THE CASE FOR CANALS

by Michael Macfarlane
Chairman, Development Committee, Inland Waterways Association

Alone among the industrial nations, Britain is allowing her use of waterways to decline. A far-sighted scheme for building the Grand Contour Canal, to serve both for transport and water supply, has been advanced by the Inland Waterways Association

If Britain is in trouble, there is basically one reason—we have not kept up to date. This backwardness extends over most fields outside basic research, but is particularly apparent in transport and water supply. The Inland Waterways Association's report, *New Waterways*, puts forward a plan to revolutionize both these fields.

Throughout most of its 19 years of existence the Association has been forced by circumstances to concentrate upon the defence of the existing system of rivers and canals. This has resulted, wrongly, in the general identification of the Association as a preservationist body, with its mind in the past. A plan has now been put forward to the Minister of Transport which envisages that the majority of the system should be transferred to a government-supported amenity trust, leaving those waterways used for heavy transport as a viable unit, but requiring modernization and expansion.

A new canal and river network has therefore been proposed, based upon the four major estuaries of England and Wales, linked by sections of the Grand Contour Canal, originally proposed by Mr J. F. Pownall, a Cardiff engineer, in 1942. The network has been designed to fulfil all the various functions that make a waterway so valuable. These functions include:

Dock improvement—By using both sides of the ship, turn-round time can be improved very significantly. A new canal system would permit barges and lighters loaded overside to carry their cargoes direct to any part of the country. At present lighters have to unload again within the dock area, thus contributing nothing overall to the prevention of congestion.

Prevention of trans-shipment—Given canals of suitable dimensions coasters and other vessels with cargoes bound for the Midlands need not unload at all at the docks, but can proceed direct to their destination.

Cheaper transport—Transport in large barges (up to 1500 tons) costs only half as much as by rail or road.

Transport of heavy and awkward loads—In the heavy engineering and construction industries transport has become a major problem. New waterways will solve it. Industrialized buildings, for instance, could be carried in far bigger sections amounting, on occasion, to the whole house.

Power-Station cooling—Great difficulty is being experienced in finding suitable sites for new power stations. Construction of the Grand Contour Canal would provide several hundred miles of suitable siting, with the canal providing both cooling water and the cheapest possible means of transport.

Ordinary water supply to dry areas—By using the canal as a water grid the need for any additional local water supply schemes will be eliminated for the foreseeable future.

Additional water supplies for irrigation—The water grid would also provide sufficient water for the irrigation of about 1½ million acres of land. The increases in agricultural productivity that this advance would produce would aid immeasurably the battle to increase the proportion of our food grown at home.

Overseas, canal building is booming. Every country in Europe, from Spain to the USSR, has a gigantic programme. The USA and Canada, in spite of their long periods of winter cold and ice, are using water transport more and more. United Nations statistics show Britain, alone amongst industrial countries, to have a declining proportion of waterborne traffic. We must modernize: but the scheme proposed by the Inland Waterways Association would do more than merely bring Britain level. It would put us out in front for, with the contour canal, it also combines two unique features: 600 miles of single level, lock-free water with a maximum current of one knot except at 12-mile staging posts; and the use of this water as a water grid.

The advantages of using canals for the supply and conservation of water cannot be overestimated. The concept of "multi-functional utilization", advocated by the Association for so many years, seems to prove as difficult to grasp for many people as would the idea that gunpowder could be used in other ways than for fireworks for the ancient Chinese. The need for a water grid is already paramount; and no number of technical advances will make it any less necessary. Official thinking seems to be along the lines that Britain should muddle through for the next twenty years, after which nuclear distillation of seawater will solve all the problems. Already eight times as much distilled seawater as we use is deposited free of charge over our islands: it is distribution rather than supply which is the problem. However many distillation plants are produced, the water grid is essential, either to distribute the fresh water to the areas that need it, or to bring the salt water from the sea to plants at the point of consumption.

Far more coordination is required between those whose one aim is to speed floods along scoured water courses to the sea and those whose duty it is to satisfy an ever increasing demand for water for all purposes. It is to be hoped that the new Water Resources Board will do just that. Including the demand for water for irrigation, authorities will need to find more than twice the present supply by 1985. The Grand Contour Canal, taking water from the wet West to the dry East and South, is the only medium which will be able to distribute, let alone provide, this sort of increase.

The main line of the canal would follow the 310-foot contour, at which height it would continue throughout the country, passing near practically all the inland industrial centres. Connection between this high level and the major rivers or estuaries would be by water lift. The actual type of lift used would depend upon a number of factors, especially the local topography and the capacity of the ground for load bearing. Lifts in general use today are usually either vertical, or on an incline. Large vertical lifts are in use on the Canal du Centre in Belgium and on the Dortmund-Ems canal in Germany. A vertical lift at Anderton in Cheshire is still operated by the British Waterway Board. Lifts as high as 300 feet, however, might not be practicable in vertical form.

Inclined plane lifts were in use in this country at one time. The foundations for the largest of these, at Foxton in Leicestershire, may still be seen. An inclined plane for 1500-ton vessels is at present under construction at Ronquières, on the Bruxelles Charleroi Canal in Belgium, and others are in use or planned for European Waterways.

The general principle behind both these lifts requires two caissons, in which the vessels float, connected by heavy wire ropes over a fulcrum. The two caissons are

thus evenly balanced whatever the load in the boats or, indeed, if one caisson has no boat in it at all. Movements up and down are effected either by winding the ropes or by adjusting the levels of the water in the caissons. When the caisson reaches the top or bottom of the lift, the boats are able to float in or out through a simple self-sealing lock gate.

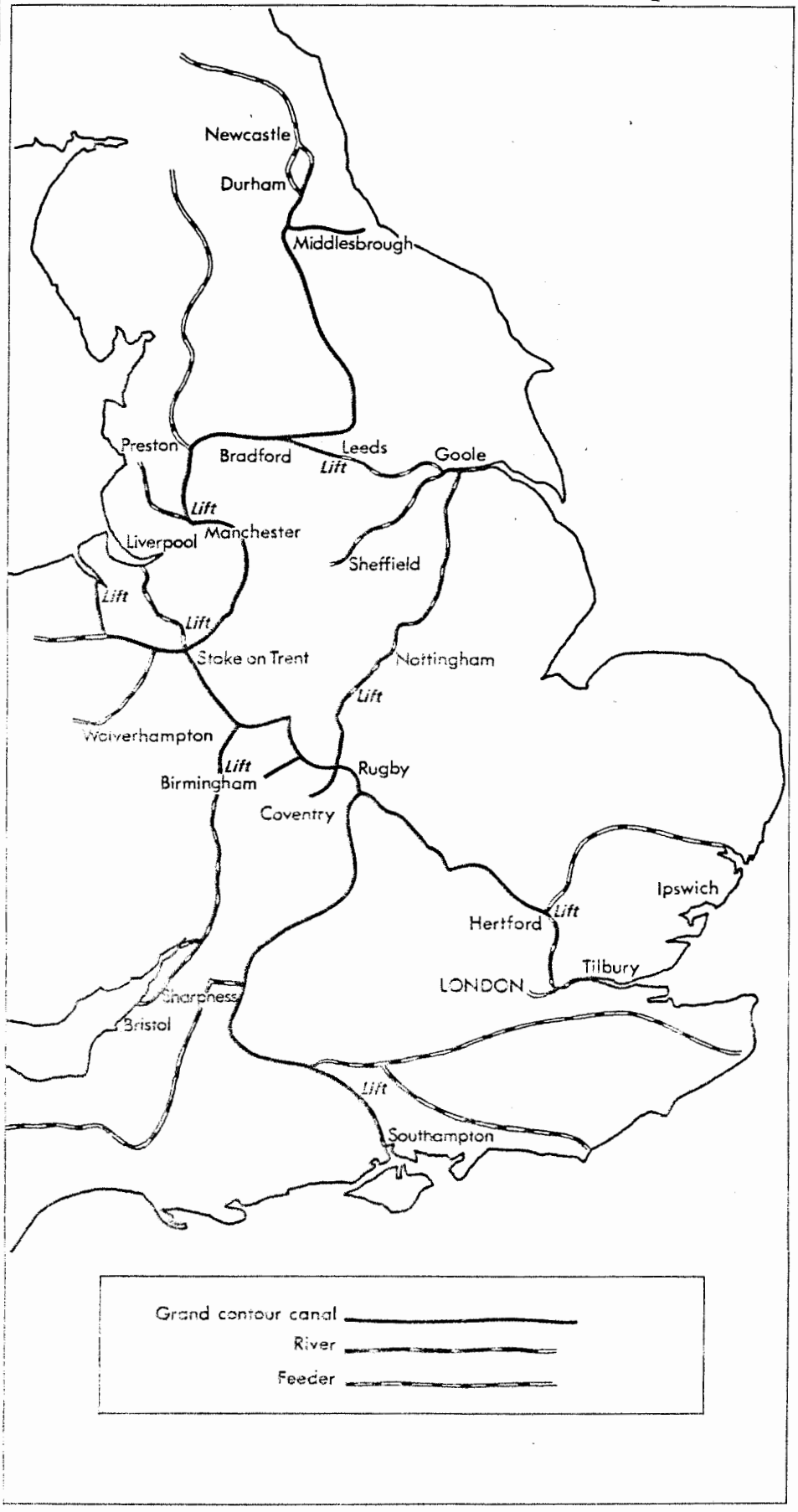
As to inclined plane lifts, new forms are coming into use, especially the "water slope". In the latter case the vessel floats on a piece of water of triangular cross-section between the incline itself and a vertical wall, which moves up and down the incline. The designers of this remarkably simple device claim that there are no sealing problems.

Turning to transport requirements, these increase at least as rapidly as general industrial production. Poorer quality ores, yielding less per ton of raw material, coupled with more sophisticated end products and an increase in the proportion of service industries, may well make the need for means of transport increase more rapidly. A recent Ministry of Transport publication, *The Transport Needs of Great Britain in the next 20 Years*, expects that commercial transport requirements will double and private passenger mileage treble in twenty years. An outlay of £300 million in road improvements *per year* cannot hope to meet that sort of target: £760 million in new waterways *once for all* can.

Modern developments in vessels for inland waters are tending towards trains of pushed barges, each of 1500 tons capacity. "Pushers" for these trains are fixed securely behind the barge or barges to form a firm unit with power and steering at the stern, eliminating the expensive necessity of a helmsman on each of the dumb barges. These tugs are often luxuriously fitted out with living accommodation for crews on a three-shift system, and working round the clock in this way would enable loads to reach Birmingham from London docks in 24 hours or less. A self-propelled barge of the same dimensions (236 ft × 31 ft) carries 1350 tons and is a more flexible, though slightly more costly, means of transport.

The modernization project will require a direct labour force of 10 000 men for 20 years. If it were started today, the scheme would hardly be completed in less than that time, if motorway progress is any indication of the speed with which these things are put in hand. Money for the project can come from a number of sources; private and nationalized industry and water supply authorities, government-underwritten Loan Stock and general taxation. Probably the best answer is a combination of all those sources, but wherever the money comes from, it is certain that it must come. Water supply and transport, like time and tide, cannot wait. We suggest that a feasibility study be put in hand at once under a government-sponsored investigation committee, with a target for construction to begin (probably on the Lonsdale feeder from Galloway and Cumberland to Manchester) within five years.

The new waterway system of 1350-ton standard as suggested by the Inland Waterways Association



Freightways of tomorrow?

The canals, presently neglected, could and should play a vital role in a more rational policy for freight transport in Britain

Ian Breach
is a freelance writer on transport and environmental matters, and former motoring correspondent of The Guardian

One of NASA's biggest headaches at the end of the 1960s was in solving the problem of how to transport larger and larger pieces of hardware from manufacturers and assemblers around the country to the launch area at Cape Kennedy. Too heavy to be airfreighted, too big to go by road or rail, some of the space vehicles eventually arrived by the oldest transportation system of all—by water: they came on the wide, deep, and commodious inland waterways of America, which now has more than 25 000 miles of navigable canals and is exploiting them as never before.

Using modern barges, often in a flotilla of many individual units, and fast developing the network by canalising rivers and improving existing channels, the US is today carrying over 500 million short tonnes of its goods and produce on the Federal and New York State canal networks. But though that represents a 25 per cent increase in total weight over the figure for 1960, the proportion of freight taken by water has remained fairly constant over the years at about 14 per cent. At a time when the developed countries' transport mix is so closely under scrutiny for environmental and resource reasons, it is vital to ask whether the canals could take significantly more than this share of the burden, and—if they could—whether they would be materially easing our problems.

If energy efficiency alone were the criterion and current trends in transport growth and availability/price of diesel and low-grade motor spirit were to be continued, the canals of the world would receive high marks. Eric Hurst's study, done for the Oak Ridge National Laboratory a little over a year ago, threw up the following comparisons for modes of inter-city freight transportation:

	tonne-mile/gal	Btu/tonne-mile
Pipelines	300	450
Waterways	250	540
Railroads	200	680
Roads	58	2340
Airways	3·7	37 000

Pipeline transportation already accounts for more than a quarter of the total freight "traffic" in the United States measured in tons carried: it has its obvious attractions as well as limitations, and it is one of the transportation systems likely to benefit massively from multi-national operations in Europe.

Measured by tonne miles, however, pipelines in America transport only 17 per cent or thereabouts; similarly with canals, the net tonnage proportion of 14 per cent is reduced to barely 9. By contrast, trucking tonnage accounts for a surprisingly meagre 10 per cent—but generates a tonne-mileage figure of 22·5 per cent. It would seem that heavy goods vehicles are generally transporting fewer loads longer distances—by a factor of up to 3·5. The conclusion is borne out by British experience: the tonnage carried by water is exactly twice, by proportion, the route-mileage share. Apart from this statistic, sadly, the figures defy unravelment: the Department of the Environment and the British Waterways Board tabulate on different bases in any case, but even on conversion produce irreconcilable data; PEP in London and the European Commission in Brussels respectively treble and double the inland freight percentages for waterway. Allowing for the discrepancies, though, it is clear that the movement of goods by canal is a much more deliberate and purposeful affair than by road. The use of container lorries does not seem to have brought about any increase in overall system efficiency: indeed, it may be concealing a worsening situation. Unplanned, haphazard load movement is difficult to detect and plot on a national scale, though it is obviously easier when open trucks present themselves for visual inspection.

My own research, conducted on the A1 five miles from the centre of London, indicates a fairly constant standard for open commercial vehicles—1 in 3 travelling only partially loaded; 1 in 5 travelling empty; and 1 in 12 passing HGVs carrying similar loads in opposite directions (the price, admittedly, of a free enterprise system as practised on the roads). Weighbridge returns from the cross-Channel ports show far more container trucks loaded below capacity than the overloaded ones which are rightly being pulled off the road. The road-haulage figures show, in fact, that the vast majority of freight carried by road in Britain consists of loads of between 3 and 5 tonnes taken fewer than 25 miles. Even for loads over 8 tonnes, the largest proportion is being trucked in this distance band—invariably in areas where there is canal or developable waterway capacity (and inward-bound goods almost precisely equal those outward bound in all the economic planning regions). The question must therefore be whether a more rational general transport policy could be devised for the carriage of goods in Britain and, if so, whether the canals could play a serious role within that policy.

A major change of attitude on the part of central government will be the first essential. It has promised a policy guideline on transport for the autumn of this year: while one would not want to pre-empt such a welcome if late development by anticipatory criticism, the government is unlikely to attach much if any importance to waterways as part of Britain's transportation network. It has repeatedly turned down requests for aid to the British Waterways Board, insisting that proof of economic viability "in the form of guarantees" must be furnished before it can put up money towards the cost of expanding and rehabilitating the canals. This is, of course, an illogical demand: no one who provides a service (and motorways are as good an example as any) can *guarantee* that

the service will be used, and the yardsticks used to measure "viability" in transport are demonstrably warped by the many pressures of special interest. It is not as though there was a shortage of waterway costings available to the government: it has, for instance, declared itself "unable" to approve the BWB's proposal for improvement of the Sheffield and South Yorks Navigational Canal on grounds of cost-effectiveness, but a shrewd and quickly exploited study of costs not many miles away shows how wrong the Department of the Environment could be.

At Knottingley in Yorkshire, a barge-tanker operating company, John Harker, has been carrying 500 tonnes of oil from Hull to Leeds in single trips, using a crew of three and taking 16 hours over the journey. If the same number of men were to drive a series of 20-tonne road tankers, it would take 50 hours of continuous haulage to move the same quantity. Esso, which tried the canal scheme here, finally adopted it and reported a one-third cut in transport costs. Kenneth Gilbert, project director for the Port of Toronto, has put the comparative extravagance of other forms of freight with canal shipment even more dramatically than Hurst: with bulk cargoes such as ores, more than 1000 tonne-mile per gallon of fuel have been obtained from vessels in the authority's operating area. Only the Rhine, in Europe, could offer figures as good as these ones from the St Lawrence Seaway, but at least they show a performance of 250 tonne/mile-gal to be a realistic base.

What the BWB must do, as British Rail has had to do, is to assail the government with more than pleas for survival. It must hammer home the comparative surface-transport cost for competing modes. The Sheffield and South Yorks proposal called for a total of £2·4 million to be spent on a stretch of water 35 miles in length, expanding and reconstructing it to take vessel systems of up to 750 tonnes: spent on highway building, the same sum would barely buy a mile and a half of open motorway and would not cover the costs of half a mile of elevated urban freeway. Not only would operating costs be cut by 25 to 30 per cent (on traffic estimated by independent consultants to rise from 500 000 tonnes to 2 million tonnes a year if the scheme went through), but the quantifiable environmental relief given to this part of south Yorkshire would be enormous. Most of the projected total traffic increase would come about in any case, much of it generated by British Steel's planned £23 million plant near Rotherham. If this were to go on the roads, the region would need not just one M62, but two—with double the hidden subsidies that presently close the gap between what road users pay and the cost.

It is impossible to spend £2·4 million on *any* length of road and bring about a fourfold increase in capacity—but even this hypothesis omits the fact that £2·4 million spent on road would buy road and road alone. It would not buy police and ambulance staff, maintenance equipment, labour, and materials; it would not pay for motor industry imports, nor any of the multitude of charges incurred in road transportation which are not incurred on water. If true comparison were possible, my guess is that freight conveyed by inland waterway would cost the community as a whole at least five times less.

There are other environmental advantages to taking goods by water. One is that mentioned in the Toronto report, which notes that the larger vessels produce 373 per cent less pollution, by volume, than diesel trucks (based on cargo carried). A second is that a waterway can transport far more freight, bulk for bulk, than an equivalent width of road (or rail)—thus making far lower demands on land. It is not important to have speed as a prime factor: continuity of supply is much more critical to the industries which—in an ideal world may be—would use the canals as a feeder network. There can be no question that the network exists in Britain—the BWB has about 2000 miles of inland waterway under its wing (roughly two-thirds the mileage that existed at the end of the great canal era 120 years ago). But only 350 miles of this is designated as "commercial" under the 1968 Transport Act.

The waterways lobby—a large if not powerful group—has not been slow to point out that the one factor distinguishing this rather pitiful state of affairs from that on the Continent is money. Germany, which carries rather more than a quarter of its goods by inland waterway, plans to spend £60 million annually for the next five years on various improvement schemes. Investment on a comparative scale is being made in Holland (66 per cent by inland waterway), Belgium (29 per cent), and France (31 per cent).

By contrast, British waterways are in monetary limbo—nominally the responsibility of the State but run mainly by economically feeble private operators: it is probably precisely the situation the railways would have found themselves in today had they not been nationalised. Uneconomic (ie, low profit) lines would have been closed much earlier, much more widely, and with even less concern for the public interest than they were under Beeching. Rehabilitation of the canals, however, would be a far easier job to tackle than

A programme for reform

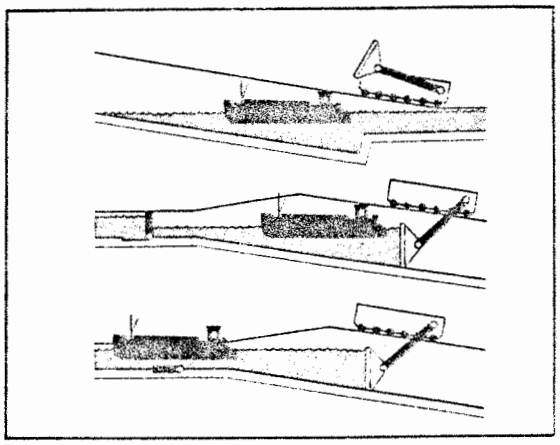
Those anxious to rejuvenate and expand the waterways of Britain have a reasonably concerted view of what is required. Summed up by the canal enthusiast and former BWB member, Charles Hadfield, the programme would fall into four main parts:

1 Creation of an inland waterway division within the DoE, technically similar to the motorway division and those in other countries, given principal engineering and technical staff and able to initiate and plan national waterway development.

2 Transfer of the BWB's carrying fleets and ancillary services to a National Freight Authority, with services to be parallel to the development of private carrying.

3 Granting of legal powers to the new local authorities to finance inland harbours of their own (as American and European towns do).

4 Provision of all capital for new building, reconstruction, and maintenance of canals from State funds as in Germany, France, Belgium, Netherlands, and the United States: the government would pay for "track", cities for the port facilities, and carriers for the craft.



Working of the water slope—one of which is now being constructed on the Canal lateral a la Garonne, in SW France

any major restoration of rail services. A good basic grid exists—which serves most of the country's industrial towns and cities—and the technology has been brought up to date, particularly in the Netherlands and Germany, where scores of expansion and development projects are now under way. Politically, it would need a totally reconstituted authority, working and costed as British Rail and its board is *supposed* to be.

How much more freight could the canals of Britain accommodate? It is not a straightforward question to answer, but with little or no development at all, the present system could accept three times more traffic, according to BWB figures. With only modest additional expenditure (like that involved in the South Yorks plan), it could bear between 8 and 10 times more. With investment of the sort being taken for granted in other European countries it is clear that the capacity could be hugely expanded, but only if that investment included the development of all the necessary linking facilities, the logical siting of new factories, in fact a whole new attitude to waterways that mirrored what is going on in the rest of the world.

Russia, for example, has just completed a 3500-mile deep-waterway system in the European USSR and is planning to join it with the canals of adjacent countries and the proposed waterways of Siberia, the extreme north, and the Russian Far East. As Frederic Doerflinger, chairman of the Inland Shipping Group points out, Britain is separated from all this by a short, free stretch of water: in Europe, more new large waterways are being built than new railways "while we have shamefully neglected our waterways".

Along with the improvement of the canals themselves has come the 20th century's answer to the narrowboat—the barge-carrying ship. Given the ideals of a large transhipment port, inland centres served by it, and navigable rivers or practicable canal courses, the pickaback vessel is a natural component. There are now three such basic systems—LASH (Lighter Aboard Ship), Seabee, and the BWB's BACAT (Barge Aboard Catamaran). LASH was developed by Lash Systems Inc of New Orleans as a vessel design in which lighters can be quickly and easily loaded and unloaded by shipboard crane at the rate of four per hour (equivalent to 1400 tonnes of cargo). The ships themselves can operate independently of ports, requiring no more than adequate depth of water, secure mooring, and room to swing.

More than two dozen LASH ships are now built or under construction, each one capable of carrying between 73 and 89 lighters. Once lowered from the parent vessel, the lighters are moved inland or to wharf by tug or push-tug; linked together they can be incorporated with other barges in push-tows (in the West European canals they thus fit the 9·5 m locks which take a Continental standard barge of 1350 tonnes).

Seabee, another commercial venture originating in the US, carries a mixture of containers, roll-on, roll-off vehicles, and much larger barges—some 38 852 tonners. These are shipped and unshipped by an elevator which can handle two barges at a time. The well-known authority on waterways and canal hardware, Charles Hadfield, is conspicuously unenthusiastic about Seabee, which he says "seems partially to have been designed for its military value". Certainly the barges are acceptable in only the larger Continental and Mississippi system locks.

BACAT has yet to operate. Designed for the Waterways Board and to be registered at Grimsby, the first vessel is due to be delivered by its Danish builders at the end of this year. The ship carries 18 barges—10 on deck and eight slung between its two hulls. Each barge can carry between 100 and 140 tonnes (depending on draught) and has the same dimensions as those now operating on the Sheffield and South Navigation. Push-tugs and barges for use with the parent ship are also being built at the moment. One tug and three barges will work as a unit slightly less than 200 ft long and 15 ft wide, but the tug can, if necessary, push up to nine barges. Alternatively, the ship will carry 10 BACAT barges and three LASH lighters—making it possible to shuttle American, Continental, and British freight

The benefits of using barge-carrying vessels hardly need spelling out, but physical flexibility, low capital and operating costs, and high energy-efficiency are obviously three of them. Any device which can directly link the existing canals of Britain—let alone an expanded network of the future—to the great trade-catchment waters of America and Europe must be a triumph: in this case, it is one of great simplicity. The best triumphs always are. There are no revolutions in naval architecture, no new and untried handling equipment, no false "economies of scale". But Britain will not benefit greatly unless it is prepared to treat the canals as their potential warrants.

No one, even the BWB and the IWA, is saying that the country's waterways can take all the freight off the road. But if the sums were done properly, they (and the railways) would be carrying very much more freight than they are now. By then we might also have rationalised our whole transportation policy and be reducing freight traffic, for as it is, we carry a whole lot of coal to a great many Newcastles.