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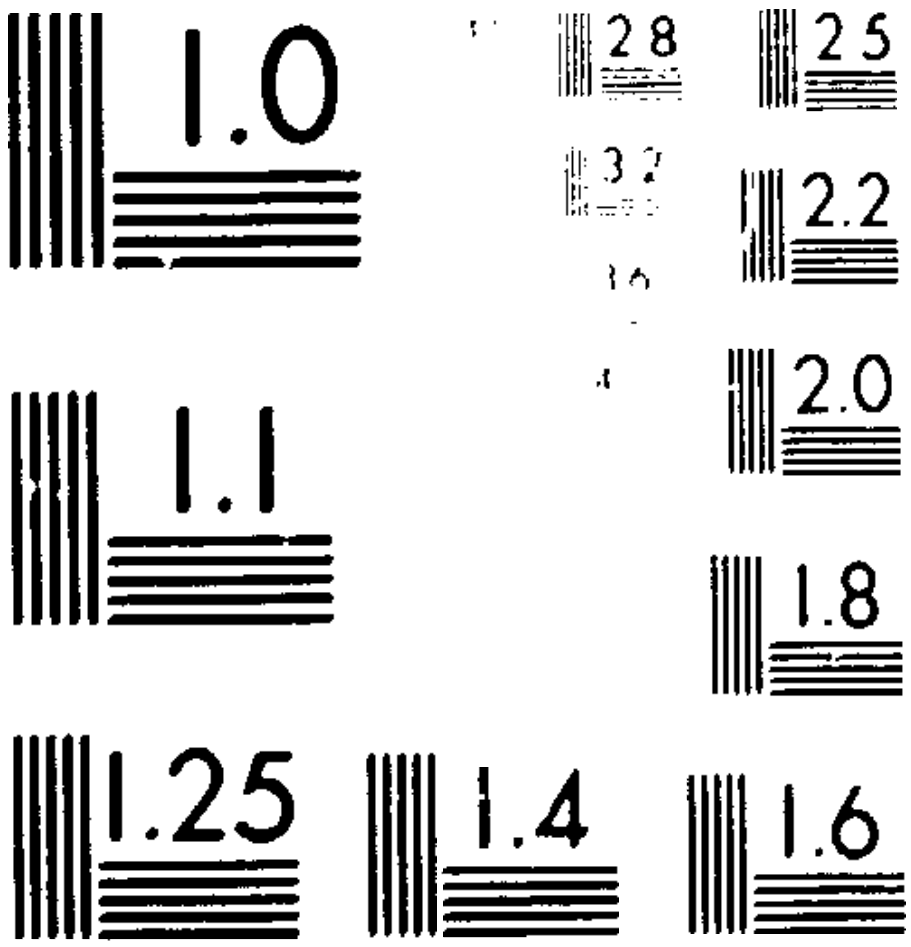

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Egypt. LIGHTER-THAN-AIR TRANSPORT SYSTEMS*.

(Background paper submitted by the Arab Republic of Egypt)

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I. The role of transport in economic development

1. The crucial role of transport in economic development needs no emphasis. Without it, any economy would have to stay largely at a subsistence level and the division of labour which also involves geographical dispersion could not take place.

2. On the other hand, transport has no value in itself. Its use lies in moving valuable goods and people, but there is little point in producing surplus transport services. Producing more transport capacity than is actually needed must, therefore, be considered uneconomic. It implies a waste of national resources (i.e. of funds available for investment) which could be put to better use for other purposes. Thus, the creation of more transport capacity than is needed at any given time should be avoided. But when the economy expands, transport should not be an obstacle and should also be expanded to fill its crucial role.

3. The lighter-than-air systems could play an important role in inland transport if it were an economic mode of transport compared with other modes. Consequently research must take into consideration the reduction of operation costs, so that these systems may participate more efficiently in consolidating the developing countries economies.

II. Geophysical description

4. Although Egypt is essentially rectangular in shape, the predominant factor from the transport point of view, is the linear configuration of economic activity, following the course of the Nile over the whole length of Egypt from south to north. There are only a few transport links ouside the Nile valley and the delta, primarily connecting the latter with the Red Sea to the east and with Libya to the west. The Nile valley and its delta, covering about 35,000 square kilometres, accounts for almost all population settlements and economic activity to a total of approximately one million square kilometres.

5. In 1949 the population of Egypt was 21 million, while the estimated population in 1979 is 41 million and is expected to reach 66 million in the year 2000.

6. The land area has remained almost the same, and the agricultural area utilized has increased only marginally during this period.

7. Cairo, which is the capital of Egypt, has a population of 6 million. Alexandria, the second city has 3 million people. In other words, almost 24 per cent of the population lives in these two metropolitan areas. About 43 per cent of the population are in the delta area, 32 per cent in lower Egypt which stretches from Cairo along the Nile to the Sudan border, and 1 per cent in Upper Egypt along the frontier.

III. Description of the Inland Transport System

8. The Egyptian transport system depends mainly on the following modes:

(a) road transport
(b) railways
(c) inland waterways
(d) pipelines

(a) Road Transport

9. The most important mode for transporting freight is road transport and its current predominance is partly a result of capacity limitions on railways and inland waterways which is expected to diminish in the future.

10. The Egyptian road network has a total length of over 28,500 kms., of which approximately 15,000 kms. are paved (53 per cent) and 13,000 kms. unpaved (47 per cent).

11. The number of motor transport vehicles in 1979 reached 90,833 trucks and 13,904 trailers. The roads are divided into 4 categories:

(i) "Divided highways", linking the capital with the main ports and large urban areas;
(ii) "First class roads", inter-connecting the capitals of the Governorates and providing access to major industrial areas.

(iii) "Second class roads", providing connections between capitals of Governorates and other towns within each Governorate;

(iv) "Third class roads", connecting villages to higher class roads.

12. When estimating the highway density, one has to differentiate between the densely populated areas in the delta and Nile valley and the rest of the country. A rough estimate showed that approximately 700 kms. of roads are desert roads, i.e. outside the delta and the Nile valley.

13. The total road density in the delta is 40 to 60 kms. per 100 kms.^{2} while in the Nile valley of Upper Egypt it is somewhat lower. Considering road density in regard to population, it is 0.75 km. per 1,000 inhabitants and 7.5 kms. per 1,000 motor vehicles.

(b) Railways

14. Egypt has a favourable environment for railway services. The population and economic activity is concentrated on flat terrain in the delta and along the Nile.

15. Population density in the settled areas is among the highest in the world and the population growth rate is high.

16. Development is being concentrated in a number of large industrial areas and projected new cities.

17. Cairo, at the apex of the delta and the base of the Nile valley is a natural centre for the railway.

18. The favourable geography and important situation of Egypt on international trade routes, led to an extensive railway network being constructed in the nineteenth century.

19. Additions and improvements have since been made. The total route length of main lines is 3,965 kms., of which 950 kms. are double track and 3,015 kms. are single track, thus the total track length of main lines if 4,915 kms.

20. The Egyptian railway network is standard guage (1,435 mm). Apart from this system there is only a double track suburban line of 25 kms. between Cairo and Helwan which is electrified. In the south the railway begins at the Aswan High Dam and runs northwards through the Nile valley via Cairo to Alexandria. From Cairo to the north there are extended systems in the delta both eastward and westward. There are also 350 kms. of single track from the iron ore mines in the western desert at the Bahariya Oasis running north-eastward across the desert passing over the main Cairo-Aswan line and the Nile to the steel works at Helwan. The rolling stock consists of 17,847 freight cars.

(c) Inland waterways

21. In addition to the road and railway networks the principal inland waterways, notably the Nile, constitute the means for and effective transport system in the densely populated areas along the Nile valley and its delta. The inland waterway system encompasses two classes of waterways, class I and class II.

22. The class I waterways consist of a narrow traffic line extending from Alexandria via a canal link to Cairo, and from there via the Nile to Aswan. The class I may be defined as those navigable by units, i.e. two ships in succession with a capacity of up to 920 tons, a width of 7.5 m., a loaded draft of 1.8 m. and a total unit length of between 90 to 100 m. The total expanse of class I waterways is 495 kms.

23. The class II waterways, located primarily in the Nile delta, cater solely for sailing boats and small self-powered barges with a capacity of up to 200 tons. Except for the old canals connecting Cairo with Alexandria, the class II waterways have a permissible loaded draft of only 1.2 m. Therefore they can only be used by the numerous sailing boats. The total length of class II waterways is 1,849 kms.

(d) Pipelines

24. A major part of the crude oil for domestic refining, part of the refined petroleum products and practically all the natural gas used in the U.R.E. are transported via pipeline.

25. The liquid hydrocarbon pipeline network consists basically of a trunk line linking the refineries of Suez, Cairo, Tanta and Alexandria with a series of relatively short spur lines from the refineries to major industrial users or storage areas. The trunk line is 345 kms. long and the spur lines have a length varying between 20-60 kms.

IV. Present and Future Transport Flows

Present Freight Transport Flows

26. A total of some 89.3 million tons of cargo is estimated to have been transported by the various modes in 1979 between the cities. In terms of tons, ton per kilometre performed and average transport distances, the modes compare as follows:

	Tons 10^3	%	Tons - km 10^6	%	Average Distance (kms)
Railways	5	5.6	1.8	11.8	360
Waterways	4.3	4.8	1.6	10.4	377
Road	73.3	82.1	10.8	70.6	147
Pipelines	6.7	7.5	1.1	7.2	146
Total	89.3	100	15.3	100	171

27. Because the average is markedly higher than that of the road and pipeline sector, the relative share of rail and water transport in the total ton/km production is relatively higher than in the total tonnage carried. In any case, the role of the road transport sector is predominant and as such may be said to play a vital role in the country's economy.

28. Inter-zonal transport activities are very much concentrated in the delta. Only 11 per cent of all cargo transported originates in one of the Upper Egypt Governorates while the area receives about 16 per cent of all cargo shipments. The direct transport interzonal distances in Lower Egypt (delta) is relatively small.

29. The biggest "general cargo" flow is registered between Alexandria and Cairo, within a distance of 200 kms.

Future Freight Transport Flows - 1979 - 1987

30. The total volume of cargo carried between zones is estimated to reach 145.3 million tons in 1987, subdivided between the four main modes of transport as follows:

	River	Rail	Road	Pipeline	Total
Petroleum products	905	402	7,131	12,831	21,267
Construction materials	3,255	45	6,032		9,332
Mineral products	2,579	3,554	1,185		7,313
Agricultural products		3,247	14,273		17,520
Industrial products	659	1,088	8,637		10,384
Others	-	-	79,468		79,468
Total Tonnage (1000 T.)	7,393	8,336	116,726		145,286
Million Ton km.	2,780	2,781	16,342	2,057	23,960
%	11.6	11.6	68.2	8.6	100
Average distance	376	334	140	160	165.

Future Freight Transport Flows for the year 2000

31. The long term projections for economic growth for the year 2000 yielded the following result (in 1,000 T).

(1,000 T.)

	Rail	River	Road	Pipeline	Total
Petroleum products	506	2,979	11,525	47,760	62,770
Construction materials	45	3,734	20,162	-	23,941
Mineral Products	4,397	2,924	1,095	-	8,416
Agricultural products	10,207	-	15,108	-	25,315
Industrial products	1,305	1,826	20,206	-	23,337
Others	-	-	216,134	-	216,134
Total	16,460	11,463	284,230	47,760	359,913

Transport Costs

Hereafter the economic cost per ton/kilometre per mode.

Railway	0.024 £ 1/
Inlandwaterway	0.012
Single truck	0.059
Truck combination	0.037

V. Chance of using lighter-than-air transport modes in Egypt

(a) Transporting water

32. Some desert Governorates suffer from the lack of fresh water resources. Fresh water is conveyed to the populations of such areas by any of the available modes. For instance, water is transported by rail to Marsa Matrouh and

1/ £.E. = Egyptian pound.

by trucks to the Red Sea Governorates. Drinking water is also transported by truck to various working groups in the desert, such as oil prospectors or utility constructors.

33. Since fresh water transportation needs a rapid, regular, cheap and efficient mode, it would be more beneficial to use the lighter-than-air system specially after being technically and economically modified for the purpose.

(b) Developing distant areas

34. Some of the regions at a distance from the river valley do not have enough modes of transport to link them up with the highly populated areas. Consequently, the production of these areas is limited to just covering the requirements of the local population. Simultaneously when taking into consideration the difficulties and constraints for securing the large amount of money necessary to build this new network, the production volume of these areas does not justify the construction of new links. Developing such communities requires the availability for marketing their products on the spot of consumption and this cannot be achieved without a cheap and efficient mode of transportation. Lighter-than-air transport modes will serve as an efficient and cheap mode for that purpose, specially since it does not require expensive infrastructures.

(c) Eliminating the ports congestion problem

35. Sometimes the number of imports increase more than the inland transport modes' capacity causing delays to vessels that have to wait several days in order to be unloaded, resulting in the Government having to pay large sums in delay penalties. In this case, lighter-than-air modes could be used to transport imports from the ports to the main storage points all over the country and also to transport provisions, fertilizers and raw materials intended for factories directly from the ports.

(d) Transporting disaster saving provisions

36. Some regions are prone to high floods which damage the transport network causing them to become isolated. In such cases, lighter-than-air transport modes could help in conveying the necessary saving provisions to the stricken areas.

(e) Rehabilitation of desert regions and construction of new communities

37. There are several projects for desert rehabilitation, land reclamation and the construction of new communities. Such schemes need to have large quantities of construction, building materials and supplies transported to the sites. Lighter-than-air transport modes could also be used for this purpose.

VI. Recommendation

Transport Cost

38. The lighter-than air system could play an important role in inland transport if it were economical when compared to the other modes. Consequently, the research must take into consideration the reduction .. operating costs.

Load-Capacity

39. Lighter-than-air transport systems could play an importan role in transport services and justify its usage as an economic mode of transportation by developing its load-capacity from 100 to 200 tons.

Speed

40. The increase of speed up to 100 kms. would double the cargo volume transported by the same available capacity due to shortening the turn around time. As a result, there would be a decrease in capital and operating costs.