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EDITORIAL NOTE

The Transport and Communications Committee, at its seventeenth session, in reviewing the publication of the Transport and Communications Bulletin for Asia and the Far East, noted with satisfaction that, while there was a gratifying response from some Governments to the Committee's request for providing the secretariat with articles for publication in the Transport and Communications Bulletin for Asia and the Far East, through the special correspondents nominated for this purpose, response had so far been confined to only a few countries of the region. The Committee, therefore, hoped that more countries would send in more contributions on a continuing basis, so that the Transport and Communications Bulletin for Asia and the Far East could publish regularly important articles emanating from national sources.

The secretariat has been continually making efforts to improve the quality of the articles published in the Bulletin and has also endeavoured to cover as wide a field as possible in order to maintain a good standard in its published material.

The secretariat will, of course, inform Governments contributing articles through their correspondents of the approximate dates when such articles will be published so that future contributions can be planned in advance.

The secretariat, therefore, earnestly hopes that there will be an adequate and continuing response from Governments through their contribution of articles of general and topical interest.

I. Articles

TOURISM AND SURFACE TRANSPORT *

SUMMARY

The paper discusses, in general, the relationship between tourism and transportation with special emphasis on surface transport. In particular, the forces generating demands for the moving of people are briefly considered. The terms specifying various kinds of travellers are defined. The process of planning the development of transport in a country or region is described, taking into account the possibility of the application of new transport technology. The role of international transport networks in promoting tourism is shown. The paper also reviews various aspects of state and private undertakings in surface transport, the role of transport institutions, the importance of the structure and level of fares, as well as various problems connected with the provision of adequate services to passengers and motorists, including transport safety.

INTRODUCTION

It is clearly evident that transport is an indispensable ingredient of nearly every kind of economic, social and political activity. On the one hand, transport plays an important role in the exploitation of natural resources, industrialization and trade by moving raw materials and products; on the other, it contributes a great deal to the satisfaction of various personal as well as collective demands for the movement of people.

Although both of these aspects are considered in this paper, primary attention is paid to passenger transportation, the connexion of which with tourism is much closer than that of freight transportation. Characterizing the relationship between transport and tourism, one could say that the moving of people is a common denominator to very many aspects of tourism.

TRANSPORT DEMAND

The demand of people to move is usually described in terms indicating the reason for travel, the places of origin and destination as well as the distance between them, and the suggested type, speed and convenience of movement.

In respect of reasons for travel, people need transportation in connexion with their work, business, education, health, family and social life, shopping, recreation and sport, as well as with other interests and purposes, such as migration, pilgrimage, political demonstrations, and even crime and war. Fortunately, at least some of the enumerated reasons can be put together under a common heading of "travelling for pleasure". This does not necessarily mean that the process of being transported, as such, is always a pleasant one. But people move to meet other people and make friends with them, see other places, attend special events particularly in the field of music, art and sport — pursue a hobby, shop, eat good food, get away from everyday routine, have a good rest, and even to look for some exciting experience.

All of the mentioned reasons have motivated people to travel in the past and will certainly do the same in the future. However, how strong the forces generating transport demands are in a specific case depends on many geographic, demographic, economic, technological, sociological and political factors.

In analyzing these factors in relation with tourism one should keep in mind that according to the definition recommended by the Committee of Statistical Experts of the League of Nations in 1937 — which is still used in international statistics — the term "foreign tourist" means any person visiting a country, other than in which he usually resides, for a period of at least twenty-four hours. Similarly, a "domestic tourist" is any person visiting, within the country in which he usually resides, a place, other than that in which he usually lives or works, for a period of at least twenty-four hours. Persons travelling on holidays for a period of less than twenty-four hours are usually called "excursionists".

Tourists and excursionists within the above definitions are, therefore, mainly the following visitors:

(*a*) persons travelling for pleasure

(*b*) persons travelling for personal reasons, such as health, education, family matters, religion, etc.

(*c*) persons travelling for business reasons

(*d*) persons travelling for meetings or in a representative capacity

(*e*) persons making a stopover in a place in the course of their journey.[1]

* The article is an extract from a paper prepared in the Transport Section, Resources and Transport Division, United Nations Secretariat, presented at the United Nations Seminar on Tourism Development held in Berne, Switzerland, from 21 October to 2 November 1968.

[1] Persons arriving in a place in the course of a sea cruise are considered as tourists even when they stay there less than twenty-four hours.

The following are not considered as tourists and excursionists:

(*a*) persons coming to establish a residence in a country or place

(*b*) persons coming, with or without a contract of work, to take up an occupation or engage in a business activity

(*c*) persons commuting in connexion with their occupation as well as education or training, including persons domiciled in one country and working or attending a school in an adjacent country

(*d*) young persons in schools and boarding establishments

(*e*) travellers passing through a country in transit without stopping.

It should be mentioned in this connexion that the United Nations Conference on International Travel and Tourism held in Rome, Italy, in 1963, recommended the use by all countries of a new term in the area of international travel, "visitor", defined as follows: the term "visitor" describes any person visiting a country other than that in which he has his usual place of residence, for any reason other than following an occupation remunerated from within the country visited[2]. The Rome Conference had also suggested that visitors as defined above should be classified into two categories consisting of tourists on the one hand and excursionists on the other.

A Group of Experts on International Travel Statistics, convened by the Secretary-General of the United Nations in co-operation with the United Nations Conference on Trade and Development (UNCTAD) and the International Union of Official Travel Organizations (IUOTO) in Geneva, Switzerland, in June 1967, studied these suggestions and considered it preferable to distinguish within the definition of "visitor" a separate class of visitors on day excursions and other border-crossers for other purposes other than employment, cruise passengers, and visitors in transit who do not stay over-night in accommodations provided within the country. The United Nations Statistical Commission accepted the definitions suggested by the expert group as a United Nations standard and recommended that they be used in international travel statistics.

Irrespective of the various definitions mentioned above, tourists and excursionists form a considerable part of all passengers moved on various means of transportation in international as well as national passenger transport. It should be kept in mind, on the other hand, that transport facilities only very seldom serve tourists or excursionists exclusively. Even passenger funicular railways and aerial ropeways built for mountain tourism move periodically or from time to time hotel employees and their families, equipment, construction materials and other goods as well. Therefore, the tourist transport requirements should always be considered as a part of the over-all demand for moving various kinds of passengers and freight.

The demand for transport of passengers to a place, country or region during a specific period of time can generally be expressed as a volume of traffic defined by the number of incoming passengers and the average length of a passenger trip[3]. This volume of incoming traffic can then be broken down by various categories of passengers (such as commuters, children and young people going to school, businessmen, shoppers, tourists, excursionists, etc.); by various places, countries and regions of origin; by various means of transportation; as well as some other criteria (such as public and private transport). Within a country or a region, the total volume of passenger traffic corresponds to the sum of incoming transport volumes established for each locality within the country or region concerned. The demand for transport of goods can be defined in a similar way[4].

TRANSPORT INFRASTRUCTURE

The demand for transport, particularly an estimate of future traffic growth in relation to the general development of the economy and the betterment of living conditions, is the key to drawing up a plan for the development of transport in a country or region. The preliminary task is therefore to evaluate long-term volumes of passenger and good traffic, taking into account the planned national and regional targets.

However, not all of the developing countries have so far elaborated and approved long-term plans for their over-all economic and social development. In such a case, specific studies on the development of the leading branches of the country's economy, particularly agriculture, industry, trade and tourism, as well as on the social progress, should serve as the basis for deriving sound estimates of the future transport requirements.

[2] Excluded from that definition are (a) *residents* (nationals and aliens) returning after a stay abroad not exceeding one year; (b) *permanent immigrants* (i.e., non-residents intending to remain for a period exceeding one year); (c) *temporary immigrants* (i.e., non-residents intending to exercise for a period of one year or less an occupation remunerated from within the country); and (d) *foreign diplomatic and military personnel* stationed in the country.

[3] The result of multiplying the number of incoming passengers by the relevant average length of a passenger trip in miles or kilometres gives the transport volume in passenger-miles or passenger-kilometres, respectively.

[4] The volume of traffic in this case is expressed in ton-miles or ton-kilometres.

The next step in the transport-planning process is usually an analysis of how far these requirements can be met by the existing transport system. To this end, a thorough inventory of transport networks, installations and equipment, as well as an evaluation of different factors connected with their physical condition and present and potential capacities, effectiveness and operations, are necessary.

Then, the most difficult problem should be tackled: that of devising future transport policy, including the improvement and extension of the transport system. In this connexion, various important questions must be answered, such as: What is the optimum distribution of the future total volumes of traffic among the various forms of transport which would ensure the highest efficiency of the transport system as a whole? What parts should the various forms of transport play and, particularly, should new railways, airports, harbours and pipe-lines be built? How much of the public financial resources available for the development of national economy should be allocated to transportation and how should these resources be distributed within the transport field? What should be the role of private investment in the development of transport?

The replies to these questions must necessarily vary widely from country to country; in this respect there is no single formula equally applicable to all cases. Much depends on the topography of the country or region concerned, particularly on national obstacles to be overcome by the transport network, such as high mountain-chains, vast deserts and rapids or waterfalls on large rivers; on weather, particularly the volume of rainfall; on the existing transport facilities; and, of course, on the future patterns of the national economy. In many of the former colonial territories, transport infrastructure was only built to serve military purposes and enable the exporting of raw materials to the metropolitan country, paying inadequate attention to the growth of the economy and the betterment of living conditions. In these countries, the existing transport systems must be extended to meet the needs of growing agriculture, new industries, large towns, and possibly also tourism; to help open new development areas; to encourage the desirable movement of population; and to stimulate capital investment.

In some other developing countries, the existing transport networks and equipment are over-age and urgently need modernization as well as the establishment of maintenance and repair facilities. The ability of many countries to adequately devise transport policy, plan transport development, supervise transport activities, and train transport personnel depends to a large extent on the existence of adequate transport institutions and training facilities.

In general, during the past ten years, the share of the total public investment devoted to transport in developing countries has mostly been more than 15 per cent, in some countries as high as 25 to 30 per cent, yet in view of the limited absolute amounts involved, apparently far below what could be usefully spent in this field.

The government bodies responsible for devising transport policies and programming transport development have to realize that a haphazard transfer of skills, money and equipment should be replaced by a planning approach towards the strengthening of the economic, social and political structure of each country concerned. Building transport facilities too far in advance of the need, in the wrong place, without an adequate co-ordination between the modes of transport, as well as without taking into account the latest advances in transport technology, may have a detrimental effect on the economy and living conditions of the country concerned.

As, generally, a considerable part of the whole system of transportation in a country or region also covers, among other requirements for moving passengers and goods, the transport demand generated in connexion with tourism, the transport planners, while programming any improvement or extension of transport infrastructure, should always try to answer the question of whether and how the programmed action could also meet the needs of tourism.

For instance, roads which have to be built in connexion with the exploitation of mineral deposits in inaccessible mountains can also be used, jointly with other related facilities for the provision of power and water, to open the scenic mountain areas for tourism and mountain sports; roads needed for the construction of electricity transmission lines or pipelines can simultaneously provide access to wild-life preserves and national parks; the reconstruction of ports and the improvement of navigability of rivers can be designed to also permit the development of aquatic sports including yachting.

Regional transport links can serve as another example of this kind. The Inter-American Highway, now passable for the entire 3,100-mile length, connects the five Central American republics — Costa Rica, El Salvador, Honduras, Nicaragua and Guatemala — with each other, as well as with Panama, Mexico and the United States of America. It is a part of the Pan-American Highway System, existing and planned, traversing and linking all of the countries of Central and South America[5]. Its justification was based on the idea of a main transport artery serving various economic, social and political needs and interests of the countries concerned; tourism was, of course, also taken into account. The Inter-American Highway,

5 The idea of linking the Americas began with a project of a railroad, first proposed in the 1880's; however, the railway project has never reached the construction stage. (*International Commerce*, 1 April 1968, page 24).

with 92 per cent of its total length paved, is now equipped with facilities for food, accommodations, gasoline and repairs, as well as with some road signs to guide the tourists. As a matter of fact, it carries considerable tourist traffic.

The Asian Highway is a system of international priority through routes linking fourteen countries of of Asia situated between Iran on the one side and Malaysia and Viet-Nam on the other; at a later stage, this system is to be connected, through Turkey and the Middle East, with highway networks of Europe and Africa. Subsequently, it was also decided to include Indonesia in the Asian Highway system. The approach accepted for the realization of the Asian Highway project was that the selected existing national through roads should be brought up to a certain standard and linked together. Two parallel priority roads are planned: a northern and a southern one. The former, which has a length of approximately 7,000 miles, should be opened to through traffic in 1970. The Asian Highway is principally aimed at the stimulation of industrial and commercial growth of the countries concerned. Nevertheless, tourism and pilgrimages will undoubtedly benefit from this overland through route which is now being equipped, step by step, with various facilities to serve national and foreign tourists.

Another similar through road will be, hopefully, the Trans-Sahara Road, a north-south link between Algeria on the one side and Mali and Niger on the other. It would be approximately 1,800 miles long and run from El Golea to Tamanrasset, Algeria, where it would diverge; two extensions would then branch off leading to Gao in east-central Mali and to Tahoua in southwest Niger. This highway, now being studied within a preliminary economic and technical feasibility survey financed by the United Nations Development Programme, is expected to promote the economic development of the countries concerned, particularly to expand the present modest trade along the existing roads and tracks; initiate new trade; provide quicker and cheaper transportation of goods now shipped by sea; and help create a thriving tourist industry.

In this connexion, one should, of course, also mention the extensive networks of inter-state highways in Europe and North America, generally well-equipped to serve tourist traffic.

In respect of the railways of the world, they are concentrated in a relatively small number of countries, Two-thirds of all rail mileage is in Europe and North America, and only a few developing countries, such as Argentina, India and Pakistan, also have extensive networks. In some parts of the world, for instance in Africa, railways were built with different gauges and without connexion.

The prevailing role of railways has been — and will also be in the future — to carry bulk materials over long distances. Nevertheless, transport of passengers by rail has been since the early days of railroads, an important service to the public and contributed a great deal to the development of the tourist industry. The competition of buses, private cars and airlines has forced the railways to continuously increase the economy, speed, comfort and safety of their operation. An important move in this direction has been the introduction of fast inter-city trains in national as well as international traffic. The Trans-Europe Express network can serve as an example. This network operates special, mostly electric-hauled trains with air-conditioned coaches and restaurants on more than a dozen routes connecting various West European cities over distances ranged from 180 to 680 miles.

The infrastructure of water transport, which includes inland waterways, coastwise, inter-island and ocean traffic, consists in devices aiming at the improvement of the navigability of rivers and channels, such as revetments, groins and bulkheads for banks' protection, dikes, walls and weirs; canal constructions requiring stable earthwork and complex locks and dams; and terminal facilities and harbours, with structures, such as sea walls, jetties, breakwaters, quays, moles and wharves, as well as transit sheds, warehouses, passenger and custom accommodations, offices, road, rail and waterway approaches, etc.[6] It is, of course, feasible to embark and disembark passengers or to trans-ship cargo to and from a vessel anchored in the middle of a river or a harbour by means of tenders, lighters, barges or boats.

There is a vast number, as a matter of fact several thousands, of ports in the world, some of them major ports, many secondary and very many minor ports with or without a harbour; several new large ports are planned or under construction at present. A large number of ports are specialized to handle only certain kinds of heavy commodities or liquids; others are multi-purpose ports frequented by tramp and liner cargo ships, tankers, cargo ships taking passengers and by passenger ships. Large liner ports maintain the depth of channels, anchorages and wharves at 30 to 40 feet; are marked to aid navigation; are equipped with appropriate facilities for handling and storing the commodities passing through the port, as well as for servicing the ships; and usually also have one or more passenger terminals.

Some transport facilities have, of course, to be built in order to serve predominantly tourist purposes. In this connexion, one could mention, for example, roads and parking fields for motor vehicles within a

6 A harbour is a place where ships can find refuge from storms; it should have natural or artificial ship channels with sufficient depth for the draft of vessels to be accommodated; be provided by land masses or by breakwaters for protection of ships against destructive wave action; and furnish secure anchorage. (R.C., Hennes and M.J. Ekse, *Fundamentals of Transportation Engineering* (McGraw-Hill Book Co., Inc., New York, 1954), pages 391-392.

tourist plant, resort or a national park; roads connecting hotels built outside residential quarters, resorts, parks, beaches, monuments and other tourist sites with mainroads or highways; earth-bound and aerial ropeways, ski-lifts and other similar facilities built in mountains for tourists and sportsmen; yachting ports; and narrow gauge loop-railways or monorails in national parks.

Aerial ropeways for passenger traffic are usually built where other means of mechanized transport are not feasible or economical, e.g. in very difficult terrain and particularly in mountains to reach the mountain peaks. Some of them are big installations having a total length of one to four miles, a difference of several thousand feet in the level between the upper and lower stations, and with a capacity of several hundred thousand passengers a year; a large number of other ropeways are lighter constructions, particularly for skiers.[7] Prior to the first World War, cogwheel railways were preferred to aerial ropeways as being safer[8]. However, the modern techniques of building aerial ropeways ensure complete safety as well as considerable savings in construction costs compared with earth-bound mountain railways.

NEW TRANSPORT TECHNOLOGY

In recent years, very many advances have been achieved in the field of science and technology which now exert a deep influence on the patterns of transportation in both developed and developing countries. The world seems to be on the threshold of a new technical revolution in transport.

The development of new sources of power, such as nuclear reactors, fuel cells and electrically rechargeable power packs, undoubtedly pertains to very promising achievements of this kind. Much successful work has also been done in the area of materials, such as steels, light alloys and plastics, which can now be tailor-made to get desired characteristics; this has a striking effect on the construction of rotating machinery, vehicles and craft, bridges, buildings, etc. One could also mention the latest advances in the area of communications and processing of information, including communication satellites, computers, closed circuit television, and automation of technological processes and operations.

There have also been a number of important innovations within motor, rail, water and air transport technology. First of all, internal combustion engines have been improved considerably in respect of reliability, fuel consumption and wear. Gas turbines, already used in aircraft, have been developed to efficiently and economically drive other means of transportation, such as ships, locomotives and highway vehicles. Transmission and transformation of power by mechanical parts, hydraulic fluid, electrical rotating machines and rectifiers have considerably advanced as well. Hydrofoil ships and hovercraft are at present in an advanced stage of development.

The above-mentioned innovations, if properly applied, can contribute a great deal to making transport more efficient, faster and safer. The developing countries, which are now faced with the problem of how to quickly improve, extend and build their roads, railroads and marine and aviation facilities, and how to provide and efficiently operate the requisite vehicles, ships and craft in order to meet the future requirements of their growing economics, should make full use of this possibility. In many cases they can more easily apply new solutions provided by science and technology than the developed countries because they are generally much less committed to traditional transport structures, techniques and procedures.

Some of the new transport solutions, even those which are still called "non-conventional", may find efficient use in connexion with tourism in both the developed and developing countries. For example, hydrofoil boats and ships — equipped with a wing-like device which, at a high speed, lifts and supports the hull above the water surface so that the craft flies with only the foils and the propeller in the water — are suitable to provide fast passenger services, regular or chartered, including sight-seeing tours, on rivers, lakes, channels and off-shore sea areas. As a matter of fact, several hundred commercial hydrofoils are now operating on scheduled passenger services in various parts of the world. Big hydrofoils are under construction at present with a capacity of 150 passengers and 8 cars and speeds exceeding 60 miles per hour.

So-called ground-effect vehicles, or "hovercraft", which operate in the immediate proximity of the ground on an air cushion created by fans, can be used to transport passengers not only on rivers, lakes and seas, but also over terrain without roads, over swamps, shallows, marshes, snow and ice. There are, so far, only several hovercraft operators with scheduled services, but one of them — British Rail's Seaspeed — has already carried more than 250,000 passengers, mostly tourists and excursionists, between Portsmouth

7 The widest use of ropeways seems to have taken place in Austria, Czechoslovakia, France, Germany, Romania, the Soviet Union, Spain, Sweden, Switzerland and Yugoslavia; Ceylon, China, India and Japan; Brazil and Colombia; in some parts of Africa; and in Canada and the United States (*Transport and Communication review*, Vol, VII, No. 3, page 4).

8 In Switzerland, the Jungfrau line, Pilatus line, Rigi lines, Rochers-de-Naye Line and the Monte Generoso line are examples of cog railways; the Giessback line is a ropeway with tracks on the ground.

and the Isle of Wright, United Kingdom[9]. Large hovercraft are now being developed which will be capable of moving up to 70 miles per hour and will carry 300 passengers and 30 cars.

The amphibious hovercraft, operating with equal facility over water and land, is particularly suitable to transport tourists from seaports or airports to hotels, resorts and beaches located along the sea coast. The craft is capable of overcoming such obstacles as low coral cliffs and does not need any special access channels or port facilities. This might be particularly advantageous in countries or on islands with excellent beaches, access to which may otherwise be difficult due to inadequate roads or difficult navigation.

TRANSPORT UNDERTAKINGS

Transport is one of the sectors of the national economy which, to a considerable extent, functions under monopolistic conditions not governed by the normal laws of supply and demand. Transport necessitates the protection of public interest; its pattern requires treatment as an integrated entity; and its market calls for a specially geared pricing policy. Therefore the state, through its various institutions, has always been involved in transportation. There is a public interest in transport undertakings as carriers, employers of labour, purchasers of materials and supplies, tax-payers, channels of investment, and as parts of the communities which they serve. Public institutions have fully or partly financed the construction of a considerable part of the existing networks of highways, railroads, canals and pipe-lines, as well as of many ports and airports; very many transport undertakings are subsidized by the state; and public agencies plan transport development, control rates and fares, regulate competition, and have jurisdiction over transport operations, safety and a number of other aspects of the transport industry. In some cases the state also finances new technological developments, for example the development of supersonic aircraft, monorails, etc.

As regards ownership, railways and airlines are, except for the United States of America, mostly government-owned monopolies or undertakings with considerable financial participation by the government. In the field of road and water transport, a privately-owned competitive system has developed in many countries. In countries with a centrally planned economy, public transport has been nationalized and belongs to the state. Nevertheless, in most countries the transport industry is a blend of state-owned and privately-owned sectors. Of course, transport infrastructure of highways, waterways and, to a great extent, of ports and airports as well, is usually government property and is maintained out of public funds replenished by a system of fees and user taxes.

From the point of view of the users of transport services, the structure and level of transport rates and fares belong among the aspects of their deepest interest. The setting of rates and fares is, naturally, most important to the transport undertakings too, because the transport operators always try to meet their costs and possibly also their profits from the fees paid by the users of transport services.

It is now generally understood that a sound and adequate transport system is most likely to result if the rates and fares within each of the various means of transportation are based on consideration of the total costs which are fairly attributed to each of the transport means. However, this is not always possible. In some cases, transport facilities built and maintained from public funds are available to transport undertakings without charge or at charges which are less than cost; in many countries transport rates and fares are subject to government regulations and supervision; and transport undertakings seek — within the elasticity allowed by the government regulations — to maximize their net revenue on the one hand and to use rates and fares as a tool suitable to stimulate the regular transport demand, on the other.

In the area of passenger traffic, operators of public transport usually publish the one-way and round-trip fares for their scheduled operations, sometimes reducing prices during off-season periods, as well as a variety of promotional tour fares for groups of people travelling together, for youths, etc. In railway and bus transportation, carriers also provide special commutation, excursion, family and schoolchildren fares at different rates per person and per mile. For the purpose of increasing international travel and for the benefit of the developing countries, it is extremely important that the air and maritime fares on main routes be reduced as far as commercially feasible. New technological developments — particularly in the civil aviation industry — may soon contribute a great deal to achieving this objective, jointly with the wide use of special promotional fares.

There is a large variety of business done by various state-owned and private transport undertakings. Some of them limit their operations to either goods or passenger transport; many others are engaged simultaneously in both activities. Usually, a carrier operates only within one means of transportation, but a certain number of railroads are also commercial truck and bus operators; many bus undertakings are also involved in taxicab and rent-a-car business; there are a number of carriers specialized in organizing sight-seeing tours

9 *The Economist*, 18 May 1968, page 76.

and cruises; and some large railways, airlines and shipping lines also wholly or jointly own and operate — directly, or through a contractor or an affiliate — hotels and inns usually built close to their large passenger terminals.

In transportation, the public is interested in having the best service at the lowest cost with the continued availability of such service, as well as a certain choice among the various types of services. This makes the market for passenger transport competitive. The competition is based upon, and the outcome is determined by two main factors: the rates charged, and the quality of services provided. The public distinguishes the quality of transport on the basis of convenience, speed, reliability, comfort and safety of the services offered, jointly with the attractiveness of the scenery and the flexibility of route. In this respect, the carriers providing public passenger-transportation face strong competition with private automobiles.

TRAVEL IN PRIVATE AUTOMOBILES

The large networks of highways, and the improvement in the construction and performance ability of passenger cars, their decreased operating costs, the greater availability of services for their maintenance and repair, and the convenience and flexibility of their movement were undoubtedly the main factors which influenced the recent expansion of travel in private automobiles. The number of registered passenger cars (motor cars seating less than eight persons, including taxis, jeeps and station wagons) reached 139.7 million in 1965 and will probably exceed 10 million by the end of 1968, compared with 86.4 million cars registered ten years ago; most passenger cars now in operation are privately owned.[10]

The use of passenger cars has contributed considerably to the development of domestic and international tourism. For the tourist who desires to be relieved of long drives but who wishes the use of his car at his destination, many railroads and shipping lines provide a service enabling the traveller to check his car and have it transported with him on the same train or ship. Recently, some airlines have also started transporting cars owned by their passengers. Many railway, bus and ship operators provide an automobile rental service at large stations and terminals.

A tourist travelling by car always likes to have a pleasant journey; one of the most important prerequisites is good roads. Also important is the availability of facilities for food, lodging, gasoline and repairs, as well as road-maps and information centres.

In respect to the safety of international road traffic, a closer uniformity throughout the world in the rules for roads, road signs, signals and markings and in the technical safety provisions for vehicles used on the roads is of extraordinary importance. An international conference aiming at such unification, convened by the United Nations at the invitation of the Government of Austria, is scheduled to open on 7 October 1968 and last five weeks. A draft convention on road signs and signals has been prepared for submission to the conference. The draft proposes the adoption of a comprehensive system of road signs, signals, symbols and road markings. Each of the contracting parties would undertake in its own territory to replace and supplement within four years any sign, symbol or marking which has the characteristics of one of those prescribed by the convention but is used with a different meaning; and to replace within fifteen years any sign, symbol or marking which does not conform to the system prescribed in the convention. One of the main objectives of the draft is to substitute symbols for words in countries where the latter are still used, thereby breaking down the language barrier which constitutes such an impediment to drivers travelling in foreign lands.

As a matter of fact, the automobile, is not a very efficient means of transportation. Nevertheless, the passenger car has taken deep root in the lives of the people of the developed countries and is also likely to exercise its influence on the economic and social pattern of the developing countries. International travel by car will undoubtedly speed this development.

10 Statistical Yearbook, United Nations, New York, 1967, p. 428.

BRITISH RAILWAYS AND PROBLEMS OF CONTAINERIZATION[1]

All countries, developing industrially, can benefit from the experience of nations in which intensive transport systems are well established. They can benefit also from mistakes which have been made. In Britain, although transport equipment has multiplied and improved, ideas of deploying and employing it have, until recently, remained rooted in the past.

Exploitation of national resources, the development of industrial activity and the growth of imports and exports progressively created a demand for means of movement. The different media for transport, i.e. water, rail, road and, latterly air, were, as a direct result, developed as they emerged and as demand grew. These forms did not, however, emerge together and develop in parallel. Consequently, in most of the older industrial communities, each means of transport grew up as an entirely separate method. Integration and rationalization, which can be described as developing, modifying and employing all transport assets to the best advantage, was not even thought about in the years of emergence and development. Equally was this so, in other industrial countries.

Traditional, and at one time needed, practices have been perpetuated far too long.

In recognizing the need for rationalization, everyone is of one mind. But some may have made more progress than others in thought and in action. Realization of the wastefulness of old methods is growing. Appreciation of the merits of new technique applied to road, rail and sea, is emerging.

It has been against this background that those responsible for British Railways have critically examined the prospects of a network installed to meet the needs of an earlier age.

The Railways Board's report on "The Reshaping of British Railways" — the most analytical appreciation of the problems assailing railways ever made — really got down to studying the place of a railway in a modern industrial society. The need for the existence of, and co-ordination with, other means of transport was accepted. The thoughts of railway management in regard to rationalization of transport as a whole were expressed, as follows:—

> "Consideration of the best use of national resources will lead most people to the conclusion that some co-ordination of the various modes of transport is necessary. This view is bound to present itself very forcefully to those responsible for railways, which are especially vulnerable to uncontrolled development of transport capacity, because of their high fixed investment and their correspondingly high break-even level of traffic. Nevertheless, sound co-ordination must be based upon the use of each form of transport for those purposes for which it is the best available means."

It followed that there had to be acceptance that the size of the rail network was in excess of requirements, bearing in mind that road transport was the best medium for carrying a large proportion of the traffic over short and medium distances. Indeed, it also had to be accepted that, unless radical improvement in speed, reliability and costs of long distance rail transport emerged, road transport was also superior over the longer distances. This is something which is very evident in Europe where the distances to be traversed are longer than they are in Great Britain, and also something which may eventually emerge elsewhere if, and when, adequate road systems are developed.

Consideration was even given to whether there was need for a railway at all and, if there was, what size it should be and for what purpose it should be used. The conclusion reached was that it was in the national interest to retain, and develop, a rail network which would cater adequately for those parts of the existing and developing national traffics which were, or could be made to be, suitable for rail transport.

However, it had long been clear to thinking people that if the railways were to recover, and hold, any reasonable quantity of merchandise traffic, passing between the main centres of population and industry and emanating from, or passing to, the ports, there had to be some radical change in the method of operation.

Ever since the British Railways existed, general merchandise traffic has been conveyed in low capacity wagons of twelve tons capacity. These are probably the smallest rail wagons anywhere. The intricate pattern of the rail system, the multiplicity of marshalling yards, and the thousands of collection and delivery points associated with the wagon as a means of conveyance, and inherited from the days when railways

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[1] Paper presented by Mr. F. C. Margetts, Chairman, British Railways Board, Freightliner Division, at the Seminar on Containerization held by the Indian Railways in 1968.

had a near-monopoly, were a serious handicap to the attainment of that degree of efficiency and cost reduction which must be achieved if the British, and possibly other, railways are to survive in the face of the flexible and cheaper alternative provided by road transport.

If the decline in traffic was to be reversed, the railway needed to maximize the advantages it had as a low-cost operator of densely occupied routes between the principal cities, ports and areas of production. A way had to be found to assemble, and operate in full train-loads, the large quantity of varied commodities which constituted the general pattern of consumer traffic and which did not normally lend themselves to full train-load despatch.

This led to major re-appraisal of the part which the use and development of containers could play in the future and the outcome was a decision to link about fifty main centres in Great Britain by a system of "Freightliner" trains, entirely composed of container-carrying platforms, designed to maximize the advantage of low-cost, fast, through rail movement over longer distances.

Essentials were (*a*) the provision of containers which were capable in all respects to customers and compatible with the requirements of road and sea transport, and (*b*) the development of trouble-free equipment for the transfer of containers between road, rail and sea transport.

The question may, however, be asked as to why container use had not proliferated earlier. After all, they are not a new conception. When first introduced some forty years ago, containers were undoubtedly popular with some trades and industries but there is no doubt that failure adequately to develop them in line with changing transport demands so far as cost, size, versatility, ease of transfer between road and rail, tare ratio, capacity, etc., severely limited use and inhibited expansion.

There was, therefore, a need to study potentialities afresh, taking account of benefits to be derived from new and light constructional materials, development of palletization, need for greater capacity, and the availability of, or possibility of inventing, rapid systems of transfer. It was also clear that the potentiality of container use needed to be studied from the ground up, i.e., in conjunction with producers of goods of all descriptions and also for a further look to be taken at the future place for the container, not as a counter to road transport but as a ready means of integration therewith. And the advent of container ships on both ocean-going and near-continental routes was adding to the need.

In Great Britain, and elsewhere, these studies have been and are, to an increasing extent, being made and, the Freightliner concept emerged as the answer not only to internal land movement but also as the link with sea-borne traffic.

So the term "Freightliner" applies to a conception of integrated door-to-door transport first put forward in the report on the re-shaping of British Railways published in 1963 under the name of "Liner Trains". The objective was to provide a quality service which would secure to, and retain on, rail a substantial proportion of the growing volume of merchandise traffic passing by road over the longer distances and to convey it in a manner which would satisfy customers in all respects and be remunerative to the railway.

The conception was based upon planned joint use of road and rail for door-to-door transport so as to take advantage of the low cost of fast through train movement of bulk freight and of the superiority of road vehicles for collecting and disseminating the freight at each end, using large capacity containers with a high payload/tare ratio. It envisaged a means of providing internal trunk haulage over medium to long distances, i.e., 75 to 500 mile for flows of traffic which, though dense, consisted of consignments too small of themselves to warrant uninterrupted rail movement unless aggregated. To succeed it was necessary so to develop the conception as to avoid the traditional disadvantages associated with the time-consuming and costly assembly of trains by wagon-load movement on rail, and the equally costly non-unitized piecemeal transfer between road and rail vehicles at transfer points.

The method adopted, and now being expanded, to convert the conception into reality is to link the main industrial, conurbation and port areas through some fifty terminals. Between these terminals pre-planned daily services are to be operated by trains with 700 tons and upwards payload capacity and consisting of specially designed continuously-coupled, long, low, flat wagons which carry a range of large containers which are mechanically transferred to and from road vehicles which collect and distribute. The trains are capable of running at 75 m.p.h. and averages 55 m.p.h. These trains connect the suitably-sited terminals by the equivalent of a moving platform on which the containers, filled at the point of origin of the merchandise, are loaded and carried.

Space is booked on the trains on a daily, weekly or other period basis. Privately-owned or hired containers are used as an alternative to those provided by British Railways, so long as they conform to certain laid down conditions regarding size and strength and provision of lifting facilities. Charges are related to container size and not to tonnage or the nature of the goods conveyed. Customers decide by whom the containers are to be delivered to, and collected from the terminals. They may use their own vehicles, employ road hauliers or contract with the railway for throughout service.

Others, both in this country and abroad, are also developing the use of containers over the short sea and ocean going routes and it is becoming clear that there is a rewarding field for close integration of all forms of transport concerned with the movement of the various general packaged and packed commodities which comprise a large section of national and international trade. The common denominator is the modern large container constructed to internationally agreed standards.

Transport operators, by land, sea and air, are well to the fore in advocating, and providing for, the use of containers. Indeed they have been, and are, the prime movers. So it might be as well to state the fundamental objective of container use. Surely it must be the provision for the *customer* of the most economic and satisfactory delivery service which can be provided by all means of transport.

The customer will himself decide whether he will use containers just as he will continue to decide, when alternatives exist, on the basic transport medium to be employed. Particularly is this so when the choice is rail or road. So in any assessment of container use, and expansion, the probable requirements of customers must loom large and, in large measure, predominate.

It may also be found, if experience is anything to go by, that there may be a not inconsiderable degree of resistance to the changes necessary to facilitate containerization, mainly attributable to what one might term a reserve of inertia. Recognising this, those who wish to maximise the undoubted benefits of container use, will need to exercise a not inconsiderable degree of maintained persistence, persuasiveness and conviction.

We are living in an age when all aspects of transport are engaging the attention not only of leaders in the field but also of Governments. The decisions which the former can take, the manner in which they go about providing service for production Managements, who must concentrate in this increasingly competitive world on design, costs, customer appeal and marketing, may well determine the quality and size of international trade and impact upon living standards. And, it is suggested, such decisions are best reached in association with customers.

Indeed it is in this field that, a major problem emerges i.e., who is to decide how the customers' needs are most adequately met. The customer himself or the transport providers or the government?

So much for a review of what has brought British and European trade and industry face to face with what some call the container "revolution" but which is really an evolution of a fringe system which has been available in an undeveloped form for years. In this, British Railways have played a dominant role. There are, however, many emerging problems for everyone concerned. But before coming to a review of these problems which must be resolved if both providers and users to reap decisive advantages, it might be useful to enumerate the advantages derived from the use of containers which are obvious. They are:—

1. Their proper use on an accepted, expanding and planned scale can make a major contribution to integration of the different methods of transport to which Government decrees, economic pressures and common sense are leading the way.

2. In time, such integration should lead to better utilization of a country's physical transport assets — existing or still to be created — and to a decrease or, where expansion is present, to a smaller increase in the use of manpower.

3. Over all transit times between production and consuming points should be permanently reduced, leading to there being fewer goods in the pipe-line.

4. The possibilities of eliminating, or reducing the scale of, packing are considerable with some traffic.

5. Permanent storage can sometimes be replaced by temporary container use for that purpose.

6. Loss through theft and pilferage is reduced. Damage is often eliminated, particularly in rail transport.

7. Rail, port and harbour installations can be reduced in number and complexity, as can the size of shipping fleets.

8. Inventiveness being promoted, physical assets being better employed, labour costs being reduced and trade stimulated, *costs* over-all, and consequently transport charges should fall.

9. Through international movement, involving transfer between different modes of transport, reap all the foregoing benefits in differing degree, according to commodity, transport media used, and distance.

10. An efficiency image is promoted.

Against the foregoing background, however, one requires some idea of quantity of goods likely to be affected by this new system of containerization. No world-wide figures are available. One published table used at a recent International Symposium of Containers gave 969,000,000 tons (390 m. tons oil) as the total

import and export trade for Western Europe. Even after deducting further unknown bulk tonnages, the residue in semi-finished and finished products must be substantial and the container use-potential immense.

Accepting, therefore, that the use of containers is a better way of doing a job we have all been doing for years, we now come to the problems which are emerging. They concern transport providers, users (customers) and manufacturers in many fields. They are gradually emerging as experience is gained. To examine them all would need a much larger paper than this, but let us look at some of them.

(1) Container Production and Manufacture

Five years ago it is likely that manufacturers of modern high-capacity containers in Europe could have been counted on the fingers of one hand. Indeed, no one could then have staged an exhibition of the size and diversity of the Olympia International Exhibition held in July this year. And yet, then forty-five different firms exhibited the containers they manufacture or for which they are agents.

To my mind, a real manufacturers' problem emerges: not one for the buyer who should benefit from the present prolification of production. How long, and at what margin of profit or loss, are so many firms going to remain in the container manufacturing game? Who, if anyone, has done the requisite arithmetic to determine how many containers are going to be wanted in the world? What is the anticipated life and replacement rate? How far will the container evolution go? Will there be setbacks and disillusionment? None of the answers is really known, and yet, everyone who can seems to have jumped on the band-wagon. Some fingers are likely to be burnt.

(2) Control of Containers

Containers cost money. High utilization is essential. This may be easily arranged, maintained and controlled within defined regular circuits but use of containers is to be world-wide. Immediately the problem of effective control emerges. Control is the essence of all sound business and consists of getting accurate information quickly and acting upon it. This probably over-simplifies what we may well turn out to be one of the biggest problems of world-wide container use.

Containers of all sizes, open and covered, will be owned in varying numbers by railway administrations, shipping companies, shipping consortia, leasing companies, road operators, forwarding agents and private firms. They may also be owned by river and canal authorities, by air lines and even by banks and credit houses. They will be moving about by land, sea, canal, road and air and by any combination of these on through journeys. There will be unavoidable empty flows due to geographical spread of industries and consuming areas and due also to seasonal crops and demands. Problems relating to maintenance and repair will emerge in out-of-the way places. Peak demands will emerge as will slumps in demand. All these factors, and some not foreseen, are going to face the container operator — not necessarily the provider — with continual operating, commercial, administrative and communications problems if waste and inefficiency in the manipulation of container fleets is not to creep in and in areas become endemic.

The scale and complexity of this problem of control do not seem to have yet become obvious in actual practice — except possibly in America and Great Britain and on the British railway, whilst already conscious of it, it has not yet been proved that a perfect control system under prevailing circumstances has been found. Investigations are proceeding. In the meantime, all should recognise the existence of a major strategic planning problem and the benefits of pooling need to be explored.

(3) Damage to Containers

Investment in containers is considerable. If mishandled, or moved by the wrong type of equipment, they can readily be damaged and, such is the precision needed for corner lifting, they can soon be made difficult to lift. Their construction and design can lead to repairs being costly and time-consuming. Statistics relating to damage, consequent loss of availability, and cost of repair are not readily available, but one suspects that these would, if available, be disturbing in some respects and in some areas of operation.

Damage can also be attributed to lack of experience in handling at all levels and in all transport services and here the problem is one of adequate training and supervision.

Undoubtedly, whatever the causes, it will be essential to have sufficient knowledge as to causes, inherent or otherwise, which will lead to efficient damage control and adequate repair facilities. It is open to question whether the problems in this field have as yet been adequately assessed.

(4) Suitability for Containerization

All traffic is not necessarily suitable for conveyance by container — even though of a general non-bulk character. Also traffic which is suitable will not all find its way into containers. Reasons will vary; they may be practical ones; they may not be.

Customers will again have the final say. They may prefer containers. They may prefer palletization alone, or roll-on/roll-off and just simply traditional packaging.

There will remain some places in the world where, for a long time, if not for ever, containers cannot be satisfactorily transferred and handled.

There will be a lot of debate and argument and, whilst all this is going on, there will be a transport mixture. How far a mixture of containers and other traffic will require, or justify, separate transport provision depends upon relative quantities, frequency of despatch, existence of competition, costs and willingness to pay.

The railway position seems to be clear here, in America and in Western Europe. Block trains will be needed, running through over the longer distances and conveying only containers. They exist now. But it is accepted that by reason of dimensions, character, size of consignment, etc., there are traffics which will not fit. So traditional means still remain. They are, however, likely to become more costly to operate.

It will, surely, be the same with shipping. Customers will demand container space, roll-on/roll-off, and traditional storage. Just as concentration of traffic at a reduced number of selected main road/rail transfer centres maximizes the container train-loads so surely the reduction in ports of discharge will maximize the use of container ships. Even so, on some routes and with some trades, there will be a need for what might be called "flexible-mixed" vessels providing cellular storage for containers, roll-on/roll off accommodation and space for other unit loads. The problem will be to assess the market, the potentiality for change, the relationship to port charges and the cost and return on investment. Maybe some mistakes will be made.

In the end, either complete containerization will be adopted or some composition of that and other forms of unit loads most suitable and economical for particular traders.

(5) Compatible Dimensions

Size, shape, weight and volume of goods and packages, whether loose or aggregated, are largely designed to suit either the manufacturers' or the consumers' convenience. Transport authorities have not, hitherto, had any control over dimension of goods they have been required to move. Now, however, the international limits, on container size — 8' × 8' in 10', 20', 30' and 40' modules imposes constraints. How many customers can or will offer commodities with dimensions, whether palletized or not, compatible with those of the container? And where this is not readily done what inducement will be needed to achieve it?

Good loading of containers, making full use of all available space, minimizing movement and reducing packaging, must surely have its origin in the field of commodity production.

(6) Loading and Unloading of Containers

Speed and efficiency in the loading and unloading of containers will be essential if a high rate of utilization of them and the road haulage units employed is to be attained. Therefore, to the greatest extent possible, goods should be formed into unit loads which can be handled by fork-lift trucks.

(7) Pallet Sizes

The observations on the foregoing Nos. (5) and (6) raise the question of pallet sizes, design and construction. There have been many efforts to standardize pallets. They have not been very successful. In 1963 there were 107 different sizes of pallet in use in Europe. It is not known exactly how many there are now — particularly internationally. If experience is anything to go by, not a lot of progress will have been made to establish maximum common standards, and yet the container sizes must require that unit loads should be compatible as far as practicable, although some space loss may have to be accepted. After all, pallets have been adapted to many road vehicles.

(8) Range of Applications of (5), (6) and (7)

One paper read at the recent International Container Symposium contained the following surprising figures: —

30 per cent of national vehicular transportation is concerned with finished domestic food products.

30 per cent with other domestic consumer products.

40 per cent to a wider range of products from agricultural feed to heavy engineering products.

The accuracy and basis is not known. But, accepting them as a guide, it does not need much thought to arrive at the conclusion that a lot of traffic could be made to conform to pre-determined storage modules or multiples thereof. It must, however, be accepted that opposition to change would be formidable, particularly in these days of marketing images.

The real question will be how to persuade management that it will be in their interests, to an acceptable and indeed eminently desirable degree, to make changes. Truly, a major planning problem spread over a wide field, but in the end the establishment of compatible standards must surely come.

(9) Packing of Containers in Relation to Damage

One problem likely to emerge when containers are used is that the stowage of goods, which previously came under the experienced eyes of stevedores and others, must be done in such a way as to ensure they

withstand the conditions of these different modes of transportation and the transfer operations between them. Experience over two years with container movement by rail has shown that movement and consequent damage, has practically been eliminated by reason of the technical and operating changes made. The transfer systems between road and rail are also almost foolproof. What remains is the possibility of damage caused by the kind of movement peculiar to sea-going operations and even this, it is considered, will be minimized, if not totally eliminated, by cellular construction. Here again, it is co-operation between shippers, forwarding agents and transporters which will count.

(10) Distribution of Loads in Containers

A problem which must engage the attention of all transport operators is their lack of knowledge regarding, and inability to control, the distribution of loads in containers. Unlike stowage on traditional road and rail vehicles, and in cargo holds, those responsible cannot exercise the same degree of control when only 20' and 30' boxes are tendered for movement. Unequally distributed loads can cause trouble, particularly on road-vehicles.

It is, however, in the future transportation of large containers by air that this problem of load distribution will be most vital and some means of ensuring balanced loading and knowing that it has been attained will surely be required.

(11) Ownership of Containers

Who does own containers? Who should? Initially transport operators, principally by rail and sea, started off to provide them. This was to be expected. After all they had taken the initiative in promoting their use. In Great Britain, the railway is prepared to provide containers of specified size and design and to charge for them at the quoted rates. At the same time, they, and shippers, are prepared to accept containers owned by anyone else provided they comply with certain laid-down physical standards.

Gradually, it is becoming clear that some customers, converted to container use would like to have their own. There are probably several reasons for this:—

(1) certainty of supply

(2) desire for particular internal fittings

(3) lower costs if traffic two-way

(4) control of cleanliness and type of goods loaded

(5) use for ship and store distribution after trunk journey

(6) marketing image

Each customer will have to decide for himself, having regard to his type and spread of business, distribution problems, etc. Cost appreciation must loom large and the problems arising from damage to containers i.e. availability of repair facilities, time lost, etc. and their eventual replacement must not be lost to sight.

Careful costing and commercial judgement may well lead to a decision to obtain most of the benefits by leasing on short, medium or long-term bases or on a mixture of all without any of the drawbacks. This can be done with lessors undertaking liability for repair and/or replacement and is a course which should be seriously considered by those who have the problem of owning, or not owning, to face. Containers, so leased, can bear the name of the firm and should expansion result in greater numbers of containers of a different size being needed, they can be forthcoming almost at once.

(12) Cleanliness and Infestation

The responsibility for maintaining standards of cleanliness: for the taking of steps to obviate, or minimize, infestation and, where it occurs, for taking action to prevent spreading. Such conditions as are envisaged have, of course, always been present with traditional modes of conveyance i.e. rail-wagons, lorries, conventional ships, but unlike them, the container is itself going to penetrate deeper into industrial, commercial and residential complexes. A problem to be remembered and watched.

(13) Container Sizes

The British Railways Board, faced with gauge problems, developed containers 8 feet high by 8 feet wide in modules of 10', 20' and 27' length (the latter was later altered to 30'). Through persistence at international discussions, the ISO Standards of 8' × 8' × 10', 20', 30' and 40' emerged, although there is some talk of having containers 8' 6" high. Largely, however, what might have well been a mixed bag has been avoided. However, the 40' long container, whilst designed and built, is hardly in use in Europe and there has emerged a customer preference which is markedly different in Europe and America.

At the recent Symposium it was reported that

> In the United States,
> 15 per cent of the containerizable commodities were packed in 40 feet-long containers;
>
> 30 per cent in 20 feet-long containers;
> which means that 45 per cent represent the "cream from the milk", with 55 per cent remaining uncontainerized.

In Europe,

5 per cent only of the same containerizable commodities were packed in 40 footers;

35 per cent in 20-footers;

with 60 per cent uncontainerized.

Whether one accepts these figures or not, it is a fact that in Great Britain the consumer preference is, at present, for 20' containers and, of course, any expansion in use beyond this length would involve many customers in accommodation and approach problems at works, loading docks and warehouses.

(14) Storage of Containers

Because containers will be discharged from prime movers — ships, and even "Freightliner" trains in some degree — at rates which will preclude immediate disposal to ultimate destination and because outward despatches will need to be assembled some time — albeit only hours — before loading, there will be a need to make accurate calculations regarding storage space of adequate load-bearing strength. Whether storage is to be on a single basis or in two-high stacks, or even three, four or more high, in compact blocks, must be carefully studied in relation to cost, volume and land availability and suitability. Mistakes in this field could be serious and costly.

It is now known from experience that concentrated container movement at ports and at selected road/rail transfer points in heavy production areas, calls for a lot of land, as very considerable areas are needed for marshalling temporary stowage and transfer between methods of movement. According to season, locality, frequency of service and other storage. It is, however, suggested that the predominating factor will always be accessibility, coupled with speed of movement. Admittedly there may be environmental and physical constraints which will limit the extent to which this predominating need can be met.

At Tilbury, a far-seeing authority is not only making sure that it has a place in the sun but its nine berths have land areas of twenty-two acres to serve them. Even this may not be enough but there should, by reason of its location and the provision of "Freightliner" facilities, be very rapid dispersal and assembly of incoming and outgoing container cargoes.

A major problem will be whether to depart from the single-storey warehousing principle and stack on a multi-storey basis, if land constraints do not make this inevitable. The actual stacking and unstacking will be more costly than single layers — land apart. And who is to say that the bottom box in a stack won't be wanted first?

(15) Port Rationalisation

If properly planned, the turn over to cellular ship operation between pairs of ports between which it has been traditional to operate, should present no problem provided it is recognized that, if the expected cost reduction is achieved, it is likely that the volume of traffic will expand at the expense of ports which are not so served. Then there will emerge rapidly the problem as to whether the port facilities are, or can be quickly made adequate. This will apply to berths, cranes, warehouses, container transfer and storage, customs, and road and rail access. In other words, to all aspects of heavy port investment.

When we come to ocean-going shipping, the operators will surely wish to concentrate on single ports to the maximum possible extent so as to reap the economies of rapid discharge and loading. This will call for forward planning of the highest order if the right ports are to be selected, if new berth and container storage construction is to be adequate, and in the right places, and if the road/rail links are to be adequate and timeously available. A lot of sums will need to be done about the number of berths required, about discharge and loading times and about dispersal rates by road, rail or water.

All the time there will be heard the voices of the competing ports whose protagonists will hardly lie down and accept that others should swallow what has come to be regarded as their trade by right. In the United Kingdom there are, at present, some eight to ten major deep-sea ports, although they cannot all take the same size of vessel. Most of them, under varying administrations, are constructing, or planning for the construction of, container berths. Tirbury and Southampton, looking ahead, predominate in size and potentiality (acknowledged not everyone would agree). We have a major strategic planning problem. It will be difficult of solution whether ports are nationalized or not.

We do know, however, and we have a report by McKinsey's in support, that the container-carrying potential by rail in Great Britain is such that any part of the country over 100 miles from the port of discharge can be served consistently overnight at rates which are, to say the least, likely to be favourable. This may tend to favour the ports lying on the main routes to Western Europe and help to counter the theory held in some quarters that the United Kingdom might be fed by transhipment at the larger continental estuarial ports.

Another pre-requisite to the success of container concentration on selected ports will be the adequacy of the customs arrangements, but already this has been foreseen and provision made for a number of inland clearance depots to which containers can be despatched currently.

(16) **Labour Problems**

It would appear that there are, or are likely to be, two main problems. Both need not necessarily arise everywhere or to the same extent. They are:—

(*a*) re-action of organized labour to a system which undoubtedly requires less man-power and less man-hours.

(*b*) matching labour capacity and potentiality for change to the sophisticated and expensive handling equipment.

The first can surely be taken care of by enlightened management taking advantage of natural wastage, redundancy schemes and redeployment.

The second problem which might to some be somewhat intractable is, in fact, from my experience, no problem at all. It is a matter of patience, selection, training encouragement and supervision.

There may, of course, be other problems at places other than where containers are transported and loaded on to rail, road or ship but they are not likely to be serious. And there can, of course, be argument as to who does what — vide the Railway Board's open terminal problem which took nearly two years to resolve finally. Still, it was resolved and one just cannot do otherwise than expect and accept re-action when such fundamental changes affecting men's livelihood are contemplated.

(17) **Air Freight**

Goods in containers or unit loads are carried by air to some extent. As aircraft increase in size and as freight-only services develop there will be more. It is understood a Boeing 747 of the future will carry 220,000 lb., so there should be larger boxes. But using such a service — taking only a few hours in the air — will not be sensible unless the clearance and onward conveyance from a limited number of airports is proportionately as rapid as the onward medium permits.

The containers will need to be just as expeditiously taken out of, and put into, the aircraft as they are now at rail/road depots and ports, delay in customs or in warehouses awaiting collection would offset time gained flying and so adequate connecting land-based services must emerge.

We may yet see a combined "Freightliner"—airport.

(18) **Summary**

It would appear that the initiative in promoting the use of containers has largely been taken by the providers of transport. Certainly this is so in Great Britain where, in the field of road/rail integration, the British Railways developing "Freightliner" conception is seen as the only reasonably sane means of re-establishing a stream-lined and operationally reconstituted railway as an acceptable means of providing trunk haulage for general merchandise in quantity. This does not mean, as has been implied in some quarters, that use and retention of a railway is being forced on customers any more than they are being forced to use only a container shipping line.

The success of a container system depends upon all the participants. Manufacturers, designers, engineers, transport operators, customers, port authorities, shipbuilders, forwarding agents, bankers — all are involved. Also, inevitably in some countries — Governments.

Between them they will contribute to a degree of co-ordination of transport which is largely still in the embryo stage but which is inevitable if the principle of containerization is to be carried to a conclusion.

Success will depend upon many factors but not least upon confidence that the long overdue change in movement method, which singularly enough was always round the corner — or at least for the last forty years — is the right course to pursue from all angles.

Probably the best method to assess the extent to which containerization can benefit trade is by a thorough research study into the comparative economics of containerization and traditional systems of handling goods. Unless this is done, one can never easily identify the industries which will benefit, or more precisely, quantify the benefits. There is also a risk that particular organizations and commodities, which perhaps should be persuaded to change from conventional movement to container movement, will slow down the growth of containerization. If there are benefits in containerization, we must set out clearly where they are found and what are the best conditions for sharing them.

It is necessary to understand the whole system and the interaction between the parts played by road, rail and port operators, shippers, shipowners, Government Departments and other financial interests. In the past, most research related to containers has been fragmented, and isolated studies have aimed at the selection of a best solution for a particular transport group and have consequently evaluated a part only of the total problem.

In the final analysis, however, it is the shipper or consignee, or both, who have to pay the total cost of sending a consignment from origin to destination. The shipper may also be the manufacturer. These are the customers and if they use containers, or are persuaded to do so, it will surely only be because it will be to the over-all benefit to do so.

Some of the savings claimed, as due to the change-over to containers, will accrue to them in the form of lower charges. Anyway they will expect this even if, as would be likely, they benefit from greater security and reduced packing costs and from quicker and greater reliability in transits.

ROAD SAFETY PROBLEMS IN INDIA*

INTRODUCTION

Road accidents are gradually replacing all other causes as the major killer of mankind in all the countries of the world, especially in those with high motorization. The number of accidents is increasing correspondingly with the number of vehicles on the roads and the population. In India, as against 26,121 road accidents in 1956 and 59,770 in 1961, there were 71,897 in 1965. Although the total number of accidents in Europe and the United States of America is much higher than in India, the number of accidents as a percentage of the number of motor vehicles is very much higher in India.

This state of affairs naturally poses a serious problem to the authorities concerned. For the authorities in metropolitan cities, the problem is still more acute as motor vehicles and population are concentrated in these cities. In many cities, while the annual increase in population is about 6 per cent, there is about 15 per cent increase in motor vehicles, and the increase in road accidents is about 20 per cent[1]. Factors which contribute to the ever-increasing traffic problems in urban areas are:

(i) unplanned expansion of the city, and ribbon development along important roads;

(ii) rising demand for transport due to increase in population and other activities;

(iii) concentration of land-use in certain areas, such as central business districts and office-concentration areas;

(iv) general rise in per capita income resulting in more transportation demand;

(v) mixed nature of traffic;

(vi) inadequate geometric features for segregating slow traffic;

functional obsolescence of roads built for light and slow traffic to meet the demand of automobile traffic;

encroachment upon effective road width by hawkers and retail businessmen;

(ix) heavy demand for parking and terminals;

(x) lack of road sense on the part of the road-users;

(xi) lack of effective measures of enforcement of traffic rules and regulations; and

(xii) non-existence of a specific organization with specialized personnel to deal with the problem.

Efforts taken in the past to solve the traffic problems by the municipal, police, transport, and other authorities, have not shown impressive results; and this is mainly due to the following reasons:

(i) Roads, parking places and transport services are planned and constructed with hardly any over-all concept;

(ii) inadequate funds to meet the heavy requirements of the essential requirements;

(iii) divided responsibilities of the traffic problems among various organizations;

(iv) non-availability of trained men for the job and

(v) efforts generally directed towards the supply side, rather minimizing the need for travel by proper land-use planning.

With the growing increase in population and vehicles, the problems of traffic congestion and road accidents are bound to become serious, unless effective steps are taken early. The practical approach to these problems lies in the application of traffic-engineering techniques for improvements, which should be within the framework of an over-all plan prepared on a comprehensive basis. For solving these problems successfully, besides traffic engineering measures, traffic education to the public and enforcement of regulations should be given adequate importance.

PEDESTRIAN PROBLEM

So far as the vulnerability of the various road-users are concerned, the old adage "survival of the fittest" is applicable in road accidents also. Thus pedestrians, cyclists, motor-cyclists scooterists and drivers of motor-vehicles are numbered against the injured in descending order, the most defenceless, i.e. the pedestrian, being the greatest sufferer. In 1965, in Delhi[2] alone, out of the 1657 pedestrians who were

* Contributed by Dr. N. S. Srinivasan, Head of Traffic Division, Central Road Research Institute, New Delhi, India.

1 Srinivasan, N. S., & Hingorani, D. V., "Road Accident Problem in Urban Areas", in *Journal Mobile*, Madras, March 1966.

2 Srinivasan, N. S., "Road safety in the National Capital", a paper presented at the seventeenth annual Town and Country Planning Seminar, held at New Delhi in November 1968.

involved in injury accidents, 168 were killed, which accounted for about 55 per cent of the total number of persons killed in road accidents.

Pedestrian behaviour

A pedestrian accident generally occurs when a pedestrian steps on to a roadway either negligently or carelessly. They move about on the streets, oblivious of the risk they are taking, and behave as if the rules of the road were not applicable to them and it was the duty of the vehicles to keep away from them rather than their own to keep away from the vehicles. Even in such places as Connaught Place in New Delhi, where people are expected to be educated as well as to have more road-sense, they are seen crossing the roads from all possible points. Even at signalized intersections with special signal phases for pedestrians, people are seen crossing at the 'wait' signal.

Education of pedestrians

To tackle the problem to pedestrian safety, at the outset it is necessary to make the pedestrians realize their vulnerability to accidents, and also that, as road users, they should know and abide by the traffic rules and regulations for their own safety as well as for the safe and smooth flow of traffic. For this purpose, traffic education schemes, such as traffic safety weeks, safety placards, road safety pictures and slides, road safety films and cartoons, training of children in traffic parks etc. should be carried out.

Engineering facilities

Unless suitable facilities are provided, one cannot expect the pedestrians to use the roadway in a proper way. Hence footpaths and pedestrian crossings should be carefully planned and provided; and if that too seems to be an inadequate inducement, railing barriers should be provided to make them cross the road at pre-determined places. At mid-block pedestrian crossings with heavy pedestrian traffic, push-button signals for pedestrians would be useful. At intersections, besides the provision of railing barriers, road markings and traffic signs, signal phases should be so designed that pedestrians have a signal phase without any conflicts with vehicular traffic. At places with a heavy volume of pedestrians, provision of a sub-way or over-bridge would be useful.

Enforcement

In a country like India, where traffic sense is not very prevalent, enforcement seems to be the remedy which is most likely to give some immediate results. To make the people use the facility, enforcement measures should be taken, not sporadically but regularly. Pedestrians who do not obey traffic laws and regulations should be fined on the spot by having mobile traffic courts throughout the year. Such an action would have an immediate effect on the behaviour of the pedestrians. In order to ensure pedestrian safety at mid-block pedestrian crossings, and at road intersections where there is no police or traffic control, traffic laws should be introduced, as is done in a few European countries, to accord right of way to pedestrians at such crossings. Such a law will compel the motorists to consider the pedestrian as a traffic unit.

CYCLIST PROBLEM

Another small fry on the road is the cyclist. In 1965, out of the 825 of them who were involved in injury accidents in Delhi, 75 were killed, which accounted for about 25 per cent of the total number of persons killed. This is another tribe of road-users which is always susceptible to injury and is harmless to everybody, except occasionally some pedestrians. The cyclists are expected to be most careful, if only for their own safety, but the fact remains that they are a most careless lot. If there is a rush on the road which spells danger to them and warrants their getting down from their saddles, they will weave their way in the crowd; if they are at an intersection with a red signal facing them, they move to the front and form a web in front of the motor-vehicles, occupying every inch of space around rather than waiting on the extreme left of the road; if a separate cycle-track is provided for them, they get more concerned about the bad road surface and lighting conditions than their own safety. Not that the tracks provided are ideal or even good, but considering their own safety, it would be advisable to use them.

Cycle-tracks

The problem of cyclists' safety can be effectively checked by providing separate cycle-tracks on either side of the roads. But again, to induce the cyclists to use these tracks, they must be provided with a better road surface, proper lighting and limited access from neighbouring property. On routes with heavy volumes of cycle traffic, roads should be provided exclusively for cycle traffic. Segregation of cycle traffic should be done at road intersections also.

Education and enforcement

In many Indian cities, cyclists account for about 75 per cent of all the trips performed by private conveyance[3] and these persons, in general, do not know even simple traffic regulations. From the point of view of smooth flow of traffic and road safety, it is necessary to educate the cyclists by properly planned schemes. Adequate enforcement measures should also be taken to control their behaviour. These measures will make

[3] Srinivasan, N. S., "Growing traffic and transportation problems in Indian cities", *Journal Traffic Engineering*, United States of America, July 1957.

them learn and obey traffic rules and regulations and result in making them better road-users than they now are.

PROBLEM OF MOTOR CYCLISTS AND SCOOTERISTS

In recent years, there has been an unprecedented increase in the number of motor-cycles/scooters in many cities; and there has also been a corresponding increase in accidents involving motor-cycles/scooters. A study[4] has shown that, in Delhi, the chances of fatality are fourteen times as great for motor-cyclists and scooterists as for other drivers, and also that motor-cycle accidents are increasing annually at the rate of about 50 per cent. The study has further revealed that the fatalities were due to injuries to the head; and in severe injury accidents, most of the wounds were on the head and face. Studies[5] carried out on the injuries sustained by motor cyclists have shown that the use of safety helmets reduced the severity of head injuries. It is suggested, therefore, that the motor-cyclists should be made to realize that they are very vulnerable to accidents and should be convinced of the need for wearing helmets, even without the coercion of the legal enactment. They should also be educated to drive their vehicles carefully, and not negligently and recklessly, as many of them do now.

DRIVERS OF MOTOR VEHICLES

As mentioned earlier, there is almost a jungle law prevailing on the roads, the powerful trying to oust the weak. On the road, no courtesy or regard is shown to lighter vehicles. Unless a policeman is there, even the rules of the road are neglected. Many times speed limits are violated and corners are drastically cut when making turning movements. Improper behaviour of the drivers is the main cause of accident occurrence. A study[6] conducted by the Central Road Research Institute at twenty-one high-accident-frequency locations in Delhi has shown that at these locations 87 per cent of fatal accidents, 94 per cent of severe injury accidents and 86 per cent of slight injury accidents were due to faults of drivers alone. To control this, there is a need to have road safety drives. Besides, a well-planned traffic education programme regarding safe and efficient use of roads should be arranged. The case histories of drivers should be maintained by the licensing authorities, and on the basis of 'point system of control', accident-prone drivers should be screened out. It is also suggested that the drivers, whose driving records have not been satisfactory, should be given a fresh test in the knowledge of traffic rules and driving aptitude before their driving licenses are renewed. The licensing authorities should be empowered to revoke a licence when a driver is found callous, having no regard for the safety of road-users.

Heavy vehicle drivers

Since more than 60 per cent of the fatal accidents are caused by the drivers of heavy vehicles such as trucks and buses, it is suggested that there should be better control over these drivers. Further, suitable tests should be conducted to screen out accident-prone drivers of heavy vehicles.

As the drivers trained in driving schools are found[7] to be better than self-trained drivers, it is suggested that training should be made obligatory by law, to start with for professional and transport-vehicle drivers, and later for other drivers too. Training institutions should be set up with proper facilities, and should be regulated and controlled by legislation. Minimum education standards[8], such as elementary education, should be laid down in the interest of highway safety.

Vision and Reaction Time

It appears that some of the licensed drivers are not physically fit to drive. A study[9] conducted in Delhi on one hundred drivers involved in fatal and severe injury accidents has shown that the majority of these drivers had defective eyesight and poor reaction time. About 15 per cent of these drivers had monocular vision and thus were not in a position to perceive distances correctly. Hence, it is suggested that the physical fitness of drivers, especially the professional drivers, should be tested.

Drunken driver

Drunken driver is another problem of road safety, which has not been dealt with seriously. The inadequacy of Section 117 of the Motor Vehicles Act[10] and the difficulty of determining the degree of drunkenness seem to be the reasons for neglecting this vital factor in road accidents. It has been found that 0.05 per cent of alcohol in the blood is sufficient to make the judgement of the incumbent erroneous and his driving skill deteriorate. Hence it is suggested that this

4 Srinivasan, N. S., & Sharma, B. M., "A study of motor-cycle accidents in Delhi", *Journal of the Indian Roads Congress*, June 1967.

5 High Cairns, "Crash helmets", *British Medical Journal*, 2(770), 1946.

6 Srinivasan, et al, "A study of accident-prone spots in Delhi," *Journal of the Indian Roads Congress*, Volume XXVIII-3, 1964.

7 "A preliminary report on tests conducted at drivers' clinic," *Road Research Report No. 60*, Central Road Research Institute, New Delhi.

8 *Report on the third ECAFE study week on traffic engineering and highway safety*, Bangkok, 1963.

9 Srinivasan, Bhalla & Lal, *An appraisal of the skill of drivers involved in serious accidents*, (Central Road Research Institute, New Delhi, 1968).

10 Srinivasan, N. S., "Some aspects of traffic regulation and control for better road safety", a paper presented at the Seminar on 'Law and Urbanization" organized by the Indian Law Institute at Allahabad in December 1967.

limit should be fixed by law, above which any one will *ipso facto* be considered unfit for driving. As it is hardly possible to obtain under the existing laws a conviction of a person driving a motor-vehicle, while under the influence of alcohol or drugs, it should be also legislated that any driver suspected of having imbibed alcohol can be compelled to undergo the test for determining the amount of alcohol consumed by him. Moreover, the public should be made aware of the fact that it is not safe to exceed the above limit, so that it is borne in mind every time anyone sits down to drink before driving.

ROAD INTERSECTIONS

Intersections pose another serious problem; so much so that about 20 per cent of the total number of accidents take place at these locations.[11] So it is of utmost importance that road intersections are designed in such a way as to achieve efficiency and safety. The present approach to the design of intersections is not scientific; factual information about vehicular and pedestrian movements is not generally collected before preparing improvement plans for the intersections, which leads to faulty designs. These guess-work methods of design are not only uneconomical and inefficient, but also unsafe. The following aspects, which are not given due consideration now, if followed, would help in improving the traffic flow and increasing safety at road intersections:

(i) Very often signals are installed at intersections without changing the geometrics, whereas road geometrics should be matched with the signal design.

(ii) Conflict points and conflict areas, which lead to inefficient and unsafe conditions, should be reduced to the minimum.

(iii) Principles of segregation of traffic should be applied. For segregating cycle traffic at road intersections carrying a heavy volume of cycle traffic, the 'parallel path' method or 'turn path' method or 'cycle box' method or a combination of these methods should be chosen, depending on the road and traffic conditions.[12]

(iv) Flaring of approaches, pocket lanes for turning traffic, acceleration lane, deceleration lane and other geometric features should be included in the design.

(v) Extensive use of traffic control devices like traffic signals, signs, markings and channelizers should be made for ensuring safety at intersections.

(vi) Standard of lighting, which is poor at the intersections, should be improved.

(vii) The lay-out of roundabouts should avoid as far as possible large exist angles, obtuse internal angles around the round-abouts and straight "run ins".

(viii) Pedestrian safety should be given due consideration.

(ix) The intersection design should aim at achieving capacity, safety, economy, aesthetics and easy understability.

(x) At intersections carrying a heavy volume of traffic, grade separations or grade interchanges should be provided.

VEHICLES

There are many "road-unworthy" vehicles plying on the road, which cause not only congestion but also accidents. In order to have a continuous check on the vehicles permitted to operate, periodic inspection of vehicles should be carried out. In the case of vehicles more than ten years old, it is suggested that a rigid and strict inspection by the competent authority should be carried out once in six months.

It is seen from experience that the vehicles, which are brought for inspection, are prepared just like a bride for a party. Though this improves the road-worthiness of the vehicles, the fact remains that many of the old vehicles are not otherwise road-worthy. To have a better control of this problem, spot inspection of vehicles should be done periodically. Mobile inspection squads should be set up to carry out this work. This will create an awareness in the vehicle owners to keep their vehicles always fit for operation.

CONCLUSIONS

With the increasing traffic on the roads, especially those in urban areas, the problem of road safety is bound to become serious in the coming years. The problem of accidents in the developing countries like India is mostly a problem of road-user behaviour. In a way, it is a problem of saving persons from their own follies and other people's negligence and rashness. To control this, adequate measures of traffic education and enforcement should be taken. Further traffic engineering techniques should be applied more widely than at present to avoid congestion and accidents.

11 Srinivasan and Sarna, "Application of traffic engineering techniques in the design of road intersections under mixed traffic conditions", *Transport-Communications Monthly Review*, New Delhi, September 1967.

12 Srinivasan, "Case studies on segregation of cycle traffic at four-arm intersections", *Journal of the Indian Roads Congress*, Volume XXIX-2, 1965.

THE ROLE OF WATER TRANSPORT IN THE DEVELOPMENT OF THAILAND[1]

Waterway transport has, by tradition, been the most important mode of transportation in the livelihood of the Thai people. Even now, although facilities for land transportation have been expanded, waterway transport plays an important role in the economy of Thailand. The rising cost of freight and the consequent increase in price of goods brings into focus the need for developing a sound transportation system, of which improvement of waterway routes is but one aspect.

Thailand is fortunate in that nature has provided it with an extensive navigable waterway system. This system, located largely in the central part of the country, comprises some 1,600 kilometres of perennially navigable waterways, serving an area of approximately 150,000 square kilometres. It constitutes the principal means of transportation for more than a third of the population of the country. The earliest settlers in Thailand established themselves on and along the waterways and this pattern of settlement still prevails to a considerable extent in the central plain. Even though other forms of transportation have now been developed to a point where the tonnage handled by them far exceeds inland water transport in terms of tonnage carried, the latter's importance cannot be underestimated. Available statistics indicate that rivers and canals are still the mainstay for the transportation of bulk cargo such as paddy, rice, certain kinds of petroleum product, timber and construction materials, which, during the past three years, has averaged about five million metric tons a year. There is also a large volume of passenger traffic on the waterways of Thailand. If properly developed, these waterways will continue to constitute one of the most important means of transportation in Thailand and must therefore be regarded as national assets.

The Chao Phya River delta is the granary of the country; it produces much of Thailand's main crop (rice), much of which, as the staple food of the population and the principal export item, has to be moved to Bangkok. Since the interior is still inadequately served by rail and road, most of the rice moves by water; consequently the traffic on the "trunk line", which consists of 200 kilometres on the Chao Phya River from Chainat (the site of an irrigation dam and power plant) to Bangkok, plays a substantial part in the country's economy. As return cargo, the boats carry certain imports, household goods and food products. Besides, an ever-increasing amount of petroleum products is carried upstream by water.

The launching of the First National Economic and Social Development Plan had marked the first chapter in the field of water transport in Thailand. Collection of water transport statistics in the central rivers basin as well as in the northeastern part and at some coastal ports was undertaken, whereby hydrographic and topographic surveys were made for 1 : 5,000 charts for navigational purposes along the Chao Phya River.

Many sections of the waterways are shallow, particularly in the dry season when the need for transportation is greatest. However, the rivers are, on the whole, fairly stable and maintain natural navigable channels. In these sections, the navigable depth decreases to as low as 1.0 m. or even to 0.75 m. If these isolated sections could be maintained at a depth of say 1.5 m. or 2 m. by corrective dredging or river regulation throughout the river, the existing barges could carry almost twice as much as they do now; waste of capital due to groundings and stoppage could be avoided and, in addition, larger and more modern vessels could be used, which would result in further savings.

It is also a fortunate circumstance that the shoals consist mostly of sand and gravel which are not found anywhere else in the delta and which could, therefore, be extremely valuable for the building industry, for road construction and for raising residential and industrial areas. Since dredging must be done annually, there would be a continuous supply, and it might be possible to make the dredging operations financially self-supporting. For the transport of sand and gravel to Bangkok, modern craft of a size adapted to the improved channel conditions and built of the available local materials by local craftsmen could be developed. This would have the added advantage of providing practical experience by experimentation in the most efficient design for modern paddy-boats. At present, these boats are constructed in accordance with an age-old design which was suited to the channel conditions and to the materials available (teak and hardwood) in those times. However, teak is not as cheap as it used to be and, as these vessels need frequent caulking, they have to be slipped about every six months, resulting in reduction of fleet strength and wastage of shipyard space and manpower. Now that the costs of labour and teak have risen, building techniques have improved and plans have been made to improve the channels, it is time to review the designs and modernize

[1] Contributed by the special correspondent of the Government of Thailand.

the craft, so as to effect economies in the construction and maintenance costs. This will involve demonstrations by craft built according to the latest designs. Once suitable designs and types of vessels are established and have been proved by prototype operations, steps must be taken to ensure that they can and will be built at the most central local points of consumption and distribution. To this end, a model shipyard might be established. The transition from wooden craft to steel barges will take some considerable time. However, it has become clear that there should be no difficulty in building barges and tow-boat hulls very efficiently, although expert advice and guidance may be needed at the beginning.

In order to derive maximum benefit from the new vessels, their turn-round time should be accelerated; hence, the introduction of suitable mechanical loading and unloading equipment should be considered. At present, it may be said that there is virtually no inland port in the upper reaches of the Chao Phya River. The traffic pattern will indicate suitable sites for inland ports along the various sections. These inland ports should have adequate terminal facilities including handling equipment and storage space for various types of cargo. Adequate road and railroad connections will have to be provided to prevent the craft being detained.

These considerations would suggest the following:—

1 The creation of an excellent alternative route for the transport of bulk cargo and supplies from Bangkok (and Bangkok port) to the junction of the railway lines serving practically all of Thailand north of Bangkok;

2 Dredging and river-training of waterways wherever technically feasible and economically justified;

3 Better utilization of existing craft, as deeper channels would permit better utilization of vessels' carrying capacities and faster turn-round;

4 Provision of cheap sand and gravel to Bangkok for the building industry, road construction and raising of residential and industrial areas;

5 Replacement of existing paddy-boats by bigger and more modern craft, better suited to the present economic conditions and fit to carry cargo faster and more cheaply, while saving manpower;

6 Effective reduction of transport costs, thereby affecting the price index in the most densely populated area of the country.

In conclusion, the future work programme of the Harbour Department which administers the inland waterways includes the following:

(1) Regular hydrographic and hydraulic investigations and inspection of inland waterways;

(2) Construction and installation of landmarks and buoys to facilitate passage through shallow channels;

(3) Dredging and temporary or permanent training of the shallow channels of the Chao Phya and Pasak rivers;

(4) Study of the feasibility of making the gravel and sand dredged available for commercial sale by transporting them to sites where there is a demand for them.

(5) A demonstration pilot project for the construction of modern paddy-boats;

(6) Development and promotion of a modern boat-building industry for inland waterway transport uses, other than the carriage of paddy;

(7) Construction of repair yards for modern inland water transport craft;

(8) Development of inland ports with storage and cargo-handling facilities, including mechanical equipment;

(9) Training of inland water transport personnel at various levels.

OPERATION OF VEHICLE-DECK CONTAINER VESSELS[1]

Over the last decade there has been a general awareness in Australia not only of the advantages, but the necessity of having an efficient, modern fleet of interstate coastal ships, better port facilities and improved cargo-handling techniques. Within the next few years the entire face of Australian shipping will have changed. We are now poised on what will be one of the most exciting and challenging periods in maritime history.

After the war and throughout the early 1950's, the Australian coastal fleet comprised in the main a large number of mass-produced ships, which were pressed into service in any type of trade. All types of dry cargoes were being carried in these orthodox general-purpose carriers. Economics soon dictated that specially designed ships should be built for bulk trades, and the first of these appeared in 1955. Since then, they have developed rapidly in size, through a range of 7,000 to 50,000 tons D.W. The general cargo ships were then employed in the carriage of cargo other than bulk around the coast, but the volume of cargo carried in these ships decreased in the ten years from 1954-1964, hastening their departure from the Australian scene.

Cargo-handling methods over the last fifty years have changed very little. This conventional form was — and still is — a complicated, wasteful and an increasingly costly business. Goods have to be handled in the first place at the factory or the depot into a delivery truck. At the wharf, the individual packages are transferred from the truck to a covered shed to await loading. From there, they are again handled, often on to pallets, and at that point they are lifted by ship's gear or by crane into the hold, where they are once again man-handled into their stowage position. This entire process is then repeated in reverse at the port of destination — at least eight, and sometimes more handlings in this door-to-door process. Ship loading and discharge rates are slow, resulting in ships spending much of their time alongside the wharf; in some Australian ports periods of twenty to thirty days were not uncommon for larger ships. Together with intolerable delays in transit, shippers and consignees had to contend with breakages, pilfering and other damage, which, in a system involving so many different handlings, is inevitable.

To add to the shipowners' difficulties, road and rail transport in the years following the last war made a concentrated effort to capture as large a proportion of the profitable general cargo trade as possible. Competition, made more intense by constitutional protection afforded to other transport media, and the activities of the State-owned railways, resulted in numerous coastal trades being denuded or abandoned. Door-to-door delivery, with all its attendant savings in pilferage and breakages, proved that the conventional coastal ship could not compete economically. As with the bulk carriers, shipowners were convinced that specialized ships for specialized trades are a necessity, and along these lines the face of coastal shipping took on an altered appearance.

From the bow-opening landing ship, which had been developed during the war to land vehicles across the beaches with minimum loss of time and efficiency, there evolved in the United States of America and the United Kingdom, roll-on roll-off ships with stern doors. The advantages of this type of cargo-handling were immediately obvious. It was not long before the Australian Shipbuilding Board adapted the design in the first roll-on roll-off ship to be built in this country — "Princess of Tasmania", which entered service for the Australian National Line in October, 1959. Obviously such a system could not work efficiently as long as cargo continued to be handled in "penny packets", and a system was developed of moving cargo in units weighing up to sixteen tons and suitable for transport by road, rail or sea. Special ancillary equipment, such as sixteen ton fork-lifts, the largest then seen in this country, was required to handle the units, and immediately the system showed benefits. Coupled with the normal roll-on roll-off operation, which involves the carriage by sea of fully laden road vehicles up to 12'6" in height and with the ability to accept varying lengths, the new methods, which gave door to door shipment produced a 35 per cent over-all reduction in freight rates between Melbourne and Tasmania, and formed the foundation for much of the subsequent thinking and planning in the field of modern cargo-handling developments.

In parallel development with the roll-on roll-off principle is the "cellular container ship" module, which was developed in America and was introduced to Australia by the "Kooringa" in 1964. This ship operates a schedule service between Melbourne and Fremantle. The concept of putting a number of smaller packages into a large container is ideal for trades and services where such a level of demand exists, where standardisation is acceptable and where flexibility of operation can be sacrificed. However, containers are an expensive means of achieving a unit load. The amount of flexibility required dictates whether the

[1] Contributed by the Australian National Line.

unitization concept (roll-on roll-off) or cellular container concept (20' × 8' × 8' or 8'6" containers) is to be employed in any particular trade.

A considerable proportion of goods are unitized in the normal course of production and it may be at times unnecessary or impracticable to "containerize" goods that have already been "unitized". Heavy machinery, outsize lifts, electrical machines, road graders and agricultural machinery are some units that cannot be stowed in a container. They are, however, very suitable for direct loading on to a roll-on roll-off ship and need only to be secured to the deck.

For several years it has been the practice to strap together slabs and ignots of aluminium, lead, copper and other metals into lots of about two tons. These can be handled either directly on to the ship, using small fork-lifts, or consolidated into larger units of about fifteen tons on a "flat" and loaded by high-capacity fork. The basis of the system is a platform 8 ft. wide and 14 ft. 5 in., 16 ft. 8 in. or 20 ft. in length. These flats have a S.W.L. of fifteen, seventeen and twenty tons respectively. These units, stowed with metal or rolls of paper, are at present being stowed one on top of the other in the vehicle-decks of ships plying between Tasmania and the Mainland.

The major advantages of the roll-on roll-off system over the pure container ship are:—

1. Some goods are by their size and nature difficult commodities to containerize and are equally difficult to unpack.
2. Goods of a certain nature, particularly bulk commodities, do not require the ultimate in security afforded by containers.
3. Initial capital cost and repair and maintenance are lower in relation to "Flats" than "Containers."
4. Empty flats can be stacked, for delivery to the shipper or returned empty from destination, up to six high. Thus one vehicle can do the job that would require six vehicles if containers were used. The saving in transport costs, particularly with large consignments, is apparent.
5. The flat is easy to load and can be approached from all sides. It is in fact similar to the tray of a truck and therefore can be used with existing facilities.
6. No "follow-up" ship is required for cargo which cannot be containerized.

The years 1969 and 1970 will see the introduction of many new ships to the Australian Register for service both interstate and overseas. Roll-on roll-off and container ships will have proportional representation, and the advent of these transport media will virtually seal the fate of the age-old general-cargo or orthodox units.

In 1969, the Australian National Line will commission four more new roll-on roll-off lift-on lift-off vessels, now known as vehicle-deck container ships. The first of these, to be known as "Australian Trader", will provide a supplementary nightly service to the "Princess of Tasmania" on the Melbourne/Tasmania trade. The second such vessel will operate a weekly Melbourne/Brisbane service, and the third such unit will operate a similar service between Melbourne, Sydney and North Queensland ports.

The fourth vessel referred to will be commissioned in August 1969 and will inaugurate the first venture by the Australian National Line into a scheduled overseas service, between Australia and Japan.

Two further specialized ships will be delivered in 1970.

The "Australian Trader" will be capable of carrying 200 passengers and cars, together with 2,300 tons deadweight of unitized or container cargo, stowed both in the main vehicle deck and on an open crane-deck at the after end of the vessel. To provide the maximum comfort for passengers, this vessel will be fitted with two types of stabilizer system, utilizing mechanical retractable fins in one system and a passive tank system in the other.

The vessels for the Melbourne/Brisbane, Melbourne /North Queensland services are stabilized for cargo security purposes, and the design of these ships allows for the carriage of semi-trailers, containers, flats and other unitized cargo in the main vehicle-deck, and a considerable proportion of containerized or unitized cargo on an open deck at the after end of the shelter-deck. In addition, cars and palletized cargo can be carried under cover at the forward end of the shelter-deck, with stowage provided for similar commodities in car-decks below the main vehicle-deck level. The provision of a hatch connecting the shelter-deck with the vehicle-deck will enable the handling of cargo in and out of such vehicle-deck by means of twenty-five ton cranes which will be installed at each terminal port as an alternative means where a shore ramp is not justified. The heavy-duty fork-lift working inside the vessel will convey cargo to and from the hatch-opening to any desired storage position in the vehicle-deck itself.

The vehicle-deck container vessel for the Australia /Japan trade is at present under construction in Japan and is scheduled to be commissioned in August, 1969. This vessel will have the navigation bridge, crew accommodation and engines positioned aft. She will have three cargo-decks, comprised of an upper or

weather-deck, an upper vehicle-deck and a lower vehicle-deck. The weather-deck cargo will be loaded and unloaded by shore based cranes, and this deck has a capacity for 164 twenty ft. I.S.O. containers. Access to the upper vehicle deck will be by way of a stern door opening, nineteen ft. six in. in height and thirty-eight ft. in width, which is believed to be the largest stern door of any vehicle-deck ship in the world. The lower vehicle-deck will be serviced by a fixed interior ramp from the upper or main vehicle-deck.

Two hatches on the weather-deck permit access to the upper and lower vehicle-decks, enabling simultaneous loading by shore crane and stern ramp operation. Both upper and lower vehicle-decks have sufficiency of height to enable double tiering of twenty ft. I.S.O. containers; it is anticipated and generally accepted that below-deck stowage will be mainly on flats or stake-flats, for reasons outlined previously. Cargo stowage on flats will include baled wool, which forms a large proportion of the northbound cargo.

Cargo units will be handled, both in the ship and ashore, by large capacity fork-lift trucks, which will be amongst the largest such units operating in Australia. The ships and terminals have all been designed to take the heavy-axle loadings involved in this type of cargo-handling operation.

With ships, terminals, cargo units and high-capacity fork-lift machines, all specially designed for the trade, and based on actual experience, it is confidently anticipated that, through the concurrent use of the shore crane and fork-lifts to the vehicle-decks, a faster turn-round can be achieved than that predicted for the cellular container ship, but at the same time retaining the flexibility of cargo acceptance afforded by the roll-on roll-off type vessel.

ENCOUNTER BAY - THE FIRST SHIP OF A NEW TRANSPORT ERA [1]

The recent launching of Overseas Containers Limited's (OCL) "Encounter Bay" at Howardtswerke yard in Hamburg for the Australian trade was an event of particular significance to British shipping. All the advantages reaped for raw materials by the introduction of big tankers and bulk carriers are now to be achieved for general cargo with the new cellular container ships of which "Encounter Bay" is the world's largest, and first to enter the Australian trade.

A new dimension and perspective comes to the economics of shipping. No longer needs goods be packed and sent individually to ports to await shipment in a week and more, and be delayed equally as long at the port of destination. Now consigned in a container without unit packing charges, the goods at no extra cost can travel undisturbed, unhandled from start to destination in at least two weeks less than if shipped by conventional means. All the shipper need now do is to make one telephone call, fill in one document, pay one bill and his exports are on the way with a reliable delivery date for his customers.

Moreover, the shipper receives his negotiable document earlier than before. A comprehensive door-to-door insurance rate is in negotiation. No longer has the shipper to think in terms of sailing dates, but of delivery dates. The container, as a ubiquitous warehouse, can be used to reduce both the producer's and the customer's stocks. Far-sighted firms will be quick to modify their storage and distribution systems to meet the new service of weekly sailings scheduled for early 1969 and should achieve considerable savings in costs compared with previous shipping services.

The "Encounter Bay" is the first of six £5 million vessels being built, four of the remaining ships are being built in Hamburg and the sixth by Upper Clyde Shipbuilders Ltd.

The ships are all cellular, that is, the whole cargo of containers enters and leaves the ship by a vertical drop or lift from a shore-based crane, and is stowed in cells. The ships are designed for twenty ft. long standard containers initially, but are capable of carrying forty ft. long containers on deck at any time; or in the holds, after a straightforward adjustment has been made to the cell-guides. The engine-room is right aft and the whole area forward of this, above and below deck, is available for containers. The crew accommodation and the navigating bridge are also aft. Special care has been taken to ensure that vision from the navigating bridge has not been impaired by the deck container stack. The naval architects have endeavoured to produce an outline that is in keeping with the ship's function, with a somewhat severe but striking profile, accentuated by the deep green livery.

Great care has also been taken in the design of the hull, not only to produce a ship with low resistance to the water, but also in an endeavour to keep the seas off the deck and off the deck containers. Vickers ship model experiment tank staff at St. Albans carried out extensive tests and a form of hull was developed forward that is akin to an aircraft carrier's bows, so devised that the very heavy flare casts the water clear of the upper deck. Four passive anti-folling tanks of Flume design are built integral with the bulkhead structure. They will reduce the ship's motion and further relieve the deck container stack of undue strain. A counter stern provides additional deck space for mooring activities and is more economical to build.

There are three hatch-openings in the width of the ship; because of the very limited extent of deck abreast these hatches, the ship's designers have had to cope with structural problems. The container ship is an open-topped vessel where the twisting effect of the waves at sea can be highly critical; every move to greater ship lengths increases the problem of stress. The main strength members are made of Lloyd's Grade E higher tensile steel, and because of weight limitations the hatch-covers themselves are also being made of higher tensile steels.

The standard of all accommodation is high. Crew members have single-berth air-conditioned room. Every man in the ship's complement will have facilities for taking his wife to sea with him on a limited number of voyages. The principle adopted has been to keep all the service space, i.e. messrooms, galleys and so on, on one deck and so segregate them from the living-spaces on the other decks. The navigating bridge lay-out provides all-round vision and the easiest access to points of control.

1 Extract from Modern Transport, September 1969.

Because of the need to keep the ship static while handling containers by shore-based cranage, the mooring equipment is extensive. There are four automatic constant-tension winches aft and four forward — two of which are coupled with cable lifters. There is no cargo gear in the accepted sense as all container handling is carried out from the shore. The only cranes are two of AEG make, situated aft and used for handling deck and engine stores. The non-refrigerated holds are ventilated by a Thermotank mechanical system and all are protected by a carbon dioxide fire-extinguishing and detection system of Walter Kidde make. The whole design has been based on the need to keep maintenance to an absolute minimum because there will be no opportunity to do it except at the annual lay-up.

Container spaces form the really important part of the ship. Basically, the containers are held six high in guides below deck and are lashed two or three at a time and end to end by a system of which OCL have been the innovators and which has become known as "twinlift." Thus fewer cranes are needed to handle the same number of containers. The speed with which the crane operator can enter containers in the guides is important and is helped by having a large splay at the top of the guides. The OCL ships have therefore a very generous lead-in both fore and aft and athwartships, but because every inch of lead-in means a longer or wider ship the designers have adopted a simple device, which has come to be known as a "flip-flop," at the top of the athwartship guides to provide adequate gather. These moveable flaps, which have been extensively tested in prototype, are pneumatically operated and make it possible to save four ft. in ship's beam.

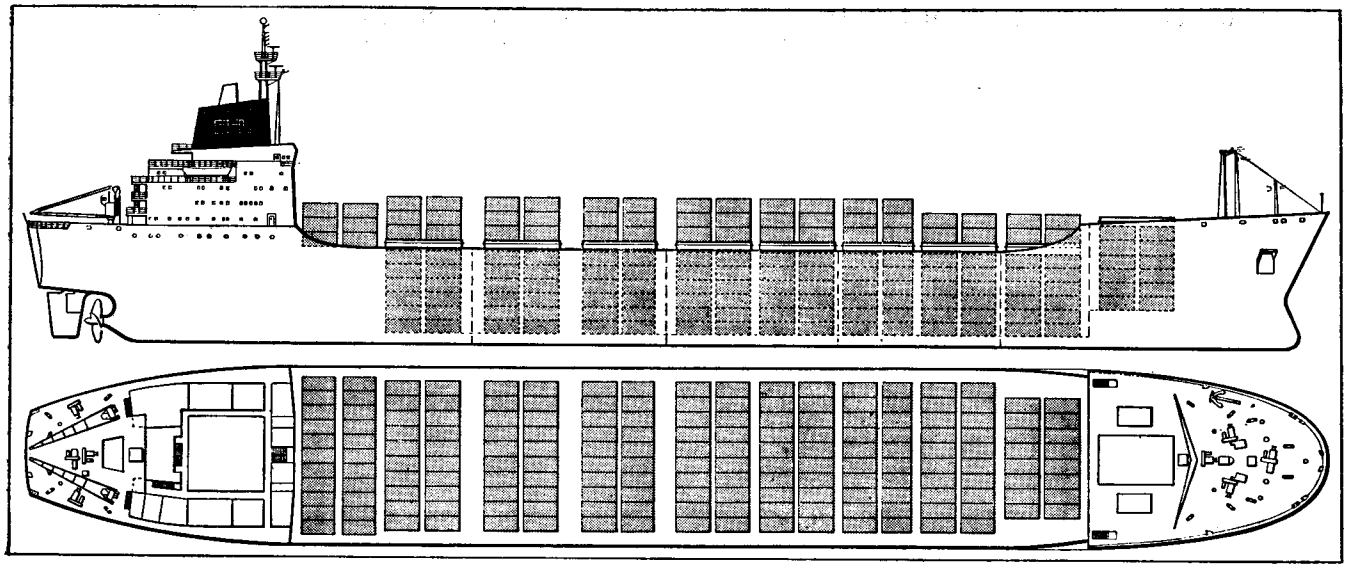
The No. 1 hold has been selected for the carriage of containers carrying hazardous substances and is specially ventilated for the purpose. Holds No. 5 and 6 are designed for the carriage of refrigerated containers. These are cooled by a duct system circulating cold air direct into and out of each container so that only light insulation is needed on the ship's structure. Each container must be connected to the ducting on arriving in the cell and this is done mechanically through a remote-controlled pneumatic and spring-operated coupling device.

The ships must obviously be kept reasonably upright when working the containers to avoid jamming and delay. Cross-pumping facilities are available by which water ballast can be moved from one side of the ship to the other at a rate equivalent to the discharge or loading of containers.

On deck, at least to begin with, there will be two tiers of loaded containers with one of empties on top. Three tiers of loaded containers can, however, be carried. When required, a diagonally-arranged lashing system, quickly set up and easily handled, will keep the stack in place. This has been the subject of much careful calculation so that even the worst sea conditions can be accepted without endangering the deck load. Here again, experimentation has preceded the final design, since the Blue Funnel ship "Priam" has been carrying a typical stack of lw containers to Japan and back on several recent voyages each with a different type of lashing system fitted. She also carried measuring instruments which recorded the forces and stresses involved. Further, since it was not clear how much load could be taken by the container itself and how much by the wires, it was necessary to test in racking a series of actual containers and the results were observed and fed into the lashing design calculations.

Users of the OCL container service will note that the load in each, including any dunnage, is limited to 41,000 lb. The width of the door frame is 92½ in. with a height of 84½ in. The closed-end half of the container should not carry more than 65 per cent or the door-end half more than 60 per cent of the total load. For units of cargo up to two tons there must be a total bearing surface on the floor of the container of at least 12 sq. in. per ton. The containers have laminated redwood floors protected by Celcure A wood preservative to conform to Australian quarantine regulations. The containers conform to ISO standards.

The engine-room installation has been designed for operation by one officer at sea and to be unattended in port. Automatic and remote control systems have been used extensively. The temperature of the air to and from the containers is automatically recorded. A data logger will automatically record all data associated with the carriage of refrigerated containers. The Stal-Laval main turbines are the largest sets of single-screw machinery built to-date and have been designed to develop 32,000 shp at 140 rpm to provide a service speed of 22 knots.



ENCOUNTER BAY DIMENSIONS

Length overall	745 ft. 9 in.
Beam moulded	100 ft.
Depth moulded	54 ft.
Max. draught	35 t
Gross tonnage	27,000 grt

To carry 1300 ISO containers, 20 ft. by 8 ft., including 304 insulated units.

II. NEWS ON RECENT DEVELOPMENTS

HIGHWAYS AND HIGHWAY TRANSPORT

Alcohol contributes to U.S. motor car deaths

(World Highways, September 1968)

Use of alcohol by drivers and pedestrians contributes to some 25,000 deaths and at least 800,000 crashes in the United States each year, according to a report submitted to the U.S. Congress last month by the Department of Transportation.

The study discusses in detail the results of scientific research into the dimensions of alcohol's role as a highway hazard factor.

"Research shows that more than half of adults use the highways at least occasionally after drinking. However, the scientific evidence is irrefutable that the problem is primarily one of persons, predominantly men, who have been drinking very heavily, to an extent rare among drivers not involved in crashes . . . .

"Fatal and other crashes of teenagers and young adults also frequently involve hazardous amounts of alcohol. Adults who use alcohol immoderately, but not identified as problem drinkers by the research to date, are also frequently involved."

Right-hand driving surveyed in Sweden

(World Highways, December 1968)

Conducting an intensive investigation of a year of right-hand driving, the Swedish Road Safety Board notes relatively fewer accidents occurred than during left-hand driving days.

At the same time, it says that at the end of the year certain curves on accident statistics have begun to rise and poses the question:

"Have the Swedes adapted themselves to right-hand driving as well as they think they have?"

The voluminous report, "A Year of Right-Hand Driving", compiled by the Section for Development and Follow-up Work at the National Swedish Road Safety Board, is in part praise for the early reactions of Swedish drivers to the change-over and in part a warning against over-complacency in continuing adjustment to the change.

Sweden's H-Day, or change-over from left to right-hand driving, took place on September 3, 1967.

The report notes that from April, 1967, when an intensive publicity campaign was started, to April, 1968, there were 300 fewer fatal accidents than in the same period the year before.

Up to July 31st, with road traffic driving on the right, a total number of 14,223 persons were injured in traffic accidents as against 14,446 during the corresponding earlier period with left-hand driving.

The total number of accidents involving personal injury in built-up Swedish areas was lower in right-hand traffic from the change-over up to April, 1968, in relation to the comparative period of September 1966, to April, 1967. But thereafter an increase took place.

Similar tendencies were traced in figures for accidents outside built-up areas. Accidents involving personal injuries were substantially fewer during the first two months of right-hand traffic.

During November, there was an increase, which continued during December. In January, 1968, however, this tendency was interrupted and the accident figures decreased, to achieve approximately the same level during April as the figures during the comparative period. In May the comparable figures were about the same for both left- and right-hand driving, but during June an increase took place for the right-hand traffic injuries.

The report says:

"The number of fatal accidents was markedly lower, both inside and outside built-up areas, up to and including April, 1968. Thereafter, a comparatively insignificant increase took place.

"Reckoning over the whole period, the number of fatal accidents was less than in left-hand traffic."

But the Safety Board report also notes:

"The accident statistics have curves which point in the wrong direction at the end of the first year of right-hand driving. Have we over-estimated our adaptation to the new traffic environment?"

And it suggested that most of relapses into the wrong kind of driving took place when drivers made left-hand turns at crossings.

The report is a continuation of the extensive work carried out by the Safety Board during the change-over to right-hand driving.

"The aim", says the board, "is to gradually create an increasingly detailed and reliable foundation for further road-safety work".

Loan announced for Taiwan road

(World Highways, December 1968)

The Asian Development Bank has agreed to assist a feasibility study of the proposed North-South Freeway in Taiwan from Keelung, a port in the extreme North, to Kaohsiung in the South — a distance of 400 km (249 miles).

The proposed four-lane freeway which will pass through the western plain of Taiwan is intended to facilitate fast-moving, long distance traffic and is divided into four sections. The two sections in the north and one in the extreme south will serve two major harbours and three important cities — Taipei, Tainan and Kaohsiung.

The remaining segment linking Chungli and Hsinshih and passing through more sparsely populated areas will account for the greater part of the highway.

Under the proposed technical assistance programme, the Bank will finance the foreign exchange cost of the feasibility study of the complete freeway project, including if appropriate the detailed project preparation of the northern section between Erhchung and Chungli. The Bank will provide for this purpose, a grant of $100,000 on a non-reimbursable basis and a loan of $400,000 to the Republic of China. If the Bank eventually decides to provide a construction loan for the northern section, the loan portion of the technical assistance may be consolidated with the future loan.

The feasibility study will be undertaken by a team of engineering experts and economists who will assess the traffic potential of the entire project, the routing and type of the highway needed, the anticipated economic and financial returns and the pattern of priorities and phasing.

Taiwan has made significant economic progress in the past fifteen years. Between 1953 and 1967, real income increased at an annual average of 8 per cent and real per capita income by 4.6 per cent. This impressive record of performance is mainly attributable to substantial increase in productive investments and exports.

Transportation in Taiwan is predominantly by means of highways and rail-roads and their further development is considered essential to cope with the rising tempo of growth in the fields of commerce, industry and agriculture.

At present, Taiwan has a highway network of 16,581 km. (10,305 miles) of which 11,303 km. (7,023 miles) are village, town and urban roads. The principal highway is the North-South Arterial Highway along the western plain of Taiwan.

The use of highway transport in Taiwan has risen markedly in recent years. During 1953-67, the volume of passenger traffic by highways increased at an annual average rate of 12 per cent and the freight traffic at 18 per cent.

£137 million roads programme proposed for Hong Kong

(Highways and Public Works, December 1968)

A comprehensive report was recently completed by traffic consultants Messrs. Freeman, Fox, Wilbur Smith & Associates, to assist the Hong Kong Government's Public Works Department plan the development of the Colony's road network over the next twenty years.

The consultants' long-term proposals, which carry a price tag of £137 million, include elevated roads to increase the carrying capacity of existing main arteries; new flyovers and underpasses to relieve clogged intersections; construction of a second tunnel under Lion Rock, and a tunnel to link Aberdeen with the northern part of Hong Kong Island.

In their report, the consultants have concluded that the travel needs of the Colony's population cannot be met wholly by surface transport, and that a rapid transit system will be needed.

To support their contention, the consultants cite the number of car-owning households which will increase from 36,800 in 1965 to 250,000 by 1986. The consultants say also that the number of daily vehicle trips by private car and taxi will rise from a half-million in 1965 to 2.5 million in 1986. And together with the large number of buses and trams which will have to use the roads, a separate rapid transit system on the lines recommended in the Mass Transport Study report will therefore, be required.

The report, which was tabled by the Legislative Council, was said by the Director of Public Works, Mr. Michael Wright, to be valuable aid to the Public Works Department in planning road improvements.

Conventions on road traffic and on road signs and signals

(Note by Secretariat)

The United Nations Conference on Road Traffic, attended by eleven countries of the region from 7 October 1968 to 8 November 1968 at Vienna, resulted in the recommendation of two approved international Conventions on Road Traffic and on Road Signs and Signals respectively, for signature before 31 December 1969. The Conventions will come into force one year

following their ratification or accession by fifteen countries and will replace all the relevant existing international instruments relating to road traffic and signs and symbols.

These Conventions prescribe a new set of rules of the road and standardized road signs and symbols. They also stipulate conditions and technical requirements for the use of roads by international traffic.

CONVENTION ON ROAD TRAFFIC

The Convention on Road Traffic contains, in a series of fifty-six articles and seven annexes, both detailed rules of the road to be followed in the territory of each contracting State, and technical conditions and requirements for the admission of vehicles in international traffic. It obliges contracting parties to take appropriate measures to ensure that the rules of the road in force in its territory conform in substance to the provisions of the Convention and to a detailed set of technical requirements.

It further obliges them to admit to their territories in international traffic motor vehicles and trailers, cycles and mopeds which fulfil the conditions laid down in the Convention. Parties to the Convention also undertake to communicate, on request, information necessary to determine the identity of a person in whose name a motor vehicle or trailer is registered, if the request shows that this vehicle has been involved in an accident.

Under the rules of the road section, the Convention provides among other things that:

— Road users must comply with the instructions conveyed by road signs, traffic light signals or road markings even if the said instructions appear to contradict other traffic regulations;

— The laden weight of a vehicle must never exceed the permissible maximum weight, and loads projecting beyond the vehicle must be clearly marked in all cases where their projection might not be noticed by the drivers of other vehicles.

Other articles on rules of the road cover such questions as overtaking and movement of traffic, speed and distance between vehicles, intersections and obligations to give away, rules applicable to pedestrians, standing and parking, special rules for cyclists, moped drivers and motor cyclists and lighting and general requirements.

As regards the conditions for the admission of vehicles and trailers in international traffic, the provisions stipulate that the drivers of a motor vehicle shall carry a valid certificate of registration issued by a competent authority. Every motor vehicle must also display at the rear, in addition to its registration number, a distinguishing sign of the State in which it is registered, the sign consisting of one to three letters in capital Latin characters painted in black on a white ground of elliptical form.

This section of the Convention also provides that every motor vehicle, trailer or combination of vehicles in international traffic must satisfy the technical conditions contained in annex 5 of the Convention. This annex specifies technical requirements for such things as braking, lighting and miscellaneous items including steering mechanism, rear-view mirrors, audible warning devices, windscreen wipers and windscreen washers.

It also provides that vehicles must carry a triangular sign-plate, or other equally effective device, as a warning when the vehicle is unavoidably stopped; that vehicles and trailers be so constructed and equipped as to minimize danger in case of accident and that no non-essential ornament or other object with projections of ridges be fixed to the exterior or interior of the vehicle.

Other annexes to the Convention cover exceptions to the rules governing admission of motor vehicles and trailers in international traffic, registration numbers of such vehicles, the requirements regarding distinguishing signs referred to above, identification marks of such vehicles, domestic driving permits, and international driving permits.

CONVENTION ON ROAD SIGNS AND SIGNALS

The Convention contains forty-eight articles, with seven annexes specifying the types of sign and symbol authorized in the articles.

The Convention on Road Signs and Signals takes into account the existence of two primary systems of signs, the European and the American, on which most national systems are currently based. For reasons of safety and cost, it was recognized that it would be difficult to abandon the shape and colour of the signs of either system — especially of the danger warning signs — now in use. It was generally agreed, therefore, that the most important goal to be achieved is the standardization of the symbols shown on the signs and the deletion of verbal inscriptions on the signs in the national language.

The difference in shape of danger warning signs is considered no obstacle to safety and can be allowed. Hence the Convention makes provision, in its basic articles, for the choice by contracting parties of one or the other of the two systems in the matter of the shape of the danger warning signs. Similarly, the Convention allows a choice in the case of "stop" signs, the octagonal sign being used under the American system and the circular sign in general use under the European system.

The Convention thus aims at complete standardization, at least at the continental level, within a particular system of signs and signals, the intention being that the symbols adopted will be the same throughout the world, apart from a few slight differences which cannot alter the meaning of the symbol. This is considered an important result of the Conference and, as stated in the report of Committee 2, "is a distinct advance over the previous situation".

States Parties to this Convention undertake to replace or supplement, not later than four years from the date of entry into force, any sign, symbol, installation or marking which, although it may have the characteristics of those prescribed in the Convention, is used with a different meaning. Parties also undertake to replace, within fifteen years from the date of the Convention's entry into force, any signs, symbols, installations or markings which do not conform to the system prescribed.

During this period, in order to familiarize road users with the prescribed system, previous signs and symbols may be retained beside those prescribed.

RAILWAYS

Trains to reach Chiangrai by 1978

(State Railway of Thailand, February 1969)

A feasibility study of the proposed Denchai-Chiangrai railway line will be completed this year and construction will start in 1973, according to Col. Saeng Chullacharitta, General Manager of the State Railway of Thailand.

The study which was started in 1966 will be submitted to the Government for approval next year. Construction bids will be opened in 1971. The railway is expected to take five years to build.

The line from Denchai to Chiangrai will be 273 km. long, 79 km. of the track passing through mountainous areas and the rest through plains. A tunnel 4.7 km. long will be built at Amphoe Song, Phrae province.

Trains will travel between Denchai and Chiangrai at an average speed of 60 miles an hour. The cost of the journey will be 27.50 baht.

Thai-Laos rail link might materialize next year

(Ministry of National Development, Thailand, February 1969)

Construction of a 440 million baht railway bridge linking Nongkhai and Vientiane in Laos will be commenced late this year.

The construction will take about one year to finish. The bridge proper will cost some 80 million baht whereas the pedestrian and railroad tracks will cost about 360 million baht.

The preliminary survey for the bridge was made with the co-operation of the Japanese Government. All the detailed feasibility surveys will be double-checked and are scheduled to be completed within the next six months.

Thailand intends to seek financial aid from foreign countries at the next ECAFE conference in Singapore in April 1969.

Seminar-cum-study tour on Diesel traction

(Note by Secretariat)

A Seminar-cum-study tour was organized by the Government of France, under the auspices of ECAFE, for the benefit of the countries of the region. It was held in Paris from 2 to 30 May 1969. Participation was at a high technical level, as was manifested in the ready response by nine countries of the region, namely Burma, Cambodia, Republic of Korea, India, Indonesia, Iran, Malaysia, Pakistan and Thailand, in sending seventeen representatives of very high calibre to participate.

This seminar-cum-study tour, as its name implies, devoted more time to on-the-site inspections and observations, followed by on-the-spot discussions.

The various technical advances in the field of diesel traction were explained to the participants and all the shops, sheds and manufacturing plants were shown to them. The French National Railways and the manufacturers of equipment took special pains to explain in detail their experience in the operation of the equipment and how the practical problems were overcome.

These were of direct practical interest to the participants. Thus, the aims and objectives of this particular form of co-operation between the developed and the developing countries, for acquainting the senior officials of the railways of the ECAFE region with the latest advances in the field of diesel traction, were largely achieved.

WATERWAYS AND PORTS

Port Development

The Dock and Harbour Authority, February - November 1968)

Brunei

Port of Brunei

The Gammon and Yau Wing Joint Venture have been awarded a B$12,700,000 contract by the Brunei Government to develop the Port of Brunei. Members of the Joint Venture are Gammon South East Asia Berhad and Yau Wing Co., Ltd. The work consists of an access channel of 400 ft. bed width through Pelompong Spit, reclamation and bounding behind proposed new berths, reclamation and bunding of selected locations in the port area and the construction of a training bund and groynes. Some 4,750,000 cu yd of dredging is involved and about 300,000 sq yd of stone are required in bunds. The consulting engineers are Sir Bruce White, Wolfe Barry and Partners.

Ceylon

Trincomali

Emergency measures to relieve congestion in the port have been prepared by a Cabinet sub-committee of which the Prime Minister, Mr. Dudley Senanayake, is chairman. Warehouses with a capacity of about 25,000 sq ft, which have fallen into disuse, are to be repaired for use as soon as possible. It is estimated that the cost of repair will be about Rs250,000. The sub-committee has also sanctioned a loan of Rs.800,000 to the Port Cargo Corporation for the purchase of a fleet of twenty-five lorries for Trincomali port.

Taiwan (China)

Kaohsiung

To cope with increased shipments of crude oil to their Kaohsiung refinery, the Chinese Petroleum Corporation has announced plans for the construction of an offshore oil tanker discharging terminal. It is to be built just south of Kaohsiung, and its exact location is lat. 20 30 29 N long. 120 17 49 E., being approximately 13,900 ft from the shoreline. The depth of water at the new terminal is approximately 10 fathoms. Discharge of oil will be effected through three 12 ft floating hoses which are attached to an "Imodco" buoy, and which will swing with a tanker in a 360 deg. periphery. The buoy is 40 ft in diameter, and is connected to the shore by a 34 in diameter submarine pipeline. Construction of the new terminal will be completed by the end of July this year.

Hong Kong

More typhoon shelters and sheltered anchorages will shortly be available to local craft owners and operators, as Hong Kong approaches another typhoon season. The newest additions are the Rambler Channel typhoon shelter near Tsuen Wan, the Sham Ka Tsuen typhoon shelter in Lei Yue Mun, and the Aberdeen typhoon shelter. The one at Aberdeen West was completed several years ago and this section is now considered "typhoon-proof". In Aberdeen South, the main formation of the breakwaters is complete and there remains only the capping of the arms to be undertaken. Reclamation is presently going on in Yau Ma Tei to provide better working areas for cargo vessels.

The new petroleum storage terminal at Tsing Yi, Hong Kong, was inaugurated by Mobil Oil Hongkong Ltd. The terminal has a capacity of 680,000 barrels and has cost 30 million Hong Kong dollars. The complex covers 40 acres of land is three times larger than the old Mobil site at Laichikok. It consists of 46 giant steel tanks, a buloil blending plant capable of blending more than 150,000 barrels a year or lubricant oil, and oil products. The laboratory is available for use by Mobil customers and outsiders. Mobile will serve Asian countries through the terminal, which took 18 months to complete. As the terminal is built close to deep water and is serviced by a 900 ft pier, it can receive ocean tankers of up to 60,000 tons.

India

Mangalore

The Indian Government has approved the Mangalore harbour project at an estimated cost of Rs.240 million. The all-weather, 30-ft deep-sea port will have three alongside berths — one for iron ore, manganese ore and coal, one for general cargo, and the third for raw material imports of the fertiliser factory and general cargo.

Madras

Costain-Blankevoort International Dredging Co., Ltd., has been awarded a contract, worth £1½ million, to dredge inside the harbour and alongside the approach channel to facilitate the accommodation of tankers up to 90,000 tons. The enlarged harbour will serve an oil refinery to be built at Madras. The self-propelled hopper suction dredger "Tees Bay" from Australia will carry out the dredging work, the greater part of which is expected to be completed by the end of this year.

Paradeep Port

A major rail link connecting the Daitari iron ore mines with Paradeep Port will be completed within three years to handle the annual export of two million tons, according to an Indian Government statement. The Estimates Committee has suggested that the pace

of development of Paradeep Port should be closely related to the development of the iron ore mines in the hinterland. The Government said that traffic survey for the rail link was nearly completed.

Haldia

The first phase of this big new port, which is 75 miles from Calcutta, is scheduled to be completed by 1971. The £22 million port, sited near the mouth of the Hooghly River, will handle vessels of deeper draught than can be accommodated at Calcutta. From early 1971, the new port will begin handling coal, ore, fertilizers and grains. It will eventually handle about 10 million tons of cargo a year.

Marmogoa

The Rs.250 million plan to develop Marmogoa harbour will not get World Bank aid, the Chief Minister of Goa, Mr. Bandodkar, disclosed recently. The reason advanced was scarcity of funds. The World Bank had undertaken a feasibility study of the project. The Goa Administration has suggested that the project should go ahead, with the aid of Japanese steel mills, the main buyers of Goa ore.

Vizagapatam

The Indian Government announced its approval for the construction of an outer harbour at the east coast port of Vizagapatam, capable of handling ore carriers of between 100,000 and 150,000 tons deadweight, with a draught of over 50 ft. At the moment the port's limit is vessels of 33,000 tons with a 33 ft draught. Mechanical equipment at the port is also being modernized to increase loading rates to six million tons annually, compared with the present four million. The port will be used for shipping iron ore produced at Asia's biggest mechanized iron ore mine at Bailadila, which was formally inaugurated last month. The mine, developed with Japanese assistance, will produce four million metric tons of high grade iron ore each year for Japanese steel mills.

New Zealand

Napier

The Harbour Board has approved a £3.4 million development plan and called on its officers to furnish a report on its immediate implementation. The work approved is the first stage of a long-term project which the Board believes will provide facilities at least equal to those anywhere else in New Zealand. The first stage envisages: construction of a 4,800 ft western breakwater costing £2 million; reclamation work costing £¾ million; further dredging of the harbour's channel and touring basin at an estimated cost of £½ million; and construction of an oil tanker wharf, near the end of the new breaker, expected to cost £150,000. The reclamation of an initial 32 acres out of an eventual 98 acres will pave the way for converting the Higgins finger-wharf and the port's easternmost one into a breastwork wharf and for additional breastwork wharves to the west of the enclosed harbour. The long-term over-all development at Napier includes a 1,200 ft extension of the existing eastern breakwater to overlap the end of the proposed western arm, giving a 200 ft wide entrance to the harbour. The Board approved Stage One of the project on the recommendation of its engineer, Mr. S. M. Fisher. He said the plan provided a depth of 40 ft at lower for ships up to 900 ft long.

Tauranga

Proposals for extension of berthings, dredging and other facilities for the port, at an estimated cost of nearly £1.4 million have been approved by the Tauranga Harbour Board. The plan includes a 700 ft extension at the south end of the wharf at a cost of £645,000; work worth £68,000 on the cutter channel, in addition to the present £419,000 contract now in progress, and a £40,000 Customs house.

Singapore

Port of Singapore

The East Lagoon area is to be developed for container ships at a cost in excess of £9 million, but conventional ships will continue to use the port. The Port of Singapore Authority hopes to have the container port ready for operation by 1971. Construction work will include the provision of a breakwater for the East Lagoon area, part of which will be reclaimed and filled in to provide 100 acres on which to stack containers. A 2,200 ft wharf of piled concrete is also to be built along with a 700 ft crosswharf. Dredgers will cut a 36 ft channel so that large container ships can dock next to the wharf.

Central dredging organization for Indi

The Dock and Harbour Authority, August 1968)

A central dredging organization is being set up by the Government of India. This is to help the minor ports to clear the backlog of dredging as well as to meet the urgent dredging requirements at the iron and manganese ore shipping ports.

The organization will initially have two dredgers, but it is proposed to add two more together with ancillary equipment.

According to an official review of minor ports, the dredging of sand bars at the sea entrance to the ports is an acute problem, especially at Masulipatnam. Cuddalore, Nagapattinam, Mangalore and Mandvi.

The silt and sand accumulation in these areas is recurring and removal is possible only during the limited period of November - May, which makes it necessary to have a large number of dredgers and equipment.

The review also refers to coastal erosion as one of the major problems of the minor ports and notes that intermediate and minor ports on the west coast suffer from severe effects of the south-west monsoon, and consequently remain closed to traffic from the middle of May to the beginning of September.

East Pakistan Inland Water Transport Authority acquires electronic hovercraft

("DAWN" 21 May 1969)

East Pakistan Inland Water Transport Authority has acquired the world's first survey hovercraft equipped with electronic equipment, for conducting a survey of inland waterways in the Province.

The vessel has been acquired primarily for survey work but at the same time it will be an experiment for its ultimate use for commercial purposes if the vessel is found successful in the climate of East Pakistan and its waterways.

The sources said that its introduction for commercial purposes, will revolutionize the transportation system in this riverine part of the country. The sources added that, with the withdrawal of helicopter services in this Province a few years back, the introduction of hovercraft was mentioned in various circles, including the PIA, as a substitute for quick means of transportation.

The hovermarine survey craft consists of two units — a hovercraft with 60 passenger seats and a hovercraft with five seats only. The cost of the two units, including the expenditure to be incurred on training of its crew members, would be £145,800.

The hovercraft could survey an area of one mile in five minutes. The survey with the help of electronics could be done on tapes. The equipment in the hovercraft is the most sophisticated in the survey field.

The speed of the hovercraft is 35 knots per hour. The three-man craft, known as the survey marine, is based on the 60 passenger hovermarine HM2 rigid sidewall hovercraft. It is the joint development of the Hovermarine and Decca Navigator companies.

The hovercraft has a glass-fibre hull and the machinery lay-outs of the 51 feet long HM2, but the superstructure has been modified to provide a wider deck, walkways and a large bridge.

The craft is, in fact, divided into two similar sized compartments, a forward operational section and a rear accommodation area that includes a gallery and a washroom.

The craft has been specially designed, as its range has been increased from 140 to 400 nautical miles.

Establishment of Port Information and Advisory Centre

(Note by Secretariat)

At the first Regional Port Seminar held in Singaport from 7 to 16 October, 1968, which was attended by over 70 participants, many problems affecting port efficiency were discussed, and one of the important recommendations was that the secretariat of ECAFE should set up a Port Information and Advisory Centre for the pooling and dissemination of port information, including the latest technological developments. This recommendation was one of fifteen, many of which were aimed at improving regional co-operation in this field. The Transport and Communications Committee at its seventeenth session, held at Bangkok from 3 to 11 February, endorsed the setting up of such a Centre within the ECAFE secretariat and recommended that the Centre should concentrate, in particular, on regional problems not covered by other bodies. The Economic Commission for Asia and the Far East meeting at Singapore for its twenty-fifth session in April, 1969. gave its approval to the setting up of a Port Information and Advisory Centre, recognizing that the First Regional Port Seminar had provided a valuable forum for the exchange of views and experiences among senior port officials of the region. At the same time, it endorsed the convening of such seminars at regular interval in the future.

Following these directives, the secretariat has recently set up a Port Information and Advisory Centre attached to the Transport and Communications Division. It is hoped that in liaison with other governments, and agencies such as UNCTAD, IAPH, PIANC, ICHACA, and with the assistance of the port administrations in the region, a useful inflow and outflow of information will be generated and, as time passes, these services of the Centre will grow and be of real value to port administrations etc., in the region.

As a follow-up of the work of the ECAFE Port Survey Team (disbanded in 1968) after surveying twenty-two ports in eight countries of the ECAFE region and of the recommendation of the ECAFE Regional Port Seminar, the Commission also endorsed, at its twenty-fifth session, the establishment of "ad hoc" Port Consultancy Services. The aim of this scheme is to provide, on request, high-level expert advice to countries of the region on any specific port

problems, and this has been made possible by the co-operation of several advanced countries. Under the scheme, arrangements have already been made to assist the Singapore Government in drawing up a master plan of port development through the co-operation of the Government of the Netherlands, while a number of other countries have also shown interest in the scheme.

The services of a regional port adviser are also now available, having been provided by the United Nations Office of Technical Co-operation, to establish the necessary specialized link in the secretariat for the follow-up action connected with the Port Survey Team's reports, to render advisory services to governments, and to screen any requests for the "ad hoc" Port Consultancy services referred to above.

GENERAL

A compendium on facilitation of international traffic

(Note by Secretariat)

Pursuant to the recommendation of the ECAFE Working Party on "Facilitation of International Traffic", and as part of an effort to promote a smooth flow of international traffic in all modes of transport in the ECAFE region, a compendium on facilitation of international traffic is now being prepared by an ECAFE Study Group. The compendium will contain the factual position of the countries of the ECAFE region relating to immigration, customs, health, exchange control, documentation, international conventions, compulsory insurance of motor vehicles in international traffic and national facilitation committees. It will also include recommendations for facilitation of international traffic by all modes of transport.

Relevant information is now being collected from Australia, Ceylon, Republic of China, India, Iran, Japan, Republic of Korea, New Zealand, Pakistan, Philippines, Republic of Viet-Nam, Western Samoa, Brunei, Hong Kong and Singapore.

Further steps taken to facilitate international air traffic

(IATA News, July - August 1968)

At the recent seventh session of the Facilitation Division of the International Civil Aviation Organization (ICAO), many specific proposals regarding further efforts to facilitate international air traffic were discussed.

Among the important items discussed at the meeting were the need for free importation of equipment which carriers must use with the advent of high-capacity air craft. To handle high-capacity aircraft efficiently on the ground, airlines will acquire ground equipment for an entirely new and advanced type. The ICAO conference recommended to governments to allow airlines to import ground equipment into countries they serve without payment of customs duties and taxes when the equipment are used within airport limits.

The Conference also felt that as the trend towards containerization will also be more noticeable when the large aircrafts enter service, it is equally imperative that airlines have the same freedom from customs duties and formalities for the equipment. The tendency is towards moving container loads directly from the airport to the premises of the importer or some other inland point for customs clearance. This speeds up clearance and provides better service to shippers. Additionally, many airport cargo terminals are already inadequate to cope with present-day traffic, making clearance facilities away from the airport almost essential.

Another proposal was the study of the possibility of making the passport document similar in format to a credit card. This concept was accepted as a basis for further study.

Nautical Schools in Malaysia

(Note by Secretariat)

The Central Mercantile Marine Fund, West Malaysia, maintains and runs two Nautical Schools — one at Port Swettenham and the other at Penang.

Candidates from either Government service or the private sector are admitted to both schools, provided they have sufficient sea-service.

The Central Mercantile Marine Fund offers annual scholarships to seamen who live and work on the east coast of Malaysia, to enable them to attend the schools which are both situated on the west coast.

The courses conducted in the Nautical Schools deal with the work and duties of:

(a) Steersman
(b) Helmsman
(c) Mate of a local trade ship
(d) Master of a local trade ship
(e) Mate of a home trade ship
(f) Master of a home trade ship.

The classes are conducted in the afternoons and evenings. Instructors have instructional charts and navigational equipment at their disposal and there is a nautical library at both schools for the use of the students.

Examinations are conducted by officers of the Marine Department and successful candidates are issued with either a Certificate of Competency or a letter of Proficiency.

Research facilities for Telecommunication and Electronics in the Republic of China

(Note by Secretariat)

1. Name of Research Institute

The Institute of Electronics, College of Engineering, National Chiao Tung University.

2. Area of Research:

a. Semiconductor Electronics and Solid State Physics
b. Computer Science
c. Quantum Electronics and Laser Applications
d. Control and System Engineering
e. Information Science
f. Microwave and Plasma Physics
g. Communication System Engineering

3. Distribution of Research Activities

a. Fundamental Research	40 per cent
b. Applied Research	40 „ „
c. Development	20 „ „

4. Researchers

a. Scientists	15 „
b. Engineers	40 „
c. Technicians	12 „

5. Administrative Support

Administration personnel	43 per cent
Janitors and labourers	30 „ „

6. Important Laboratories:

a. Semiconductor Laboratory
b. Laser Laboratory
c. Computer Centre
d. Microwave Laboratory
e. Control Engineering Laboratory
f. Electronic Circuit Laboratory (including Switching Circuit Laboratory)

7. Financed by Government of Republic of China

8. Availability of Laboratories

Open to all government or private electronic industries (domestic and foreign).

9. Clientele

a. Governmental enterprises
b. Private industries
c. Institutions

10. Past Important Achievements

a. First user of digital computers in the Republic of China
b. Established the first laboratory in the Republic of China that has designed and fabricated high-frequency silicon planar transistors.
c. Established the first laboratory in the Republic of China that has fabricated silicon integrated circuits by local researchers.
d. Established the first laboratory in the Republic of China that can fabricate gas lasers by local researchers.

TRAINING FACILITIES

Training Courses

a. Computer applications
b. Microwave electronics
c. Transistor electronics

2. Duration of all training courses
Eight weeks

3. Site of training courses:

The Training and Research Centre for Telecommunications and Electronics at Hsin-Chu, Taiwan, Republic of China.

4. Nationality of participants:

All participants must be citizens of democratic nations.

5. Qualification of participants for all training courses:

Participants must be graduates from Engineering or Science Colleges, or those currently employed as engineers or technical staff.

6. Language of instruction:

Chinese or English as required.

7. Number of participants for each course:
   About 40.

8. Expenses for each participant:

   NT$1,400 (US$35) for tuition and laboratories.
   NT$300 and up for board (room free).

9. Where to apply:

   College of Engineering, National Chiao Tung University, Hsin-Chu, Taiwan, Republic of China.

10. When to apply:

    At least two weeks before the beginning of the training session for local applicants. Two months before the beginning of the training session for foreign participants.. Application can be made by letter with resumé and duplicates of necessary certificates.

III. DOCUMENTATION

HIGHWAYS AND HIGHWAY TRANSPORT

Load-Bearing Piles

(The Journal of the Institution of Highway Engineers, November 1968)

This Paper deals with load-bearing piles of various forms, whether constructed *in situ* or preformed, bored or driven. Piles of various materials are mentioned, and it is suggested that the classification of piles should be related more to their effects on the ground than to their individual characteristics. The importance of the site investigation is therefore stressed. The need for caution in the use of piles installed by certain methods, and some common mistakes in practice, are referred to.

A definition is given for the static load-bearing capacity of a pile, whether bored or driven, which is related to settlement. Reference is made to the ratios between the static load-bearing data and those obtained during driving. The fundamental influence of the helmet-packing and other factors which bear upon the calculation of load-bearing capacity are also dealt with.

A plea is made for data obtained from measurements on actual jobs to provide information for a statistical approach to the problem.

Finally, research and developments in techniques are briefly discussed.

Cost-Benefit Analysis Questioned

(Highways & Public Works, January 1968)

A report questioning the efficacy of traditional cost-benefit analysis for the evaluation of transportation plans by Prof. M. Hill, University of N. Carolina, is one of nine papers comprising "Highway Research Record 180" issued by the Highway Research Board. Cost-benefit analysis was designed for the evaluation of plans in terms of a single objective — economic efficiency. An alternative method of evaluation, known as goal-achievement analysis, is proposed and described.

Cost-benefit analysis, after all, says Prof. Hill, was developed as a technique for examining plans with respect to their achievement of the single objective of economic efficiency. This objective may be broadly defined as the maximization of net project or system contribution to the regional income or national income. Thus, in a manner analogous to the profit-maximizing firm, a public agency in pursuit of economic efficiency should allocate its resources in such a manner that the most "profitable" projects are executed. Traditional cost-benefit analysis requires the translation of both the costs and the benefits of a transportation improvement into monetary terms. Some of these costs and benefits are determined in market prices while others are imputed as if they were subject to market transactions. However, some costs and benefits known as intangibles are outside the scope of the market and cannot be priced in monetary terms. Although lip service is paid to the consideration of intangibles, they do not really enter into the analysis.

Under the goal-achievement system, plans are examined in terms of the entire set of objectives in a single system. Goals are defined operationally and goal-achievement is measured in units which are relevant to the particular objectives. The relative effectiveness of alternative plans in achieving the set of desired objectives is determined by applying a weighting system to objectives and to the subgroups, sectors, locations and activities affected.

Prof. Hill presents a diagram showing the relationship by lines between the sets of policies, objectives and the ideals, which are Economic Welfare, Health, Happiness, Peace of Mind, Choice and Opportunity, Social Justice, and others. Thus, under "Policies", elevated expressways can lead to "Objectives" reduction of air pollution and reduction of noise which in turn lead to "Ideals" health and peace of mind.

A link between policy and objective does not represent a judgment about the degree of relationship that exists between objectives and policies. It simply states that the type of policy has an effect on the achievement of the objective, and, in turn, that the objective has an effect on the achievement of the ideal. If there is no line, on relationship exists between policy and objective. Thus pedestrian-vehicular separation has no effect on the achievement of a more equitable income distribution and the objective of increase of accessibility has no effect on peace of mind.

Development of an Urban Street Needs Study

(Highway Research Abstracts, February 1968)

The purposes of this investigation were to develop a rational technique for the conduct of an urban street needs study and to evaluate the use of sampling procedures as applied to this needs study to determine the reliability of the cost estimates obtained. The facilities analysed were the arterial and collector streets

and the major intersections in West Lafayette, Indiana. The study process involved the completion of several basic steps: classification of streets into systems according to the functions performed in serving traffic demands; development of design and tolerable standards; inventory of each street section and intersection to describe its physical characteristics and its traffic load; determination of present street and intersection deficiencies and those which are expected to develop within the 20-year study period; determination of the physical improvements needed to overcome the present and future deficiencies; estimation of the costs of needed improvements; establishment of priorities for improvements; application of statistical considerations to determine if reliable cost estimates can be obtained by sampling techniques. This procedure provides a rapid, accurate, and inexpensive means of determining the physical and financial needs of an urban transportation system for communities of small and medium size.

Assembly, Analysis, and Application of Data on Warrants for Traffic Control Signals

(Highway Research Abstracts, February 1968)

The initial work included a review of existing bibliographies, direct contacts with numerous researchers, organizations and individual traffic engineers. The areas of information were divided into six groups as follows: volume, gap availability, gap acceptance characteristics, delay, pedestrians, and vehicular control accidents. A general review covering each of these subject areas is provided. These reviews of existing work have been supplemented by local studies on volume, accidents and delay. The total work performed by all parties has resulted in the development of suggested warrants. The basic variable uses a delay expression. The warrant is sufficiently broad to cover any type of intersection, including those subject to minimum volumes, interruption of continuous traffic concepts, and high-volume driveways. A street by a third proposed warrant, based on delay due to gap availability vs group size and roadway width. In order to aid future researchers in the area of signal warrants, the bibliography has extensive notations. The single area of greatest significance found for this study is the combined theoretical and field validated simulation models. While much remains to be done, this tool offers tremendous potential for multivariant analysis.

Variations in strength, moisture content and unit weight for lime-soil mixtures

(Highway Research Abstracts, February 1968)

This article reports the results of a laboratory investigation involving the addition of nine hydrated limes (four high calcium, one dolomitic, three semihydraulic and one hydraulic) and a portland cement to four soils (a sand, a silty loam, a clay loam, and a clay). It was found that there were considerable variations in the dry unit weight (dry density) of a particular mix, depending on the type and quantity of lime that was added. Variations due to the lime content were more noticeable as the clay content of the soil increased. A simple relationship was established between the maximum dry unit weight of a lime-soil mixture and the $SiO_2+Al_2O_3+Fe_2O_3$ content of the lime ingredient; this relationship was found to vary from soil to soil. The optimum moisture content for maximum unconfined compressive strength was found to differ significantly from the optimum moisture content for maximum dry unit weight. With increasing clay content the optimum moisture content for maximum strength moved from the dry side to the wet side of the optimum moisture content for maximum dry unit weight. After twenty-one days moist curing under controlled conditions and one day's immersion in distilled water, the semihydraulic group of limes generally proved to be the most successful of the limes used. The dolomitic lime also gave higher strengths than the high-calcium limes. The hydraulic lime, however, gave the lowest strength of all the limes. Lime-soil specimens were also prepared for testing both in the soaked and unsoaked conditions; considerable differences were found in the strength values obtained for the two conditions.

Flexible Road Construction in Germany

(Highway Research Abstracts, February 1968)

Fully flexible construction in Germany is increasing and it is said that some 36 percent of new construction is in this form. Normal construction of a flexible roadway should have 18 cm of bitumen base, 8.5 cm of a binder course and 3.5 cm *Gussasphalt.** Experiments are taking place in an endeavor to provide a more economic method of insulating the subgrade. One experiment used an insulator which consisted of baked clay coated with 20 percent of bitumen. The material had a specific gravity of about 1.2. This layer could be used to a depth of 10 cm instead of the designed thickness of a frost-free layer of 50 cm. In Germany it is usual for high-speed routes to be surfaced with asphaltic concrete or *Gussasphalt,* and the latter is gaining in favor because it is said that a surfacing contractor can gain an additional two months laying during the year, principally because *Gussasphalt* is capable of being laid at temperatures down to -4C. The reason for this is that no consolidation of the mix is required as it is fed into stirrer pots mounted on vehicles, and the *Gussasphalt* is poured directly onto the road. The machine spreads this material up to 7 m in width and is capable of laying 1.2 m linearly per minute at 3.5 cm thickness. There is a heated screed bar and the machine runs on steel lines. A further advantage of *Gussasphalt* is that it appears to perform better than other types of surfacing where studded tires are used.

* black-topped surfacing.

RAILWAYS

JNR's Plan for High-Speed Network

(Indian Railways, July 1968)

A plan for a high-speed rail network to link the major cities by "Shin Kansen" (new trunk lines), like the new Tokaido line, was made public recently by the Japanese National Railways. The aim was to reduce the time and distance between cities and stimulate local economic development as well as to create new satellite cities with specialized functions. It was based on the following premises:

1. The urban population in Japan is expected to continue its rapid growth and to occupy 80 per cent of the nation's total population by 1985, with 70 per cent of this urban population, or 64 million, concentrated in the three main urban areas on the Pacific Coast.

2. Along with the development of the industrial structure from primary to secondary and tertiary stages, urbanization is intensifying throughout the country. The trend toward reorganization of the local cities around such core cities as the seats of the prefectural government has already set in, and the ties between these key cities are becoming all the more close.

3. Should the rapid growth of the urban population be left as it is, disorderly urbanization would be bound to take place, increasing the commuting population along railway lines farther and farther away from the city centre.

4. In Japan, long in terrain and without much plain area, and with a dense population, the cities are developing in a belt-like shape. It is necessary, therefore, to carry on railway transportation by a new standard-gauge trunk line network that is highly efficient, capable of mass transport at high speed and in great safety, as is attested to by the New Tokaido line.

The trunk line network, as envisaged in the plan, consists of new lines of standard gauge, linking major cities throughout the country and totalling 4,000 km or 2,400 miles in route length. Trains are to run on these lines at the maximum speed of 250 km/h (157 mph).

The new lines will have a minimum radius of curvature of 4,000 metres (4,374 yds) with no level crossings. The whole project is estimated at 3,900,000 million yen ($10,834 million).

JNR plans to use the new trunk lines for long-distance passenger and container services, and the existing narrow-gauge lines for commuter traffic and ordinary freight service and as feeders to the new trunk lines.

The plan also calls for construction of six additional high-speed commuting lines for the Greater Metropolitan Area of Tokyo, linking the city centre, by these new lines, with new residential districts lying within a range of 100 km (62 miles) from the city core. The terminals of these lines in Tokyo are to be built underground, near Tokyo Central Station, in the Palace Plaza and at Shinjuku. The estimated cost for the new commuting lines is about 900,000 million yen ($2,500 million).

Indian Railways Make A Start in Electronics

(Indian Railways, November 1968)

A revolution is taking place in the application of electronics in the field of high-speed rail transportation. The field covers basically railway telecommunication, safety and control equipment.

Railway electronics has the inherent benefits of reliability and easy maintenance. Some of the major safety systems utilizing electronics today are automatic train control, track circuits, axle counter and train identification, under which trains report their movement along the track and activate the automatic train description apparatus and its ancillaries through track circuits.

The track circuit has been found to be extremely efficient and stable in operation. A multiplexed type of track circuit, called an "electronic-coded" track circuit, is also used under certain conditions.

Track monitoring is very ingeniously done through electronic axle counters which consist of electronic rail contacts at the entrance and exit points of the track connected to an electronic evaluator. The axle counter is a highly versatile device which can be used for the protection of level-crossings, siding occupation-indicators and trains passing through long tunnels, where the maintenance of the conventional track circuit is extremely difficult.

Automatic train control could be as sophisticated as a system which will take over the functions of a driver in the event of his failing to react appropriately to the signal aspects, including speed control and progressive braking, or as simple as giving a warning to the driver. A stop signal, when displayed, has to take effect only through the agency of the driver who has to see the signal in time and then apply the brakes.

Even though Indian Railways cannot be said to have entered the electronics era, a beginning has been made in the introduction of a microwave system and computerization and a pilot project of application of automatic train control.

WATER TRANSPORT AND PORTS

Automated cargo handling

(The Institute of Marine Engineers, December 1968)

Kaiser Engineers has developed an automated LASH — container terminal utilizing the Kaiser Speed-Tainer System for the cellular warehouse storing of containers combined with automated barge handling. The combination of the Kaiser automated terminal and LASH ships is expected to produce substantially lower transportation costs. Preliminary design work also has been completed by Kaiser Engineers on two modern terminal complexes that will be occupied in joint tenancy by Pacific Far East Lines, Inc. and American President Lines. A unique aspect of the facilities is that they will accommodate and service the most modern container-ships afloat as well as LASH (lighter aboard ship) vessels, first of the new patented methods approved by the United States Maritime Commission to expedite ship turn-around. The terminals will be located on San Francisco Bay and in the Los Angeles area. Initial work included site selection and basic terminal lay-out, including preliminary design and equipment selection. The terminals will handle variable mixes of containers and lighters and will include marshalling areas to position shipments for random access pending the arrival or departure of vessels.

World's largest hydrofoil vessel

The Institute of Marine Engineers, December 1968)

The world's largest hydrofoil vessel has recently been undergoing tests on the waters of Puget Sound.

An experimental vessel being built by Lockheed Shipbuilding and Construction Co., 220-ft "Plainview" is a major item in the Navy's broad investigation of hydrofoil vessels. Displacing 300 tons, "Plainview" is the largest in this programme and incorporates numerous design and construction innovations.

As weight is an important factor in a hydrofoil vessel, "Plainview" is constructed from aluminium. Many of her bulkheads are of aluminum sheathed honeycomb construction similar to that used in aircraft. Adapting an approach widely and successfully used in the aerospace industry, extruded aluminum plating is used in the hull. In place of the usual plate welded to stringer, the extrusions provide stringers which form an integral part of the plating.

'Plainview" is powered, when on foils, by two marinized General Electric J-79 jet engines (especially modified for marine use). The ship's automatic pilot is practically the same as that used in modern airliners.

By an intricate system of gears and shafts, the two jet engines drive the ship at speeds in excess of 40 knots, via two specially made titanium propellers at the extremities of the foils. A third foil at the stern serves as a rudder and stabilizer.

The foil propellers made by Hamilton-Standard, are the world's largest titanium propellers. They are positioned on the pods at the lower end of the two forward 25 ft, stilt-like struts.

The foils are of the submerged type as opposed to the surface-piercing type. Remaining submerged in a stable element, "Plainview's" foils remove the limitations of surface-piercing foils which can operate only in relatively calm waters and skid somewhat like a hydroplane in sharp, high speed turns.

With the foils raised, the ship in a hull-borne configuration is driven by two Diesel engines which provide power to two large outboard-type units. The units swing much like an outboard motor to provide steering control.

Automated shipyards

(Marine Engineering/Log, December 1968)

Automated assembly-line technique will be adopted in two futuristic shipyards planned by the Mitsubishi and Uraga companies. The idea behind the entirely new shipbuilding facilities is to keep the labour cost down by employing a minimum of workers.

Japanese executives feel that reduced work forces are essential to meet future competition in the construction of super-sized ships. MHI is aiming at building vessels between 500,000 and 700,000 dwt. Uraga's yard will assemble 300,000-dwt ships and repair vessels up to 500,000 dwt.

Meanwhile, Ishikawajima - Harima received an order for a 370,000-dwt tanker that will be the world's largest when launched in 1971. Like the world's now largest ships, the six Ludwig 326,500 tonners, the new 1133.5-ft tanker will see service on the Persian Gulf route. But it will transport crude oil to Japan rather than to Western nations.

Japanese-built hovercraft

The Institute of Marine Engineers, October 1968)

Since the delivery by Mitsui of the first Japanese-built type MV-PPI hovercraft to the Customs Department of Bangkok, Thailand, research and development on this type of craft has continued apace.

Based on experience gained with the MV-PPI, the construction of the first production MV-PP5 has now been commenced. Mitsui claim that, when completed, this will be the most operationally economical medium-range vehicle to be introduced into commercial service.

While intended primarily for passenger use it will be readily convertible for coastguard or rescue work.

Design particulars of the Mitsui	MV-PP5 are:
Length, o.a.	52ft 6in
Breadth, o.a.	28ft 2in
Height, rubber top on pads	14ft 5in
Skirt depth	3ft 11in
Bare weight	6.5 tons
All-up weight	12.0 tons
Cushion area	741ft^2
Complement	2
Passengers	50
Machinery marine gas turbine	1050 shp
Fuel consumption	320f/shp-h
Speed, maximum	55 knots
Speed, cruising	45 knots
Endurance	3.5 h

World's first computerized bill of lading

(Ports and Terminals International Freighting, April 1969)

Associated Container Transportation Ltd., which officially opened its new containerized freight service for the receipt of Australia-bound cargo on February 10, has produced what is believed to be the world's first fully computerized "through" Bill of Lading.

The ACT document was issued on February 12 to Pickfords Overseas Services as a receipt and document of title for a containerized shipment of household effects consigned to Pickfords' Australian associates, Grace Bros. of Sydney.

Simultaneously with production of the Bill itself, its contents were transferred to magnetic tape, a copy of which will be flown to Sydney ahead of the ship carrying the goods. On arrival there, the tape will be processed on a Honeywell computer, similar to that used by ACT in London, and the details notified to the consignees and others concerned, advising them of the cargo and when they can expect to take delivery.

IV. BOOK REVIEW

Getting the Most from City Streets

(Available from Highway Research Board, 2101 Constitution Avenue, Washington, D.C., 46 pp. $1.00)

This illustrated book is intended to serve as a guide to public officials, service organizations, civic leaders and others interested in improving traffic flow and safety, increasing street capacity, and creating a better urban traffic environment.

In layman's language, it shows how the application of professional traffic engineering techniques, often of a low-cost nature, has been use effectively in urban communities of all sizes to alleviate growing traffic problems. Measures discussed include traffic control devices, turn lanes, one-way streets, parking controls, street lighting, and transit operations.

The book also devotes considerable space to ways and means of gaining public acceptance for traffic engineering programmes.

Traffic Engineering, September 1968)

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