-national organization will be drawn up, including a strategy for this unit.

B.2. METHODOLOGY

- 2) The state or area sub-strategies will be broken down into recommendations and action plans for each maintenance facility.

Included in this will be requirements for changes in buildings, trackwork, equipment, staff, organization, planning etc. as well as an estimate of the workload and the capacity of the facility when these changes have been carried out.

When developing the above, the findings of task 6 as well as the parallel work in Task 13 will be taken into consideration in order to avoid duplication of facilities in neighboring states.

Part of this recommendation will be input leading up to the tasks for technology transfer, training seminars, Study Visits and establishing a rolling stock transport group.

This will have the form of highlighting maintenance facilities, subjects, training, etc. within the overall maintenance, that should be dealt with further under the above mentioned tasks. This selection process can either depend on the organizations or groups of people that are especially responsive to the suggested changes, or it can depend on the fact that facilities or subjects are especially important to making the TRACECA traffic flow smoother and faster.

Task 12 Responsibility

The Consultant's Workshop Management Expert and Workshop Engineering and Equipment Expert together with TRACECA Local Staff.

TASK 13 - MANUFACTURING FACILITIES/SPARE PARTS & COMPONENTS REQUIREMENTS

Objectives

To determine the future structure and size of the rail transport sector.

Approach

The Consultant will study for each state its potentialities for transforming existing facilities and/or developing local manufacturing industries. He will distinguish requirements for heavy manufacturing industries (locomotive) and light industries (spare parts). For spare parts, he will look for regional manufacturing industries which will specialise their production in different types of spare parts. The solutions proposed will include limited capital costs and higher purchase spare parts prices.

The Consultant will provide guidance to rail organizations in the region for the establishment of commercially viable rolling stock maintenance and manufacturing within the framework of a market-oriented railway system.

B.2. METHODOLOGY

Duplication of facilities will be avoided by adopting a regional approach to maintenance of rolling stock and the local manufacture of items regularly used.

Based on Task 6 findings the Consultant will propose the well defined following approach:

Maintenance facilities

A Plan will define the site, number and capacity of the major workshops. This plan will be justified according to the selection criteria indicated in Task 6. The major shifts from the existing situation will be identified. As per requested in the Terms of Reference a construction plan for the existing facilities will be prepared and modernization of equipment deemed necessary will be indicated.

Spare Parts and Components & Manufacturing Facilities

The Consultant will study the development of local facilities for the manufacture of high usage and easily manufactured items such as brake blocks. The feasibility of manufacturing more sophisticated spare parts on a TRACECA regional level will be reviewed. Possibilities for joint ventures between local manufacturers with existing (Russian) spare parts manufacturers for the current fleet will be assessed. There may be opportunities for development of a railway manufacturing industry based on existing (non-railway) manufacturers in the TRACECA states. The possibility of manufacturing major items such as locomotives in one or two locations will be looked at as an alternative, including a review of the costs and economics of production quantities.

As per requested in the Terms of Reference, a plan covering the enterprises for the construction of new rolling stock will be submitted as well as a plan for spare parts supply & manufacturing.

These restructuring and rationalization plans will include organizational, financial and economic evaluations of the proposed options, including restructuring, capacity balancing and task distribution at national and regional levels. These aspects will be part of the Transport Economist studies in collaboration with the Transport Planning Expert.

Task 13 Responsibility

The Consultant's Rolling Stock Expert and Spare Parts Manufacturing Expert together with the Transport Economist Expert and TRACECA Local Staff.

B.2. METHODOLOGY

TASK 14 - TRACECA FUTURE COOPERATION AND POOLING

Objectives

Determine overall efficiency of cooperation and minimum size for economic justification of development (insufficient size to justify a development of all required facilities). Identify potential for joint venture agreements to convert or restructure the existing rolling stock maintenance facilities.

Approach

The Consultants will have established the future requirements of rolling stock versus the present fleet in task 2. This will allow policies to be identified where pooling may make economic sense. This will of course be more suited for neighboring countries. Physical boundaries like distance and geographical barriers limiting the movement of rolling stock will be accounted for.

Given the previous situation where everything was centralized from Moscow, there certainly will be opportunities for rationalization and improvement by pooling of resources (a coordinated maintenance policy). The Consultant will identify practical means of having regional heavy maintenance of rolling stock, regional manufacture of specialized spare parts, and if appropriate joint procurement, to obtain a better value through the economies of scale. There are clear opportunities and rewards to be had from this TRACECA co-operation. The Consultant will identify sensible methods to do this.

This task is based on the findings of Phase 1, tasks 2 to 7 Technical & Economic study for possible options or scenarios.

The Consultant will study financial terms and impacts of potential use of rolling stock by more than one state (pooling). This includes utilization, evolution and possible reduction of the total fleet. To do so, the Consultant will propose several juridical options which can be implemented one after the other. For each option the advantages and inconvenients will be described.

The Consultant assumes that the rolling stock fleet is the rail organisation property. Therefore, the Consultant will propose regional committees encompassing the networks of each state to prepare the following actions:

- design and juridical implementation of procedures related to rolling stock fleet and transport planning
- allocation system for rolling stock cost of use (for instance: km travelled per network; operation time; rolling stock type)

B.2. METHODOLOGY

The possibility for pooling the freight rolling stock will be examined as well as the management of wagons by a private firm. To do so, the Consultant will make an inventory and study the planning of reconversion and privatization projects.

The Consultant will carefully examine the important aspect of the border crossings which often slow down the traffic. Doing so, the Consultant will be able to study the future structure and size of the sector from the organizational, financial and economic viewpoints.

Task 14 Responsibility

The Consultant's Rail Transport Economics Expert together with TRACECA Local Staff.

PHASE 2 DURATION AND REPORTING

Phase 2 will be performed in months 4, 5, 6 and 7. At the end of month 6, a Project Progress Report will be issued including the possible scenarios that could be implemented in the future as well as the Case Study progress. It will also deal with the proposed training programmes of the Seminar and Study Visits which will be implemented in Phase 3.

B.2. METHODOLOGY

PHASE 3 - TECHNOLOGY TRANSFER & FINAL RECOMMENDATIONS

TECHNOLOGY TRANSFER

Counterparts

The Consultant suggests that counterpart staff be assigned by the TRACECA Railway Companies. These would be senior management/officials in disciplines corresponding with the key members of the Consultant's team.

This has many advantages:

- It will assist in development of managerial and other skills necessary for the future of rolling stock maintenance in these countries.
- It will create a core team of staff in these railways who will fully participate in the study. This team could continue building the study's momentum after its completion and could assist in the implementation of the study proposals.
- A counterpart system would result in a more efficient execution of the study.

If requested, the Consultant will be pleased to work closely with the TRACECA railways to advise on the selection of counterparts and can prepare an outline of skills, experience, etc. of the staff required.

The Consultant will, by advice and assistance, transfer knowledge to their respective colleagues in the TRACECA railways during the course of this project. In particular, the Case Study will offer a good opportunity for this.

LOCAL CONSULTANTS

The Terms of Reference have suggested that local experts be engaged. The Consultant endorses this as it will provide the necessary local dimension to the study. A sum has been allocated in the Financial Proposal for engagement of local consultants. At the beginning of the project (during Phase 1), it is intended to source and identify the correct levels of expertise in the TRACECA countries necessary for this project. When this expertise has been sourced, details of these staff will be furnished to the EU/PMU Task Manager and approval sought.

Local assistance will be required in the following areas:

- Railway Rolling Stock Maintenance Experts
- Railway Operations Experts
- Economic Expert(s) Experts
- Experts in all the fields of Data Collection
- Experts in Spare Parts & Manufacturing

The Consultant include in his proposal a pool of Local Experts including Senior and Junior staff.

B.2. METHODOLOGY

TASK 15 - SETTING UP A LOCAL TRAINING SEMINAR

Objectives

To maximize know-how transfer. To establish an open forum on opportunities for shared and common actions. To help reinforce existing contacts among the railway staff and force new ones so as to build a core team of regional and inter-regional Experts.

Approach

Seminar Audience

The Consultant will first establish the selection criteria for the Seminar attendees. This selection will be based on the Rolling Stock Transport Group that will be set up in Task 16. It will be open to members of the Ministry of Transport, Railway Organization and Institutes and other rail-related agencies. The final selection will be defined with the National Authorities.

Location of the Seminar

The selection criteria to determine the location of the seminar will be based on easy access of the site by western and local participants; availability, capacity and equipment of conference rooms which are different from current work places.

Contents and Timing of the Seminar

The seminar will last a week and will take place when the full Consultant's team is in the TRACECA Region. The Seminar will cover the different aspects of the senior management in rolling stock maintenance. However, the Consultant will ask the participants to prepare in advance their specific fields of interest to be discussed.

The Consultant Team will provide the following courses:

- Modern Rolling Stock Maintenance Techniques
- MIS in Maintenance
- Preventative Maintenance
- Stores and Spare Parts Procurement
- Workshop Practice, Organization and Facilities
- Modern Trends in Rolling Stock Manufacture
- New Ideas in Rolling Stock Maintenance and Organization

The seminar will act as a technical forum for different regional and inter regional maintenance organizations to whom it will bring technical assistance and guidance.

Furthermore, the seminar will give the rolling stock maintenance specialists and experts an introduction and detailed information in modern maintenance approach and philosophy.

B.2. METHODOLOGY

The seminar will end with suggestions for training programmes for other specialized staff to be trained by the members of the Rolling Stock Transport Group.

Task 15 Responsibility

The Consultant's Project Manager with his full team together with the TRACECA Local Staff.

TASK 16 - SETTING UP A ROLLING STOCK TRANSPORT GROUP

Objectives

To build a team of Rolling Stock Experts who can "carry on" the task after the end of this project (project sustainability). To find and appoint the right group of people. To establish a centre of know how which can support the rest of the maintenance organization. To ensure that the transferred know-how can be used in the future.

Approach

During the visits to the different maintenance workshops performing tasks 1, 2, 5 and 6, in each state, spot key personnel of the rail organizations which seem progressive and willing in adopting the new approaches and practices. It is important to ensure that the group is established and implemented as a knowledge and information group on which the various workshops can draw on when necessary.

The people needed will be the best technical persons selected from the existing staff in each state. Their technical qualifications will cover the total spectrum of rolling stock maintenance aspects. Members of the Rolling Stock Transport Group will be selected by the Consultant in consultation with the TRACECA and National Authorities.

A common meeting ground shall be established where the group can have regular sessions exchanging information and know-how.

Task 16 Responsibility

The Consultant's Project Manager together with the Rolling Stock Engineering Expert, Workshop Management Expert, Workshop Engineering & Equipment Expert and the Rolling Stock & Spare Parts Manufacturing Expert in collaboration with TRACECA Local Workshop.

TASK 17 - STUDY VISITS

Objectives

Examine the organization and execution of rolling stock maintenance and manufacturing in Western countries. Familiarize the participants with technologies currently used and under development in the West.

B.2. METHODOLOGY

Approach

The Study Visits will take place in two different countries: France and Ireland, being 1 week each.

Selection of participants will be in collaboration with TRACECA & national Authorities

Visit program

Week 1	Location	Topic Covered
Day 1	SYSTRA-SOFRETU-SOFRERAIL Headquarters SNCF Headquarters	Welcome and Presentation of the Programme Meeting with Managing Director of Traction Department
Day 2	Major Maintenance Workshop	visit Rolling Stock Maintenance Equipment and Facilities for electric locomotives. See Workshop and Maintenance Organization and Methods of Maintenance for modern Locomotives.
Day 3	Maintenance Workshop and Depot for Diesel locomotives	Meeting with Depot Manager. Organization and methods for diesel locomotives
Day 4	Modern Maintenance Depot (TGV)	Methods and organization of a routine maintenance, heavy maintenance cycles, electric equipment, bogies, wheels, brakes and other safety components
Day 5	Freight Rolling Stock Maintenance Workshop. Center for International Certification Visit a French Manufacturer	Visit and Discussions Manufacturing Facilities in France. Organisation and Methods
	SYSTRA-SOFRETU-SOFRERAIL Headquarters	Training Evaluation
Day 6	Going to Ireland.	

B.2. METHODOLOGY

Week 2 - Ireland - Dublin

Ireland: Inspection of Irish Rail facilities; Meeting with Maintenance Management. Ireland's railways are of the same size as many of those in the TRACECA countries. The TRACECA visitors can inspect facilities which are relevant to their needs. In addition, the facilities are self-contained-they can inspect all that is necessary within the space of a week.

Week 2	Location	Topic Covered
Day 1	Irish Rail Headquarters, Dublin	Meeting Managing Director, Irish Rail Discussion about new role of Rolling Stock maintenance as service provider within the new commercially-driven organization.
Days 2 & 3	Chief Mechanical Engineers Department, Inchicore Works, Dublin	Inspection of Rolling Stock Maintenance Facilities & Organization. Inspection of modern locomotives, carriages and wagons. Discussion on: - planned maintenance - MIS in maintenance - spare parts policies - stores organization - workshop facilities - procurement of rolling stock - new trends in rolling stock - world-class manufacturing
Days 4 & 5	Irish Rail Maintenance facilities	Inspection of facilities and procedures Training Evaluation

Task 17 Responsibility

Project Manager and EU Training Specialists. Backstopping in respective countries.

TASK 18 - FINAL RECOMMENDATIONS

Objectives

To present the most suitable solutions for the region and the states according to the objectives of the TRACECA programme and the needs/wishes of the states.

B.2. METHODOLOGY

Approach

The recommendations will be based on the conclusions of each task of Phase 2. They will be discussed during the course of the project with the Consultant's counterparts and TRACECA management members.

The recommendations will be formulated in the Draft Final Report so as to be discussed both in Brussels and in the TRACECA region.

They will take into account the final objectives of the TRACECA technical assistance programmes, the different constraints and the evolution of the economic, financial and political parameters which exist in the region.

Task 18 Responsibility

The Consultant's Project Manager on the basis of each Expert's own conclusions.

PHASE 3 DURATION AND REPORTING

Seminar, Study Visits Programmes. Rolling Stock Transport Group. Draft Final and Final Report.

TASK FLOW CHART

