Hubbing

Hubbing helps airlines to fill seats by attracting a large potential market. A nonstop flight serves only a single pair of cities; a flight with an intermediate stop serves travelers between three pairs of cities; and a second flight through the same intermediate point widens the potential market not merely to travelers between six pairs of cities but to all those traveling between ten pairs (that is, five cities taken two at a time). It is not uncommon for an airline to bring 20 flights into a hub to exchange passengers, and for these 20 aircraft and the passenger interchange among them to provide service between over 400 pairs of cities. Hubbing has been the source of much of the cost reduction in domestic air travel since deregulation, measured not only in fare reductions but in time savings from more frequent or more convenient flights.[11]

Hubbing may also lead to better use of the capacity of the existing airport system. Since the hub itself need not be a major traffic origin or destination, it can be established where capacity exists for the traffic interchange, rather than at an already busy airport. If congestion develops at a hub, traffic can flow over to new hubs. These smaller hubs raise the standards of service available at smaller airports far above what local traffic would allow. Thus the hubs at Raleigh and Charlotte, North Carolina, which developed to spread traffic from the much larger hub at Atlanta, Georgia, provide travelers to and from those cities with far wider choices of fares and flight times than they would otherwise have.

For the individual airport, however, hubbing greatly increases the peaking of traffic. To provide an effective interchange, flights must arrive and depart close together. For this reason, hubbing exposes individual airports to greater financial risk, since investments must be sized to a much larger level of operations than needed for local traffic and be closely tied to the commercial success of a single airline. The viability of investment at any hub can be suddenly altered by an airline bankruptcy or merger, or by an airline's reorganization of service patterns to improve profits. Since a single airline usually generates most of the peak, hubbing also tends to make airlines face

11. Changes in airline operations and their effects on airports are discussed in Congressional Budget Office, *Policies for the Deregulated Airline Industry* (July 1988).

the costs of peaking better than they do at other airports: the delays and confusion caused by overscheduling are directly reflected in the hub airlines' on-time performance records, rather than shared with many other carriers.

Hubbing represents a challenge to the outmoded air traffic control system. Two difficulties have arisen. First, the system has been slow to cope with the rapid buildup (and sometimes decline) of traffic at new hubs, and with the shift of traffic into new flight paths. One temptation is to reduce traffic to what the out-of-date traffic control system can handle, by such methods as allocations of arrival or departure slots. Second, airlines tend to open or close hubs without facing the costs imposed on the air traffic control system, since they are not charged a fee that reflects the use of traffic control towers and en route facilities.

OPTIONS FOR FEDERAL AVIATION POLICY

In dealing with aviation, federal policy can draw few lessons from the past. Simply spending more money on new facilities would probably not help to alleviate the widespread congestion, since additional traffic capacity depends not only on how many runways airports construct but also on how many aircraft can be safely handled by air traffic control. The physical capacity of the control system will probably continue to be limited for another 10 years until major components of the National Airspace System plan are completed. The prospect of little improvement in air traffic control, coupled with environmental objections to airport expansion, argues for a better system of managing demand so as to make the best use of existing capacity. The current system of user fees does not serve this purpose, and nothing in the current grants-in-aid program encourages airports to examine noninvestment solutions.

Two broad strategies may help in framing federal policies for a more efficient aviation infrastructure in the 1990s:

- Increasing the design capacity in the system to reduce peak-period congestion; and

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- Using idle, off-peak capacity to substitute for, or replace, some peak requirements.

Increase Design Capacity

The recent approval of extra funds for the FAA probably leaves little scope for speeding up completion of the National Airspace System. Progress will be largely determined by the time required to manufacture equipment and install it at air traffic control centers, and to hire and train controllers. But providing extra capacity may be possible through limited disbursements to airports that have enough air traffic control capacity to handle extra flights, or that will use the funds to improve ground handling and terminal areas. According to current projections, outlays of $1 billion a year for such a program over the next five years could be financed from the trust fund. Such additional spending would still leave an uncommitted balance in the fund (that is, a cash balance above commitments) of about $1 billion in 1993. This spending would provide about half the FAA-projected capacity investment at commercial airports shown in Table 13, although it is uncertain how many projects could meet the special terms for this aid.

One advantage of this option is that most of the programs are already in place, so that few additional uncertainties or delays would be introduced. Some earmarking of the additional airport grant money, or retargeting of existing grants, might be desirable. More could be dedicated to the capacity program, for example, if it was allowed to draw on funds otherwise available for grants to general aviation airports.

The disadvantages of the option are that major improvements in capacity would not occur until at least the mid-1990s when construction would be finished, and that it would not necessarily achieve the necessary flexibility in system capacity. Without improvements in the air traffic control system, relatively few airports are likely to gain significant capacity by developing runways and other ground facilities. Most airports, including the four that are subject to FAA slot allocations, have limited space for expansion. In addition, noise and land-use concerns have seriously limited major expansion projects in recent years. Even where expansion is feasible, it might result in excess capacity during off-peak periods; airlines might therefore be un-

willing to underwrite the investments in terminal buildings needed to match peak runway capacity because of the high costs involved, and because the new capacity would create opportunities for competitors to establish off-peak operations at major traffic points. Finally, new construction would take at least three to five years, and longer if projects proved to be controversial.

Use Off-Peak Capacity

This option would require airports to find ways of making off-peak flights attractive. A federal strategy to encourage this could be double-pronged:

- Eliminate grants for airport development; and
- Introduce peak-period prices for air traffic control.

Eliminating federal airport aid would require airports to consider all ways of providing extra traffic handling, including noninvestment options, from their own resources. The airlines, which ultimately underwrite airport expansion, would probably consider alternatives such as reorganizing their scheduling or establishing sub-hubs at uncongested centers. Demands for airport expansion would thus tend to reflect more closely what users themselves--the airlines--are actually willing to finance.

But some airport and airline responses to congestion may be unproductive. For example, congested airports sometimes dampen their traffic peaks by allocating landing or take-off times (slots), either through formal FAA procedures or through airline scheduling committees. These procedures arbitrarily divide capacity among existing carriers, with some carriers obtaining more slots than they need and others fewer.[12] Slot sales, permitted under FAA rules, allow some adjustments. But they may also be a barrier to competition. Airlines with excess slots can refuse to sell to a new airline wishing to enter service, and potential entrants may have difficulty in acquiring

12. The FAA allocates slots to carriers at John F. Kennedy Airport and La Guardia Airport (New York City), O'Hare Airport (Chicago), and Washington National Airport (Washington, D.C.).

enough slots to assemble an attractive hub service.[13] Airports may similarly discriminate against certain classes of traffic (for example, nonscheduled services), forcing them to operate only at unpopular times or at other airports, rather than allowing them to bid for slots. It is not clear to what extent airlines are able to buy or sell flight times on their own initiative without reference to airport or federal authorities. Repurchasing of landing rights gained through slot allocations or long-term use may be necessary if slot pricing is to be widespread.

Introducing peak-period prices for air traffic control would help to make better use of existing capacity by shifting some flights to off-peak hours. To the extent that airlines were willing to pay higher prices for peak flight times, the extra income could be used to build more capacity. If congestion continued in the face of peak prices, the FAA could be authorized to hire additional controllers and take other steps to increase short-term capacity.

Adoption of a national pricing system to allocate scarce peak-time airport and air traffic slots would ensure access to airports on the basis of willingness to pay. It would have the additional advantage of putting demands for expansion of the airport and air traffic systems to an economic test. So long as existing facilities are available at peak hours for less than the cost of providing additional capacity, the facilities are underpriced and likely to be overused. Using higher prices to allocate peak-time slots would show how much those slots are worth to the air carriers, and the extent to which new airport and airway capacity would be economically justifiable.

A disadvantage of the peak-pricing approach is that the FAA has had no experience with such a price system. A shake-out period might be needed before the system would begin to provide the correct market signals to airlines. Also, in order to retain some slots at peak hours for small carriers, it might be desirable to maintain a separate pool of slots for them.

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13. See, for example, Severin Borenstein, "On the Efficiency of Competitive Markets for Operating Licenses," Institute for Policy Studies Discussion Paper No. 226 (September 1985).

CHAPTER IV

WATER TRANSPORTATION

The water transportation industry has relied on federal support for a longer time, and to a far greater extent, than has any other transportation sector. This chapter reviews the federal role in the development of water transportation systems, examines the rates of return to current and proposed federal water transportation investments, and considers a number of alternatives that would focus federal aid on the most productive of these investments.

THE CHANGING FEDERAL ROLE IN WATER TRANSPORTATION

The federally supported water transportation system includes inland (and intracoastal) waterways and deep-draft ports and harbors.

Inland Waterways

The Army Corps of Engineers (the Corps) began building and maintaining the inland waterway system in 1824, when the General Survey Act directed the Corps to clear snags and sandbars from the Ohio and Mississippi rivers. Within 50 years, the federal government had assumed complete responsibility for constructing and maintaining nearly all waterways used for commercial navigation.[1]

The inland and intracoastal waterway system today consists of more than 21,000 miles of shallow-draft waterways (less than 14 feet) that have been improved by channel dredging or lock and dam construction. The primary commercial routes total about 11,000 miles. Traffic on inland waterways amounted to more than 210 billion ton-

1. Only the New York State Barge Canal system now lies outside the federal system.

miles in 1985, about 15 percent of all intercity freight movement that year.[2] Waterway commerce is heavily concentrated on a few segments: just 6 of the 28 segments that make up the inland waterway system carry 90 percent of all traffic (see Table 14). That traffic consists of tows carrying bulk commodities with low value-to-weight ratios--primarily coal, petroleum and petroleum products, sand and gravel, grain, and chemicals (Table 15).

Federal support for water transportation projects began as a way to promote both national economic development and national defense by linking the agricultural and industrial areas of the Midwest with markets in the population centers of the East Coast and abroad. The next hundred years saw the nation connected from coast to coast by a multifaceted freight transportation system. The system grew to include a trucking industry dependent on user-financed interstate highways, a network of private railroads, an airfreight industry, and numerous pipelines. These different modes now make up a substantially competitive and unregulated transportation market. With the notable exception of water transportation, these modes also operate without large subsidies from the federal government. As recently as 1982, federal subsidies to domestic inland waterway transportation totaled more than a fourth of that industry's costs, while subsidies to trucking constituted less than 5 percent of industry costs, and federal support for rail freight was minimal.[3]

Providing disproportionately large subsidies to one form of freight transportation in an otherwise competitive industry can lead shippers away from the mode that imposes the least cost on society as a whole. In 1978, the Congress sought to limit the economic distortions arising from federal support for water transportation by imposing limited user fees; these fees took the form of a tax on the fuel consumed by barges using most segments of the inland waterway system. The fuel tax was phased in over seven years, rising from 4 cents a gallon in 1980 to 10 cents a gallon in 1986. Under the 1986 Water Resources Development Act, the fuel tax will rise higher to 20 cents a gallon by 1995. The tax is expected to raise $49 million in 1988, and $325 million during the 1989-1993 period (see Table 16).

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2. Army Corps of Engineers, *Status of the Inland Waterways* (July 1987), p.11.

3. Congressional Budget Office, *Charging for Federal Services* (December 1983), p. 42.

TABLE 14. INLAND WATERWAY TRAFFIC, 1985

Waterway[a]	Thousands of Ton-Miles	Percent of Total
Ohio Brown	92,863,242	44.18
Ohio	44,806,898	21.32
Missouri-Ohio	15,589,939	7.42
Gulf Intracoastal	14,700,202	6.99
Mississippi River (Minneapolis to Missouri River)	13,023,160	6.20
Illinois	7,748,053	3.69
Tennessee	6,126,969	2.92
Black Warrior-Tombigbee	5,376,694	2.56
Arkansas System	1,485,206	0.71
Monongahela	1,280,501	0.61
Cumberland	1,247,759	0.59
Missouri	1,201,854	0.57
Columbia-Snake	1,051,217	0.50
Kanawha	900,049	0.43
Green-Brown	783,873	0.37
Alabama-Coos	512,655	0.24
Atlantic Intracoastal Waterway	346,244	0.17
Atchafalaya River	280,064	0.13
Tennessee Tombigbee	217,743	0.10
Red	196,805	0.09
Apalachicola-Chattahoochee-Flint	128,984	0.06
White	82,925	0.04
Kaskaskia	74,212	0.04
Allegheny	73,151	0.00
Ouachita-Black Rivers	49,239	0.02
Willamette	16,191	0.01
Kentucky	13,001	0.01
Pearl	308	b

SOURCE: Congressional Budget Office calculations using data from Army Corps of Engineers, *Status of the Inland Waterways* (July 1987).

NOTE: The data include only waterways covered by the Inland Waterways Fuel Tax.

a. Waterway definitions are those of the Army Corps of Engineers. See *Status of the Inland Waterways*.

b. Less than 0.01 percent.

Proceeds from the fuel tax are deposited in a trust fund, and can be used only as authorized by the Congress. The tax is intended to finance one-half of future inland waterway construction; the 1986 act authorized over $600 million from the Inland Waterways Trust Fund to pay half of the costs of seven new lock and dam projects. These seven would be the first federal waterway projects financed in part by waterway users. Because most of the funds authorized for waterway construction will go to ongoing projects, however, fuel tax receipts will equal only 21 percent of federal construction outlays between 1989 and 1993. And since the federal government will continue to pay for all operations and maintenance costs, fuel tax receipts will equal only 10 percent of total federal outlays for inland waterways during this period (see Table 16).

Deep-Draft Ports and Harbors

The federal government also subsidizes about 270 deep-draft port and harbor projects in the United States. Since 1824, the Corps has

TABLE 15. PRINCIPAL COMMODITIES IN INLAND WATERBORNE COMMERCE, 1985

Commodity	Percent of Total Traffic
Coal	27.5
Petroleum and Products	26.4
Nonmetallic Minerals and Products	14.2
Grain, Agricultural Products	13.2
Chemicals	7.6
Forest Products	3.3
Metal Ores	2.6
All Other	5.1
Total	100.0

SOURCE: Congressional Budget Office, from Army Corps of Engineers, *Status of the Inland Waterways* (July 1987).

dredged and maintained navigation channels, constructed general navigation works such as breakwaters and jetties, and (together with the Canadian government) built deep-draft locks on the Great Lakes.

In the past, the federal government has paid for nearly all the costs of building, operating, and maintaining general navigation projects undertaken by the Corps. Nonfederal interests have contributed only the lands, easements, and rights-of-way needed to construct general navigation works. In 1986, the Congress required nonfederal interests to share the cost of both the construction and the operation and maintenance of ports and harbors. The Water Resources Development Act requires the state or local government that sponsors a navigation project to pay a portion of initial dredging costs. The nonfederal share will be 10 percent for dredging depths between 14 and 20 feet, 25 percent for depths between 21 and 45 feet, and 50 percent for depths over 45 feet. This initial nonfederal share is to be paid during construction. After construction has been completed, the sponsor will have 30 years to pay an additional 10 percent of total construction costs. In general, this postconstruction payment is likely to impose no new burden on

TABLE 16. FEDERAL OUTLAYS AND REVENUES: THE INLAND WATERWAY SYSTEM (In millions of dollars)

	1988	1989	1990	1991	1992	1993	1989-1993
Total Outlays	516	569	601	620	640	667	3,096
Construction	239	280	300	306	313	326	1,526
Operations and maintenance	277	288	301	314	327	341	1,570
Fuel Tax Revenues	49	50	54	63	73	85	325
Tax revenues as a percentage of construction outlays	21	18	18	21	23	26	21
Tax revenues as a percentage of total outlays	9	9	9	10	11	13	10

SOURCE: Congressional Budget Office estimates.

most sponsors since the value of contributed lands, easements, and rights-of-way will count toward the added 10 percent share. The act does not require project sponsors to pay for subsequent maintenance dredging unless the channel depth exceeds 45 feet; for these deep channels, sponsors must pay 50 percent of maintenance costs. At present, only three ports have channels more than 45 feet deep.

The act makes explicit the right of a project sponsor to recoup its entire contribution by imposing port user fees. The act also imposes a federal fee for the use of those ports and harbors benefiting from federal operations and maintenance dredging. Most users will have to pay a Harbor Maintenance Tax of 4 cents for every $100 worth of cargo loaded or unloaded at these ports (cargo subject to the Inland Waterway Fuel Tax--most generally, cargo barged to a coastal port and reloaded for export--will be exempt from the Harbor Maintenance Tax). Proceeds from the tax are to be deposited in the Harbor Maintenance Trust Fund, from which the Corps is authorized to draw up to 40 percent of its outlays for the operation and maintenance of ports and harbors (see Table 17).

TABLE 17. FEDERAL EXPENDITURES AND COST RECOVERY FOR PORTS AND HARBORS (In millions of dollars)

	1988	1989	1990	1991	1992	1993	1989-1993
Total Outlays	558	594	622	644	668	696	3,224
Construction	128	147	156	158	161	168	790
Operations and maintenance	430	447	467	486	507	528	2,434
Harbor Maintenance Tax Revenues	152	171	187	202	220	238	1,018
Revenues as a percentage of O&M outlays	35	38	40	42	43	45	42
Revenues as a percentage of total outlays	27	29	30	31	33	34	32

SOURCE: Congressional Budget Office estimates.

WATER TRANSPORTATION ACHIEVEMENTS AND OUTLOOK

Between 1976 and 1986, no omnibus water resources legislation was enacted while the Congress worked toward the consensus on cost sharing in water resources that is reflected in the 1986 Water Resources Development Act. The Congress is now able to consider a variety of new construction projects to cope with the principal problems of the water transportation system.

Inland Waterways

Most new construction requests for the inland waterway system will be designed to cope with the problems of aging and congested facilities. Over the last 25 years, traffic on the inland waterways has tripled; it grew faster than GNP until 1972, and has mirrored GNP growth since then. With traffic growth has come congestion. Delays on the Ohio and upper Mississippi rivers, which have the smallest locks but carry the most traffic, averaged 23 minutes per tow in 1986. Delays were much shorter on both the lower Mississippi River (which, though heavily traveled, has newer, high-capacity locks) and the Atlantic Intracoastal and Mobile River waterways (which carry the least traffic). A recent Corps of Engineers study concludes that, despite these delays, inland waterway traffic will grow between 0.9 percent and 2.0 percent annually for the next 10 years.[4] This traffic will travel through facilities whose average age is increasing: by the early 2000s, nearly half of the 225 commercial locks and dams will exceed their 50-year economic life. Since good maintenance can extend lock and dam life, however, the Corps has concluded that only 56 locks will need major rehabilitation or replace-ment within the next 15 years.[5]

The Corps estimates that completing the 17 inland waterway projects in its current construction program will require further appropriations of $5.4 billion by the year 2000. Under current policies, federal outlays for new construction on inland waterways will be $280

4. Army Corps of Engineers, *Status of the Inland Waterways* (July 1987), p. 31.

5. Army Corps of Engineers, *National Waterways Study* (January 1983).

million in 1989 and $1.5 billion over the 1989-1993 period. Operations and maintenance outlays for inland waterways will total $288 million in 1989 and $1.6 billion in the five years from 1989 through 1993.

Ports and Harbors

Under current policies, about 75 percent of federal spending for ports and harbors will be devoted to routine maintenance dredging. Federal maintenance outlays for ports and harbors are expected to be $447 million in 1989 and $2.4 billion over the 1989-1993 period. In addition, federal investment in new port and harbor projects will be $147 million in 1989 and $0.8 billion between 1989 and 1993, much of it for channel deepening and widening. This focus follows from the increasing importance of large ships in the world fleet: the proportion of ships greater than 100,000 deadweight tons rose from 35 percent in 1980 to 60 percent in 1985.[6] The 1986 Water Resources Development Act authorizes the Corps to dredge two ports to the 50-foot depths these larger ships require.

Rates of Return

No study has been made of the rates of return that would be realized from the water transportation construction projects noted above. Some indirect evidence is provided by the Corps's benefit-cost studies of past projects, which show wide variation in the rates of return to water resources projects undertaken by the Corps. For example, the water resources projects requested by the Corps in the 1986 budget included 10 with net present values exceeding $1 billion and 14 with negative net present values.[7] The results may be a little more consistent in the future, since the current Administration will request funds only for projects that have benefit-cost ratios greater than one at a 10 percent interest rate.

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6. Department of Commerce, Maritime Administration, *A Report to Congress on the Status of Ports and Harbors* (1986).

7. Congressional Budget Office, *Federal Policies for Infrastructure Management* (June 1986).

While this policy sounds promising, the credibility of Corps benefit-cost studies has been challenged repeatedly over the years. Examples of overoptimistic Corps benefit-cost studies are legion. The Tennessee-Tombigbee Waterway offers one recent example. When the project was first authorized, the Corps estimated that benefits would be 1.6 times greater than project costs. Much of the benefits were to come from transportation savings on annual cargo that was projected to reach 29 million ton-miles by 1991.[9] In 1987, however, only 4.1 million ton-miles of cargo moved on the waterway. Even if traffic growth on the waterway continues at the nearly 14 percent rate experienced since it was completed two years ago, annual traffic will not reach 29 million ton-miles for another 15 years.[10]

At a minimum, the case of the Tennessee-Tombigbee Waterway illustrates the uncertainty inherent in forecasting waterway traffic patterns and thus the benefits from future construction. More important, however, it may be symptomatic of methodological flaws both in the forecasts and in the way the benefits are measured. To forecast traffic on proposed waterways, the Corps conducts "shipper interviews" in which it queries large shippers about the amount of cargo they might move along a proposed waterway. While shippers have information that is relevant, they may tend to overstate the potential traffic on a project, particularly since waterway improvements are provided free of charge.

Even if traffic could be forecast with reasonable certainty, however, the Corps's current benefit-cost techniques would not allow a proper evaluation of the transportation cost savings associated with that traffic. The Corps measures transportation cost savings as the difference between the cost of barge traffic and the cost of shipping on some other mode (principally rail). While this correctly measures savings to shippers, it overstates the resource savings to society. Since rail rates often exceed long-run marginal costs, waterway transportation benefits measured as the difference between those rates and water transport charges reflect, in part, transfers of income from rail operators to shippers, not real resource savings to society as a whole.

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9. See General Accounting Office, "To Continue or Halt the Tenn-Tom Waterway? Information to Help the Congress to Resolve the Controversy" (May 15, 1981), pp. i-v.

10. Army Corps of Engineers, *Waterborne Commerce Statistics* (preliminary report, 1987).

Despite their flaws, these benefit-cost studies at least provide some indication of the returns to new water transportation investments. In contrast, there have been no such studies measuring the return associated with routine operations and maintenance dredging of ports and harbors. Some indirect evidence is provided by the data in Table 18 on operations and maintenance (O&M) outlays.

The data vividly illustrate the economies of scale that characterize dredging costs. Between 1979 and 1984, federal O&M expenditures for all ports averaged only $0.22 per ton, far less than one-tenth of 1 percent of the average value of cargo shipped. But the range of outlays varied from $0.17 at large ports to $0.50 at medium ports and $11.68 at small ports. By itself, of course, this information tells little about the return to spending in each class, since the value of shipping may exceed these O&M costs even at the smaller ports. However, at 38 of the deep-draft projects maintained by the Corps, no commercial cargo at all was handled in 1986. The benefits from federal dredging of these harbors accrued only to the fishing industry and recreational boaters. Furthermore, at five other ports, federal O&M expenditures averaged more than $115 per ton of cargo handled, or more than 25 percent of the average value of cargo shipped in U.S. ports. Unless

TABLE 18. FEDERAL PORT OPERATIONS AND MAINTENANCE OUTLAYS PER TON OF CARGO, 1979-1984
(In 1985 dollars)

Ports	Average	Minimum	Maximum
All Ports	0.22	0.001	270.25
Large Ports (More than 10 million tons per year)	0.17	0.001	0.99
Medium Ports (100,000 to 10 million tons per year)	0.50	0.001	23.30
Small Ports (Less than 100,000 tons per year)	11.68	0.050	270.25

SOURCE: Calculated by Congressional Budget Office using data from Army Corps of Engineers.

these ports specialized in cargo with extremely high value-to-weight ratios, the return to O&M at these ports would appear to be quite low.

POLICY OPTIONS FOR WATERWAYS AND PORTS

This section considers two options designed to focus water transportation investments on those projects that provide the greatest return to commercial navigation. Both options would increase the role of the market in choosing priorities for the nation's water transportation investments. One would increase user fees on federally supported navigation projects, and the other would turn over to states and localities all responsibility for the nation's public water transportation investments.

Increase User Fees for Federally Supported Commercial Navigation Projects

Imposing user fees that recover the full cost of federal operations and maintenance outlays for commercial navigation projects would work to increase the efficiency of these investments in a number of ways. First, shippers who benefit from federal navigation expenditures would press only for those projects where benefits would exceed the fees they would have to pay. Second, reducing subsidies to water transportation would improve the allocation of private resources, since choices among modes of freight transportation would be based on the true resource cost to society rather than on the degree of federal subsidies provided to each mode. Finally, user fees would encourage the more efficient use of existing capacity, thus reducing the need for new construction to overcome congestion (as on the inland waterway system).

The effects of user fees on efficiency would depend in large measure on the extent to which the fees were imposed on a systemwide or on a segment-specific basis. Since costs vary dramatically both for inland waterways and for ports, systemwide fees would offer far weaker incentives for cost-effective navigation investments. For example, the data in Table 18 indicate that a systemwide fee of $0.22 per ton would recover all federal O&M outlays for ports and harbors.

This fee would be far less than one-tenth of 1 percent of the average value of cargo shipped; it would also be small relative to other charges now paid by shippers and carriers--including wharfage, dockage, stevedoring, and harbor transfers--which averaged $16 a ton in 1981.[11] Such a fee would put little pressure on even the most inefficient ports.

Port-specific fees, on the other hand, would quickly expose the less efficient ports. For small ports, recovering federal O&M outlays would require added user fees of more than $11 a ton; at five small ports, user fees would exceed $100 per ton--about 25 percent of the value of the cargo handled at all U.S. ports. At medium-sized ports, an added fee of $0.50 per ton would be needed. This fee would increase existing port fees by about 3 percent for containerized cargo, 12 percent for grain, and 23 percent for coal. For large ports, an average fee of $0.17 per ton would add less than 1 percent to current port fees for containerized cargo, 3 percent for grains, and 5 percent for coal. The increase in the cost of delivered cargo would be much less, of course. For medium-sized ports, for example, a fee of $0.50 per ton would add less than 1 percent to the cost of coal delivered to European ports.[12]

The difference between systemwide and segment-specific fees would be equally dramatic on the inland waterway system. The cost of federal O&M on the inland waterways ranged from $0.00047 per ton-mile to about $0.95 per ton-mile in 1985 (see Table 19). A systemwide fee of $0.00161 per ton-mile would recover all federal O&M costs, but would do little to ration use of the system. One study of segment-specific fees, however, found that fees to recover even 50 percent of federal outlays would close 4 out of 12 waterway segments for lack of traffic. Moreover, such cost recovery would make congestion-related new construction unnecessary for 25 years.[13]

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11. The data on port charges used throughout this report come from the Senate Committee on Environment and Public Works, *Committee Report 97-301, to Accompany S. 1692* (November 1981).

12. See Energy Information Administration, *Quarterly Coal Report*, and Maritime Administration, *Commodity Yearbook*.

13. Department of Transportation, *Inland Waterway Taxes and Charges* (February 1982).

TABLE 19. TRAFFIC AND OPERATIONS AND MAINTENANCE OUTLAYS ON THE INLAND WATERWAYS SYSTEM, 1985

Waterway[a]	Thousands of Ton-Miles	O&M Outlays in Thousands of Dollars	O&M Outlays in Dollars per Ton-Mile
Pearl	308	293	0.95130
Kentucky	13,001	1,610	0.12384
Ouachita-Black Rivers	49,239	4,084	0.08294
Atchafalaya River	280,064	19,636	0.07011
Apalachicola-Chattahoochee-Flint	128,984	8,468	0.06565
Allegheny	73,151	4,030	0.05509
Atlantic Intracoastal Waterway	346,244	12,908	0.03728
Tennessee-Tombigbee	217,743	8,114	0.03726
Willamette	16,191	510	0.03150
White	82,925	2,058	0.02482
Kaskaskia	74,212	1,784	0.02404
Arkansas System	1,485,206	21,809	0.01468
Alabama-Coos	512,655	5,214	0.01017
Kanawha	900,049	7,045	0.00783
Red	196,805	1,538	0.00781
Monongahela	1,280,501	9,676	0.00756
Cumberland	1,247,759	9,424	0.00755
Missouri	1,201,854	6,570	0.00547
Columbia-Snake	1,051,217	5,608	0.00533
Mississippi River (Minneapolis to Missouri River)	13,023,160	50,708	0.00389
Green-Brown	783,873	2,155	0.00275
Black Warrior-Tombigbee	5,376,694	12,559	0.00234
Gulf Intracoastal	14,700,202	27,152	0.00185
Tennessee	6,126,969	9,755	0.00159
Illinois	7,748,053	11,060	0.00143
Ohio	44,806,898	38,446	0.00086
Missouri-Ohio	15,589,939	12,188	0.00078
Ohio-Brown	92,863,242	44,032	0.00047
Average	7,506,326	12,087	0.00161

SOURCE: Congressional Budget Office, from Army Corps of Engineers, *Status of the Inland Waterways* (July 1987).

NOTE: Data include only waterways covered by the Inland Waterways Fuel Tax.

a. Waterway definitions are those of the Army Corps of Engineers. See *Status of the Inland Waterways*.

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The sharp difference between systemwide and segment-specific fees reflects the large economies of scale in shipping. On the inland waterways, the 7 lowest-cost segments carry 90 percent of the traffic. Similarly, the 10 largest ports moved over 45 percent of the cargo handled in 1985. A systemwide fee would therefore be close to the segment-specific fee that is needed to recover costs on the least expensive segment. It would, however, have little effect either on congestion or on pressure to continue spending on the highest-cost, least efficient segments.

Proponents of continued subsidies for commercial navigation have argued that subsidies are needed to maintain the nation's competitiveness in international trade. Both foreign and domestic commerce could be subject to the fee, however. If systemwide fees were imposed, they would be unlikely to reduce significantly the amount of cargo handled. If segment-specific fees were used, the vast majority of traffic would still be subject only to small fees, while some that now use inefficient ports would be redistributed to other ports and transportation modes.

Proponents of federal subsidies also note that some subsidies are provided not to benefit commercial shipping but to promote regional economic development. User fees would remove this tool of regional economic development. At present, this may not be an issue; current Corps policy is to recommend the construction only of projects that offer national, not simply regional, economic benefits.

Withdraw Entirely from the Provision of Water Transportation Services

Rather than assume responsibility to provide needed water transportation investments and then recoup the cost through user fees, the federal government could withdraw entirely from this area and allow nonfederal interests to assume control over all water transportation projects.

This option would be most applicable to ports, where there is no strong economic rationale requiring federal support for commercial navigation. The port developer can easily capture the benefits of port construction projects since those projects provide services to a clearly