CASE 3

EAST AFRICAN RAILWAYS

1. THE CURRENT POSITION

The Mombasa Area Manager of East African Railways Corporation is concerned about the delays in the Mombasa marshalling yard. He considers this to be a costly waste of time and resources. He has raised his concern with the Chief Engineer who is responsible for the design of a new marshalling yard. They have agreed that the O.R. unit should look at the planned design and give their advice.

The O.R. unit has been requested to produce a preliminary report based on the existing system. The report should examine areas of concern and should advise whether further detailed work and data collection and analysis is needed to improve the design of the marshalling yard.

The O.R. manager has assigned you the task of preparing and presenting the preliminary report to the Mombasa Area Manager and the Chief Engineer.

2. THE RAILWAY CORPORATION

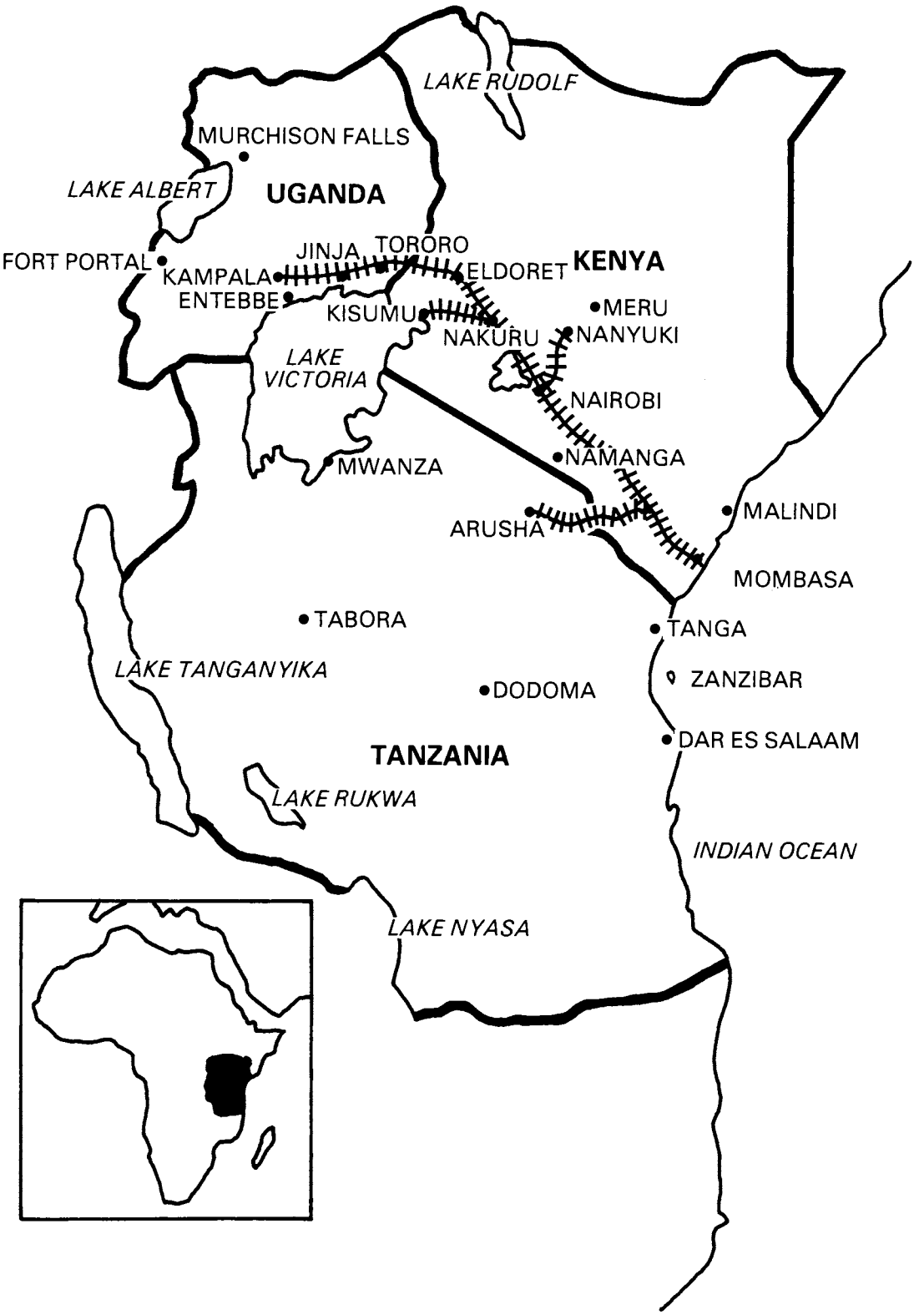
East African Railways Corporation is responsible for the management of the railways system in the three East African countries of Kenya, Uganda, and Tanzania. The main railways passing through Mombasa are shown in the map overleaf. Mombasa is Kenya's main port and second largest town. A significant proportion of Kenya's imports and exports pass through the port and the rail link to the capital city, Nairobi, is a very important element of the communications system.

3. THE AREA MANAGER'S VIEW

You attend a meeting with the Area Manager at which he puts forward his view of the problem and his suggestions to put it right. He tells you that there have been serious difficulties and delays for a number of years in the marshalling yard. He sees the main problem being with the marshalling of trains to leave the port and that this causes serious delays in the traffic to Nairobi and beyond. Proposals have been made for improving and even rebuilding the marshalling yard. He has proposed that the 'trip' locomotives for marshalling wagons from the port are not powerful enough and should be replaced, and secondly, that there should be more 'receiving' lines for wagons from the port before they are made up into trains to the various destinations.

Map of East Africa

Main Railways through Mombasa



4. THE MARSHALLING YARD

The Chief Engineer takes the O.R. team for a walk around the marshalling yard. Starting at the port, goods are unloaded into wagons which are moved by a trip train to the receiving lines. The next stage of the marshalling process is that wagons are moved from the receiving lines by a shunter engine to the far end of the marshalling yard and recombined into groups with a common destination. For example, all the wagons destined for Nairobi and beyond are joined into one train. At present approximately half the wagons are in this category. In reply to a question the Chief Engineer estimates that one shunter can clear and reorganise a full receiving line of 20 wagons in approximately 25 minutes.

At the far end of the marshalling yard the freight trains are assembled. A completed freight train consists of 30 wagons and, when this number has been assembled by the shunting process for a particular set of common destinations, a locomotive will be connected in due course and the train will leave. An exception to this rule is planned for the case of wagons going to Nairobi and beyond. Trains for this set of destinations are planned to leave every 1 hours on a regular schedule whether or not the 30 have been assembled. The interval of 1 hours was chosen since it gives 16 trains a day and the approximate average number of wagons currently going to Nairobi and beyond is 450 a day.

The far end of the yard which is to be used for the train assembly is part of the existing railway network. Up to 40 wagons can be assembled for Nairobi and beyond using this system but when 40 are assembled no more can be brought up by the shunter until a train has left. Similar problems could occur for other destinations but rather more spare capacity is available for these destinations.

The O.R. team now moved back to the port for a more detailed examination of operations there. Ships are mainly offloaded at the port between the hours of 8.00 a.m. and 5.00 p.m. Up to 400 wagons can be held at the port with the existing facilities, but when this number has been reached offloading must be stopped until a trip train has taken some of the wagons away. Everyone recognises that the 'demurrage' cost of keeping a ship waiting is prohibitive, in some cases it can be US$25,000 a day. The peak time for trip train deliveries from the port is expected to be 12 noon to 6.00 p.m. but the trains will continue to operate on a 24 hour basis if required. One trip train can pull a load of 20 wagons and during the peak period it is anticipated that a trip train will arrive in the marshalling yard from the port every 15 minutes. This estimate is based on current demand patterns for rail freight traffic.

At the marshalling yard it is planned to have six receiving lines each of which can take 20 wagons. If a line is free the trip train will be able to leave the wagons and return to the port; otherwise the train will have to wait and this may slow and delay subsequent trains from the port.

5. SOME COST DATA

The younger members of the O.R. team were surprised that it proved extremely difficult to get any cost estimates. A considerable amount of discussion and some international phone calls were necessary to get even crude estimates.

The capital cost of a trip train was estimated at US$150,000 and the running costs including fuel, drivers wages, maintenance and spare parts at KSh400,000 a year. A shunter locomotive was estimated to be less than half as expensive, with a capital cost of US$60,000 and a running cost of KSh250,000.

The costs of additional track were estimated to be US$25,000 for the addition of one receiving line in the yard with an annual running cost of KSh50,000. To provide an additional track of 40 wagons for the assembly of Nairobi trains was estimated to cost US$35,000 and running costs of KSh75,000 a year. (US$1 = 10 Kenyan shillings = KSh10).

6. THE O.R. REPORT

The O.R. manager has asked you to draft a report which he will see before it is sent to the Area Manager. It should address the following:

(1) In what areas are delays likely to occur?

(2) Will either or both of the Area Manager's suggestions help to reduce these delays?

(3) Further suggestions to improve the marshalling system given the current information.

(4) A discussion as to whether it is necessary to develop a more detailed model. If so, what type of model and what further data will have to be collected?