

PREPARED FOR  
INTERNATIONAL COOPERATION ADMINISTRATION

REPORT ON  
TELECOMMUNICATION SYSTEM  
FOR LIBYA

July 1958

TEC-213

TUDOR ENGINEERING COMPANY, WASHINGTON, D. C.

# TELEGRAM

Foreign Service of the  
United States of America

OUTGOING

EMBASSY, PARIS

UNCLASSIFIED  
Classification

Charge: STATE

Control: 122

Date: Dec 2, 5 PM

TO: Anembassy, ABIDJAN 32

RPTD INFO: USOM TRIPOLI URH (VIA POUCH)

POUCH-1

Murdenmann temporarily ill, must delay arrival a few days.

Will inform.

AMB  
HINGTON  
FIN  
BT  
FF

HOUSTON

DEC 2 2 PM 5 13

Drafted by:  
FIN/MECLY/el 12/2/60.

Authenticated by:  
FIN/DJMcGrew



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REPORT ON  
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FOR LIBYA

Tudor Engineering Company, Washington, D. C.  
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International Cooperation Administration  
815 Connecticut Avenue, N. W.  
Washington, D. C.

July 31, 1958  
Reference: TEC-213  
TEC-213-A

SUBJECT: REPORT ON TELECOMMUNICATION  
SYSTEM FOR LIBYA

Attention: Mr. Norman E. Thompson

Gentlemen:

In accordance with the provisions of Task Order No. 213, dated June 10, 1958, (see Appendix A) we have reviewed the "Final Report for a Fundamental Plan of Telecommunications in the United Kingdom of Libya", prepared by Hycon-Page. This is a joint venture of Hycon Eastern, Inc. and Page Communication Engineers, who have a contract for the telecommunication system with the United Kingdom of Libya, financed by ICA.

The attached report has been prepared with the advice and assistance of Mr. J. E. Murdoch, former Chief Engineer and Assistant Vice President of the Bell Telephone Company of Pennsylvania, as consultant.

Mr. J. E. Murdoch held conferences in Washington, D. C., Cambridge, Massachusetts, and in Libya and Tunisia with various representatives of the United Kingdom of Libya, ICA, USOM, the Libyan American

Reconstruction Commission (LARC) and officials of the Post and Telegraph Department of Libya. While in Libya during June and July, a field inspection of all phases of the telecommunication system was conducted by the consultant.

Construction of the telecommunication system outlined by the Hycon-Page final report has been divided into increments which are designated as tasks in the contract. A number of revisions to these tasks have been made by contract amendments. A summary of these tasks, as revised to date, is attached as Appendix B to this report. Many of these tasks have not been activated since funds were not made available for initiation of work. Only Tasks 5, 6, 7, 10, 23, 24 and 25 have been activated.

The major recommendations of this report can be summarized as follows:

a. Change plans of Hycon-Page for microwave line of sight radio from Benghazi to Derna to rehabilitation of present open wire line and provision of two 12 channel carrier systems.

b. Change plans of Hycon-Page for microwave line of sight radio from Derna to Capuzzo to rehabilitation of present open wire line and provision of one 12 channel carrier system.

c. Have cost study made to determine whether there is sufficient economy in rehabilitating the open wire line all the way from Benghazi to Capuzzo at one time to justify such a procedure.

d. Take no action on the section from Tripoli to Pisida until the plans of the Tunisian Government have been finally formulated.

e. Have new studies made to justify any new task orders before issuance.

f. Devote all money available to prompt rehabilitation of Tripoli and Benghazi outside plant and station equipment.

g. Determine whether Hycon-Page is best qualified to undertake Task 24 (Organization) and Task 25 (Rates and Tariffs) but nevertheless proceed promptly with them.

h. Initiate increased activity in all phases of training of Libyan nationals. ✓

i. Provide for an independent technical check on performance of circuits as completed. ✓

The above recommendations are made for the purpose of ensuring that Libya adopt the best plan for a modern telecommunications system which can be constructed, as well as maintained and operated, at a minimal cost.

At the request of USOM/Tunisia, Mr. Murdoch was directed to go to Tunis and consult with the representatives of the Post and Telegraph Department to outline their particular problems and to suggest a solution. His comments on Tunis are contained in Part III of this report and were authorized by Task Order 213-A.

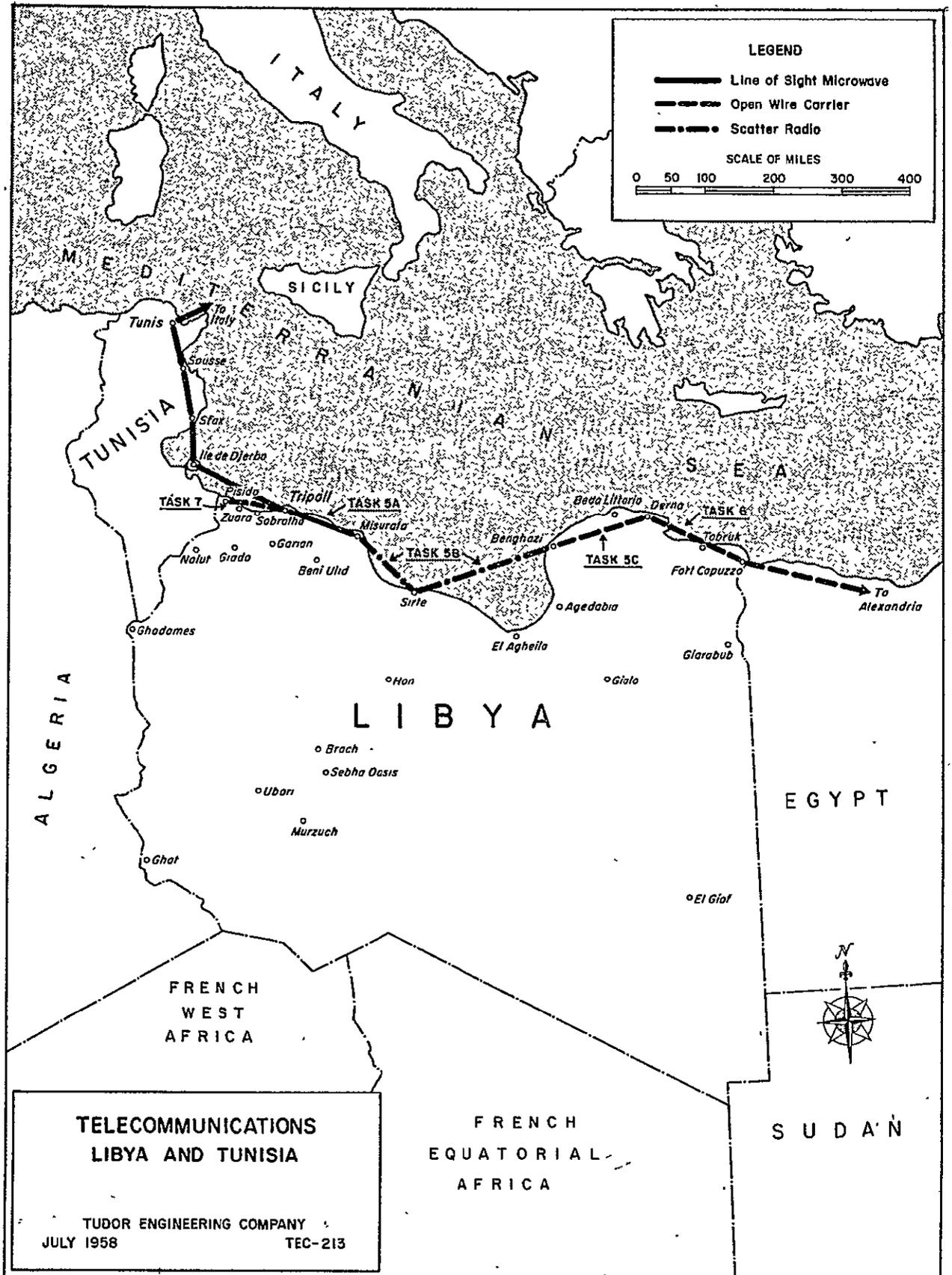
Respectfully submitted,

TUDOR ENGINEERING COMPANY



John G. Marr  
Project Manager

JGM:ebf



REPORT ON  
TELECOMMUNICATION SYSTEM  
FOR LIBYA

I. Introduction

As a first step, the "Final Report for a Fundamental Plan of Telecommunications in the United Kingdom of Libya", dated September 1956, was reviewed in Washington. Subsequent to this review, a meeting was held with the representatives of ICA and Hycon-Page to discuss the status of the report and the status of the work contracted for, committed, or underway in Libya. In order to secure the most recent information as to the status of the work, a visit to Cambridge, Massachusetts, was made on June 9 to June 11, 1958. As a result of these meetings in Cambridge, it became obvious that it would be necessary to send a consultant to the field to make on the site inspections of the various units of the telecommunications system.

The consultant spent two weeks in Libya, from June 20 to July 4, 1958. Extensive field trips and inspections were made, and conferences held with USOM, LARC, Hycon-Page and the Post and Telegraph Department of Libya during this period.

Although not a part of this assignment, visits were made to the temporary broadcasting stations in Tripoli and Benghazi and to the buildings for the permanent broadcasting stations at both locations. Satisfactory progress is being made and broadcasting takes place several hours each day.

Progress is being made in training Libyans as radio announcers and as developers of radio program material.

At the conclusion of the work in Libya, and at the request of USOM/Tunisia, four days were spent in Tunis and meetings were held with engineers of the Tunisian Post and Telegraph Department. This phase of the activities is separately reported in Part III of this report.

## II. Fundamental Plan for Libya

The Fundamental Plan for Libya as submitted by Hycon-Page may be divided into several parts insofar as the provision of physical plant is concerned. This report presents an analysis of each of the five parts of the plan under the following headings:

- A. Primary Toll Network
- B. Secondary Toll Network
- C. Central Offices Tripoli and Elsewhere
- D. Outside Plant
- E. Other Tasks

In order to accomplish the five parts of the Plan, a total of 27 Tasks were initiated as desirable. Only a few of these Tasks have been activated by ICA financing. The Tasks for which plans have been completed and work is under construction include Tasks 5A, 5B and 5C, which are for line of sight microwave between Tripoli and Misurata, tropospheric scatter radio between Misurata and Benghazi, and Task 5C for line of sight microwave between Benghazi and Derna. In addition, Task 6 has been activated which is for line of sight microwave between Derna and Capuzzo and Task 7 for line of sight microwave between Tripoli and Pisida. The locations of these Tasks are shown on the plate on page 5.

The other tasks that have been approved and funds allocated include Task 10 (line of sight radio link between Tripoli and Idris airport), Task 23 (Training), Task 24 (Organization) and Task 25 (Rates and Tariffs). Nothing has been done on Tasks 24 and 25, but Tasks 10 and 23 are now underway.

A. Primary Toll Network

A primary toll network is required to provide toll facilities between Tripolitania and Cyrenaica in Libya, with eventual connections to Egypt and Tunisia. The connection to Tunisia is planned to be extended to Europe and ultimately to the United States.

A meeting recently held at Rome, at which all of the interested nations participated (the United States was not represented), agreed that a toll network connecting all of the nations of the Near East, Egypt, Libya and Tunisia, and a connection from Tunis to Italy, was a desirable objective, and that plans for the development of such a network should proceed. Subsequent meetings between representatives of the Post and Telegraph Ministries of Libya, Tunisia and Egypt indicate that Tunisia and Egypt are preparing plans to provide 12 through circuits to connect to Libya as money becomes available. This clearly indicates that the provision of the 12 through circuits in Libya is justified. However, a coaxial cable connection between Alexandria and Cairo (a necessary link in the International System proposed) will take all of the funds available for the next few years, and the money for providing the 12 through circuits from Alexandria to the Libyan border will not be available before 1962.

Whatever primary toll network is provided in Libya should be capable of later expansion.

The means by which the primary toll network is to be provided have changed from the original proposals in the Final Report for a Fundamental Plan of Telecommunications prepared by Hycon-Page. A study of the available records did not disclose adequate support for the changes which have been suggested. These include a change in the section between Benghazi and Cappuzo from tropospheric scatter to microwave; and a change for the section from Tripoli to Pisida from buried cable to microwave.

The primary toll network from the Tunisian border to the Egyptian border is divided into three tasks as follows:

- Task 5 - Tripoli to Derna
- Task 6 - Derna to Capuzzo
- Task 7 - Tripoli to Pisida

Funds have been allocated only for Tasks 5 and 10, and it is estimated that an additional allocation of U. S. \$558,000 is required to complete the work proposed.

Task 5 has been divided into three subdivisions as follows:

Task 5A - Line of sight microwave between Tripoli and Misurata.

Task 5B - Tropospheric scatter radio between Misurata and Benghazi.

Task 5C - Line of sight microwave from Benghazi to Derna.

A review of the status of the work was made during the trip to the headquarters of Hycon-Page at Cambridge. It is clearly indicated

that Task 5A and Task 5B have progressed so far that it does not seem feasible to suggest any changes at this time. The money spent and that committed is such that it would be uneconomic to change at this late date.

Task 5C, the portion of the telecommunications systems between Benghazi and Derna, seemed to indicate possibilities for saving. Task 6, the portion between Derna and Capuzzo where line of sight microwave was also recommended by Hycon-Page, indicated similar possibilities for savings. A pole line, which had been reported to be completely inadequate and not susceptible to rehabilitation, is in place all the way from Benghazi to Capuzzo. On July 27, 28 and 29, a survey of this pole line was made by the consultant, in company with the Hycon-Page representative in Libya and a representative of the Post and Telegraph Ministries. This survey covered the entire existing pole line from Benghazi to a point 25 miles east of Tobruch. The condition of more than 50 poles, selected at random, was determined by excavating around the base of the pole with a pick ax to determine pole condition below ground level, and a further check was made for loose guys, defective crossarms, and high resistance joints in the wire. It was determined as a result of this survey that the line is in relatively good condition and it is estimated that this open wire line can be placed in first class condition with two 12 carrier channels placed on it from Benghazi to Derna for approximately \$175,000, and for approximately \$125,000 additional it can be extended from Derna to Capuzzo with one 12 channel carrier between these points. This would be a total cost of approximately

\$300,000 for the rehabilitation of the line all the way from Benghazi to Capuzzo.

A statement furnished by Hycon-Page indicates that only \$140,000 has been spent or committed on Task 5C. There was no information available as to whether any of this might be salvaged.

In Cambridge, it was found that there was a letter of intent given to the General Electric Company of England (GEC) covering the purchase of radio equipment. As a result of this letter of intent, GEC is stated to have agreed to a price reduction on the equipment being furnished on the other part of the job, which might mean an additional cost of \$60,000, should the plans covering Task 5C be changed. From this and other information available in Cambridge and Washington, it became evident that a trip to Libya was necessary to determine the status and to find out whether or not there were any possible alternates which might result in a material saving of cost.

While in the field, test calls were made from Benghazi to Derna, Benghazi to Cairo, and over a specially set up circuit from Benghazi to Tobruch and back to Derna. The quality of transmission was good in all cases, although the volume was down on the longer calls since there were no repeaters on the circuits. Three repeaters may be required to correct this deficiency. These are included in the Estimate of Cost, page 15.

Task 7 proposed a line of sight microwave between Tripoli and Pisida. This is as proposed in a revision of the Fundamental Plan. A

field survey was also made of the pole line from Tripoli to Pisida. This line is older than the line from Benghazi to Capuzzo and will be more expensive to recondition. However, either the present pole line or a substitute buried cable will have to be maintained from Tripoli to Sabratha because of the local drops required.

In Tunis discussions were held with the Tunisian Post and Telegraph Department. They are planning to provide 12 circuits to Libya by line of sight microwave radio by way of Sousse, Sfax and Djerba to Tripoli. This would make the section from Tripoli to Pisida purely local in character and microwave radio would not be the proper answer to such a situation.

#### Recommendations on Primary Toll Network

Tasks 5A and 5B are recommended without change as now being planned and constructed by Hycon-Page.

Task 5C. The plan for using line of sight microwave from Benghazi to Derna should be changed to 12 channel open wire carrier on the present pole line and the present pole line should be rehabilitated, for the following reasons:

a. Cost. The microwave system from Benghazi to Derna will cost \$824,507 as estimated by Hycon-Page. The pole line can be rehabilitated for \$175,000. This estimated cost of \$175,000 includes the cost of the carrier equipment, most of which is now in stock in the Libya Post and Telegraph Department. Taking into account the possible additional cost which is due to present commitments of \$140,000 plus \$60,000, there is a total of \$200,000 unrecoverable expenditures. These include expenditures which have already been made plus the loss of the proposed GEC price reduction for future orders of additional equipment. The

total resulting cost is \$375,000, including unrecoverables, which is a very substantial difference in favor of rehabilitation of the open wire line.

The microwave system from Derna to Capuzzo will cost approximately the same as the microwave system from Benghazi to Derna or \$824,507. The pole line can be rehabilitated for \$125,000. Therefore, the total estimated cost for the rehabilitation of the pole line from Benghazi to Capuzzo would be \$300,000. It probably will have to be increased by the unrecoverable expenses and commitments of \$200,000. This means that the total estimated cost, therefore, is \$500,000. This compares with the cost of microwave installation from Benghazi to Capuzzo of \$1,649,014. The savings, if the above recommendations are adopted, would be approximately \$1,149,014.

The detailed estimate of cost for the changes in Task 5C and Task 6, which result in the above mentioned savings, are shown on page 15.

b. Service. Excellent service can be furnished by the open wire carrier when properly maintained. The evidence in the field is that the Post and Telegraph Department can and do maintain pole lines and carrier, whereas, the present radio equipment is not being properly maintained.

c. Timing. The carrier equipment can be in service by the time the facilities are completed between Tripoli and Benghazi.

d. Miscellaneous. Egypt is now planning open wire carrier from Alexandria to the Libyan border. Investigations in the field reveal that there have been no thefts of wire during the past two years. The main objections which have been raised to open wire line, where valid, were not of sufficient weight to justify the indicated substantial increase in cost of microwave.

Task 6. The plan for using line of sight microwave from Derna to Capuzzo should be changed to 12 channel carrier on the present pole line. Rehabilitations should be made. This is justified for the same reasons given above for Task 5C and the estimated cost for rehabilitation and the estimated savings are shown on the table on page 15.

Task 7. No decision should be made concerning the section between Tripoli and the Tunisian border until the plans of the Tunisian Government for providing the circuits in Tunis have been finally determined and construction is assured.

#### B. Secondary Toll Network

A secondary toll network providing circuits to places in the interior, as Chadames, Ghat, Sebha, El Ciof, Giarabub and others, will be necessary ultimately. The plans proposed by Hycon-Page for these services, in general, appear much too costly for the estimated traffic that can be expected now or in the future. It is recommended that each of the proposed tasks should be reviewed and new recommendations made which can be justified before approval of any new specific task orders.

Task 10, originally for the secondary network for Tripolitania villages, east, was revised by Amendment 4 to provide a 24 channel line of sight radio link between Tripoli and the Idris Airport. All of the equipment has been ordered and work is proceeding on this link.

#### C. Central Offices Tripoli and Elsewhere

Provision should be made for the construction of a new dial central office in Tripoli and the later mechanization of all of the central offices. It is recommended that the new Tripoli exchange should be step-by-step equipment and that replacements of the other central office equipments with step-by-step equipment should come when and as needed. This is a desirable long range objective. It is not clear at the present time that there

Estimate of Cost for Change in Task 5C and Task 6 for

Telecommunications

Libya

Task 5C Benghazi to Derna

Line of sight microwave radio, Hycon-Page estimate		\$	824,507	
Recondition Pole Line				
Replace 20% of poles, 1440 poles @				
\$35 per pole	\$	50,400		
Replace 10% of crossarms, 1440 cross-				
arms @ \$12 per crossarm		17,280		
Tighten guys, transpose and eliminate				
high resistance joints @ \$5 per pole		36,000		
Carrier equipment (available in P&T				
stock) and repeaters		50,000		
Contingencies		21,320		
Unrecoverable expenses to date and				
no GEC price reduction		<u>200,000</u>		
			<u>375,000</u>	
			449,507	260,700

Task 6 Derna to Capuzzo

Line of sight microwave radio, approximately the				
same as Benghazi to Derna			824,507	
Recondition Pole Line				
Replace 20% of poles, 1280 @ \$35 per pole		44,800		
Replace 10% of crossarms, 640 @ \$12				
per crossarm		7,680		
Tighten guys, etc., @ \$5 per pole		32,000		
Repeaters		10,000		
Contingencies		<u>30,520</u>		
			<u>125,000</u>	
			699,507	699,507

Tasks 5C and 6 Benghazi to Capuzzo

Microwave Radio			1,649,014	
Recondition Pole Line			<u>500,000</u>	\$960,207
Total Estimated Savings	\$		1,149,014	

is an immediate need for mechanization of the exchanges other than Tripoli. It seems from the field investigation that this mechanization is many years away.

#### D. Outside Plant

The outside plant in Tripoli and Benghazi, particularly Tripoli, is in very bad condition. To achieve a satisfactory telecommunication system, it is necessary to have all parts of the system in first class condition. The rehabilitation of the outside plant and station equipment in Tripoli and Benghazi is an immediate necessity if this objective is to be realized. It is recommended, therefore, that the rehabilitation of the outside plant in Tripoli proceed as rapidly as possible. In Benghazi, rehabilitation should also be completed at an early date in the future.

#### E. Other Tasks

Other tasks which have been approved and for which funds have been allocated under the Fundamental Plan include Task 23 (Training), Task 24 (Organization), and Task 25 (Rates and Tariffs).

Task 23 is underway already. No work has been done to date on Tasks 24 and 25. Under Task 23, two training classes have been started. One for newly hired employees, providing training in the fundamentals of electricity, and one for foremen, providing training using the Bell System Foreman's Training Setup. It was noted in the field that plans are underway for a greatly increased training program. It is recommended that the training program be increased to the maximum extent possible, recognizing the availability of Libyan personnel who are qualified to be trained.

## Summary of Recommendations

As a result of a study of the various proposals, it is recommended that certain changes be made and that certain work be undertaken immediately.

Specifically, these include the following recommendations:

1. Change plans for microwave line of sight radio from Benghazi to Derna to rehabilitation of present open wire line and provision of 12 channel carrier systems.

2. Change plans for microwave line of sight radio from Derna to Capuzzo to rehabilitation of present open wire line and provision of 12 channel carrier system.

3. Have cost study made to determine whether there is sufficient economy in rehabilitating the open wire line all the way from Benghazi to Capuzzo at one time to justify such a procedure.

4. Take no action on section from Tripoli to Pisida until the plans of the Tunisian Government have been finally formulated.

5. Have new studies made in support of all new Tasks.

6. Devote all money possible to prompt rehabilitation of Tripoli and Benghazi outside plant and station equipment.

7. Give consideration to whether Hycon-Page is best qualified for Tasks 24 and 25, but proceed promptly with them.

8. A training program should be programmed which will use as many qualified Libyans as possible and should include all phases involved in the design, construction, operation, maintenance and management of a telecommunications system. ✓

9. Provide for an independent technical check on performance of circuits as completed. ✓

These recommendations concerning change in facilities for the primary toll network are shown graphically on the map on page 5. The sections covered by Tasks 5, 6 and 7 are indicated.

### III. Problems in Tunisia

There are two problems in Tunisia for which the Tunisian Government is anxious to get a solution and technical help is required.

#### Police Mobile Radio

The Tunisian police wish to establish a number of mobile radio stations to give radio coverage to most of Tunisia. It will also be necessary to link these stations together by radio. Neither the Tunisian government nor the USOM have the necessary technical knowledge at their disposal. USOM would like to be given information as to available expert help so that they can make a recommendation to the Tunisian government.

#### Telephone Communication to Rabat and Washington

Tunis now has telephone connection with the rest of the world by a cable to Algiers and radio to Sicily. The Tunisian engineers indicated that it was the desire of their country to reach Washington without going through Algeria, France or Italy. They expressed the opinion that their ability to talk to Washington should not be subject to any interference from any other country. They also expressed the desire to be able to talk with Rabat similarly.

USOM/Tunisia would like to be provided information as to available expert help so that they can make a definite recommendation to the Tunisian government.

### IV. Acknowledgements

The cooperation rendered by ICA staff and the representatives of Hycon-Page during conferences in Washington and Cambridge is acknowledged.

While in Libya, the project was discussed with the Honorable Mr. J. Wesley Jones, United States Ambassador. Numerous contacts were made with Messrs. Gordon, Coultrap and Reed of USOM. Messrs. Hannum, Yakoub and Wright of the Libyan American Reconstruction Commission were consulted on several occasions. The Ministry of Post and Telegraph in Libya made available Messrs. Kabaji and Blackett for assistance on this project. The field manager of Hycon-Page, Colonel Robert Drake, and a number of his assistants also provided essential information.

While in Tunis, contacts were made with the Honorable George Lewis Jones, Jr., United States Ambassador, Admiral Strauss, Messrs. McPhail, Ellis, Hoeveller, de Chetelat and Lindsay of the USOM. The Post and Telegraph Department in Tunisia made available Mr. Driss and an engineer of the Tunisian Government. All of these persons made material contributions to this report. It would have been impossible to have completed this assignment without the above assistance, which is hereby gratefully acknowledged.

APPENDIX A

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TASK ORDER  
OFFICE OF INDUSTRIAL RESOURCES

ICA NO. 213

INTERNATIONAL COOPERATION ADMINISTRATION  
Washington 25, D. C.

Date: June 10, 1958

PIO/T No. 99-25-042-3-89001-A-3

TO: Tudor Engineering Company

ICA Project No. and Title: Telecommunications - Libya

Country: Libya

Project Engr./Mgr.: C. S. Gysland

Phone Extension: 2581

- Assignment:
1. To review the reports and data in connection with the contract between Hycon-Page and GOL.
  2. To send a consultant to Cambridge, Mass. and Libya to review material available at such sources.
  3. To analyze and prepare a report covering but not necessarily limited to the various items indicated on the attached Scope of Work.

Target Date: September 1, 1958

Remarks: Approximately 70 man days and approximately \$15,000.

Estimated Cost:  
(Tudor to insert)

Acknowledged:

/s/ John G. Marr  
Tudor Engineering Company 6-11-58  
(Please return one signed copy to ICA)

/s/ N. E. Thompson  
Norman E. Thompson, Chief  
Industrial Engineering Division  
Office of Industrial Resources

Tudor Project No. 213

Task Engineer:  
Phone: Sterling 3-5313

ICA-10-70  
(6-56)

June 10, 1958  
T. O. 213

SCOPE OF WORK

TELECOMMUNICATIONS - LIBYA

1. Review the "Fundamental Plan" for the telecommunications system in Libya, as submitted by Hycon-Page, as to content to establish the adequacy and adaptability of the telecommunications plans and programs set forth therein.
2. Review additional reports and data which has been completed under this contract to date and review proposed work schedules where available.
3. Review the basic information provided in the Fundamental Plan and the estimates of cost as compared with the costs of the portions now completed or now under contract.
4. Analyze the conclusions drawn from the facts stated in the Fundamental Plan to determine the reasonableness of the proposed telecommunications system, particularly with respect to the scope and advisability of the proposed initial construction and the various methods recommended for providing telecommunications circuits.
5. Prepare an independent recommendation based upon the facts presented in the Fundamental Plan for suitable and reasonable telecommunications facilities in Libya, in the event that the facts and basic information warrant deviation from the plans presented.
6. Prepare comments on the types of systems proposed, their economic and technical feasibility. Completely document any recommendations with facts available and include all the reasons for such recommendations in the event that there is variance with the recommendations proposed by Hycon-Page.
7. Make such other analyses and comments as may be indicated by the content of the Fundamental Plan. This shall include comments on elements included in the Fundamental Plan or those which may not have been included in the Fundamental Plan.
8. Prepare a report in preliminary draft form on the above items 1 to 7. Upon completion confer with ICA/W with respect to the content of this preliminary draft report and then prepare a final report for submission to ICA.
9. Recommend a course of action for ICA with respect to the Libya telecommunications system.

TASK ORDER  
OFFICE OF INDUSTRIAL RESOURCES

ICA NO. 213-A

INTERNATIONAL COOPERATION ADMINISTRATION  
Washington 25, D. C.

Date: June 27, 1958

TO: Tudor Engineering Company

ICA Project No. and Title: Telecommunications - Libya

Country: Libya

Project Engr./Mgr.: C. S. Gysland

Phone Extension: 2581

Assignment: To amend Task Order 213 to read as follows:

1. To review the reports and data in connection with the contract between Hycon-Page and GOL.
2. To send a consultant to Cambridge, Mass. and Libya to review material available at such sources.
3. To analyze and prepare a report covering but not necessarily limited to the various items indicated on the attached Scope of Work.
4. To send a consultant to Tunis to provide telecommunications consulting services immediately following the work in Libya.

Target Date:

Remarks: Cost Estimate: See Task Order No. 213.

Acknowledged:

/s/ John G. Marr  
Tudor Engineering Company 7-1-58  
(Please return one signed copy to ICA)

/s/ N. E. Thompson  
Norman E. Thompson, Chief  
Industrial Engineering Division  
Office of Industrial Resources

Tudor Project No. 213-A

Task Engineer:  
Phone: Sterling 3-5313

ICA-10-70  
(6-56)

APPENDIX B

TASKS AS ENUMERATED IN CONTRACT  
BETWEEN  
HYCON-PAGE AND UNITED KINGDOM OF LIBYA

APPENDIX B

TASKS AS ENUMERATED IN CONTRACT BETWEEN  
HYCON-PAGE AND UNITED KINGDOM OF LIBYA

Tasks Nos. 1 and 2: Broadcasting - Tripolitania and Benghazi

Amendment No. 9 to the contract consolidated Tasks Nos. 1 and 2 into Task No. 1. Hycon-Page is to provide permanent broadcasting facilities and studios in Tripoli and in Benghazi. Hycon-Page will provide interim broadcasting facilities and studios in Tripoli and Benghazi using 5 kw transmitters at each location.

Task No. 3: Broadcasting - Cyrenaica

Broadcasting facilities to provide satisfactory coverage in Cyrenaica.

Task No. 4: Broadcasting - Fezzan and Other Parts of Libya

Broadcasting facilities to provide satisfactory coverage in the Fezzan and other portions of Libya not covered by equipment provided under Task No. 1.

Task No. 5: Telecommunications - Primary Toll Network, Tripoli - Derna

Communications facilities between Tripoli and Derna consisting of the following:

a. Between Tripoli and Misurata line-of-sight radio with initially 12 channels. Amendment No. 2 to the contract provided this type of communication instead of buried cable.

b. Between Misurata and Benghazi tropospheric-scatter transmission with initially 12 voice channels.

c. Between Benghazi and Derna line-of-sight radio with initially 12 channels.

Task No. 6: Telecommunications - Primary Network, Derna - Capuzzo

Tropospheric-scatter links with initially 12 voice channels. Drawing G-715, titled "Pictorial Diagram - Telecommunications Radio Toll Links", dated June 4, 1958, indicates that microwave line-of-sight will be used instead of tropospheric scatter.

Task No. 7: Telecommunications - Primary Network - Tripoli - Pisida

A 26 pair buried cable with initially 12 through circuits. The drawing mentioned in Task No. 6 indicates that microwave line-of-sight will be used instead of buried cable.

Task No. 8: Telecommunications - Secondary Network, Sirte - Sebha

Tropospheric-scatter with 4 voice channels.

Task No. 9: Telecommunications - Secondary Network, Tripolitania Villages - South and Ghadames

Rehabilitated open-wire line, line-of-sight radio and tropospheric-scatter links with a maximum of 5 channels.

Task No. 10: Telecommunications - Secondary Network, Tripolitania Villages - East

Amendment No. 4 to the contract changed this task so that it now covers a 24 channel line-of-sight radio link between Tripoli and the Idris Airport only.

Task No. 11: Telecommunications - Secondary Network, Misurata - Beni Ulid

Tropospheric-scatter with 4 voice channels.

Task No. 12: Telecommunications - Secondary Network, Fezzan Villages

Tropospheric-scatter and line-of-sight radio with a maximum of 5 voice channels.

Task No. 13: Telecommunications - Secondary Network, Cyrenaica Villages - East and South

Tropospheric-scatter with 4 voice channels and 1 teleprinter channel.

Task No. 14: Telecommunications - Secondary Network, Cyrenaica Villages - West

Rehabilitated and modified open-wire line with a maximum of 1 plus 3 carrier channels.

Task No. 15: Telecommunications - Secondary Network, Tobruk - El Adem

Rehabilitated and modified open-wire line using present circuits.

Task No. 16: Telephone Central Office, Tripoli

Modernization and expansion of the present 3,000 line telephone exchange to 5,000 lines.

Task No. 17: Telephone Central Office, Benghazi

Modernization and expansion of the present 500 line telephone exchange to 1000 lines.

Task No. 18: Telephone Exchanges on Primary Network, Tripolitania

Task No. 19: Telephone Exchanges on Secondary Network, Tripolitania

Task No. 20: Telephone Exchanges on Primary Network, Cyrenaica

Task No. 21: Telephone Exchanges on Secondary Network, Cyrenaica

Task No. 22: Telephone Exchanges on Secondary Network, Fezzan

Task No. 23: Telecommunications - Training Program

Hycon-Page is to establish telecommunication training facilities for the Libyans and operate these until Libyan personnel are capable of taking over the operation and maintenance.

Task No. 24: Telecommunications - Organizing and Staffing

Hycon-Page is to provide consultant services and assistance in organizing and recruiting a staff to operate the completed telecommunications network.

Task No. 25: Telecommunications - Tariff Schedules

Hycon-Page is to advise the Government of Libya in connection with reviewing and modernizing telecommunications tariff schedules.

Task No. 28:

This task, authorized by Amendment No. 1 to the contract, is for consulting services by Hycon-Page for work not specifically authorized elsewhere in the contract.

Task No. 30:

This task, authorized by Amendment No. 3 to the contract, covers the preliminary engineering for Task No. 16: Telephone Central Office, Tripoli.