Institute of Transportation Studies
University of California, Berkeley

Ferry Service on San Francisco Bay
Proceedings of a Symposium

Held at the Metrocenter Building, Oakland, California
June 8, 1988

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PREFACE

This report is the record of a symposium held on June 8, 1968 at the Metrocenter in Oakland, California. The event brought together over eighty participants from private organizations, government, academia, and citizen groups with a common purpose to exchange information and ideas on the future of ferry transportation in the San Francisco Area. The meeting was organized by the Institute of Transportation Studies with the sponsorship and cooperation of the Metropolitan Transportation Commission, the California Sea Grant Program, and the California Department of Transportation.

The meeting was designed to explore future prospects for increased Bay Area ferry transportation and identify any impediments to ferries achieving their full service potential. The timeliness of the meeting was underscored by a need to resolve several significant issues in local maritime transportation: including three applications before the Public Utilities Commission to provide freight ferry services throughout the area, and the hotly contested proposed abandonment of the passenger ferry service between Vallejo and San Francisco.

The symposium agenda dealt with ferries for both passengers and freight, and with the role of ferries in providing mobility during emergencies. A meeting objective was to provide as much objective information as possible to participants so that the future debate on ferry transportation would be driven by physical, economic, and market realities. The first portion of the meeting involved a number of prepared presentations on different aspects of the subject. This was followed by three round-table workshops on particular topics intended to draw out the ideas of all participants. The symposium concluded with a summary session where workshop reports and several meeting resolutions were discussed.

It seems clear that most participants saw the symposium as a step toward further action. Of particular significance are the meeting's resolutions which call for legislative and local public agency initiatives to reduce the barriers to additional ferry services and to facilitate private efforts to provide promising new services. Many meeting participants left with new action agendas which it is hoped will lead to increased future utilization of the Bay Area's natural capacity to support an outstanding maritime transportation system.

ACKNOWLEDGMENTS

The symposium was funded through contracts with the San Francisco Metropolitan Transportation Commission (MTC) and the California Sea Grant Program. The agenda and arrangements were managed by a steering committee composed of Chuck Davis of the California Department of Transportation; Marc Roddin of the MTC; and Wolfgang Homburger, Mark Kermit, Sandy Stadtfeld, and Edward Sullivan of the Institute of Transportation Studies (ITS). Edward Sullivan served as overall symposium chairman. Other ITS staff who contributed in documenting the symposium are Carolyn Cartier, Mark Pitztick, Reg Souleyrette, and Laura Steinman.

Marc Roddin of MTC deserved particular recognition for his additional efforts in arranging meeting facilities and in helping to distribute notice of the meeting to interested parties throughout the Bay Area. Finally, we all owe a great deal of thanks to the speakers, session chairmen, and workshop leaders whose outstanding efforts are directly responsible for the success of the symposium.

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I. SYMPOSIUM RECORD

Agenda

Symposium Objective: To explore the potential for future ferry services on San Francisco Bay, including both passenger and freight-carrying ferries.

8:30 Registration

8:45 Session #1:
Welcome (Ed Sullivan, UC Berkeley)
Overview of Issues and Needs (Sandy Stadtfeld, UC Berkeley)
Panel Discussion - Recent Experiences and Future Prospects for Passenger Ferry Service on San Francisco Bay
Chair: Wolfgang Homburger, UC Berkeley
Panelists: Stanley Kowleski, K & W Associates
Scott Cowan, Harbor Bay Isle Associates
Don Selle, North Bay Water Commuters
Presentation - Selecting the Appropriate Service for Particular Markets (Morris Guralnick, Consultant)

10:45 Session #2 (Chair: Marc Roddin, MTC):
Presentation - Service, Cost, and Market Experience with Ferry Service in the New York Area (Kate Ascher, Port Authority of New York and New Jersey)
Presentation - Opportunities for Roll-on, Roll-off Freight Ferry Service on San Francisco Bay (George Roberts, Black Ball Ferry Systems)
Presentation - Service, Tariffs, and the Market for Waterborne Movements in the Seattle Area (Don Nutter, Washington State Ferries, Washington Department of Transportation)

1:00 Session #3 (Chair: Chuck Davis, Ca. Dept. of Transportation):
Presentation - The Effect of a Major Earthquake on the Bay Area's Transportation System (Richard Eisner, BAREPP)
Panel Discussion - Access to Bay Area Ports
Panelists: John Glover, Port of Oakland
Randall Rossi, Port of San Francisco
Ed Boyle, Ca. Dept. of Transportation

2:00 Concurrent Workshops - To discuss possible findings and recommendations to the California P.U.C. and Legislature regarding the future of passenger and freight ferry services in the San Francisco Region.
#1. Vessel Technology (Leader: John Tozzi, U.S. Coast Guard)
#2. Waterborne Freight (Leader: Eric Mohr, Golden Gate University)
#3. Passenger Markets and Implementation Issues (Leader: Paul Maxwell, MTC)

4:00 Final Session (Chair: Ed Sullivan, UC Berkeley)
Discussion of Workshop Reports and Symposium Conclusions

Minutes of the Presentation Sessions

The San Francisco Bay Area is one of the country's great metropolitan regions. Communities housing some six million people surround the bay, and development has spilled over from the central Bay Area into inland valleys which were once dominated by orchards and farmland. Freeways are the main arteries that serve to bind the region; six major bridges link the different counties and help tie together their various transportation networks.

The region's population is growing at eleven percent annually, but transportation improvements have not kept pace with demand. It is now widely known that Bay Area residents view the lack of adequate transportation as the region's number one problem, yet in a recent election three bills failed that would have provided extra money for transportation system development. Has the public become skeptical that the mere construction of more roadway will not provide a long term solution?

Innovative solutions are sometimes borne of crises. To help avert gridlock disaster and increase the availability of Bay Area transportation services, a number of private and public organizations are trying to reinstate a transportation mode which at one time was dominant in the Bay Area transportation scene: ferry boats.

The Bay Area Ferry Symposium, sponsored by the Metropolitan Transportation Commission (MTC) and the California Sea Grant Program, took place June 8, 1988 at MTC headquarters in Oakland. The Institute of Transportation Studies (ITS), U.C. Berkeley, organized the one-day event to assemble technological, economic, and institutional facts about the potential for increased ferry service on the bay. Six individual presentations, two panel discussions, and three smaller group workshops were the forums for information exchange.

ITS researcher and symposium chairman Edward C. Sullivan opened the meeting, observing that interest in waterborne transportation is growing in the Bay Area. But before more ferry services can successfully be instituted, a background for informed decisions needs to be created. The ferry service from Vallejo to San Francisco is an example of a passenger ferry market that insists upon being served, despite planned discontinuation of the service by the present operator because of high costs. Sullivan noted that several other private concerns are assessing the Vallejo-San Francisco run, and a Vallejo citizens group has formed to champion the cause of maintaining ferry links with San Francisco.

Background on San Francisco Bay ferry services was the topic of the first presentation. Sandy Stadtfeld, an ITS graduate student who wrote the resources paper which accompanied the symposium agenda, reviewed the essential variables of waterborne transport on the bay. In terms of needs and demands, Stadtfeld noted, a ferry system should fulfill several criteria: help relieve congestion, satisfy peak period schedules, offer dependable service and competitive pricing, and provide a reliable commute mode for specific market segments. To meet these needs, operators will have to weigh ferry system technology options, from conventional boats to high speed craft, which have implications for terminal design and dredging. Routes and schedules must be carefully considered, including whether they will meet with troublesome administrative and regulatory constraints.

A working example that illustrates the gamut of concerns is the Golden Gate Ferry Service, operated by the Golden Gate Bridge District. These ferries, running from San Francisco to Sausalito and Larkspur, have operated with subsidies throughout their history. But ridership has been slowly increasing while the revenue shortfall has decreased. The past manager for the Golden Gate Ferries, Stanley Kowleski, related a personal history of Golden Gate Ferries planning and service implementation during the subsequent panel session.

The symposium's first panel presentation featured three speakers from different facets of ferry boat transit: an operator, a developer, and a passenger. Stanley Kowleski, consultant with K&W Associates and former manager of the Golden Gate Ferries, was joined by Scott Cowan, of Harbor Bay Isle Associates, and Donald Selle, of the North Bay Water Commuters.

Kowleski began by explaining why the experience of the Golden Gate Ferries seems to be unique to the Bridge District and the San Francisco-Marin commute. In 1969, the bonds to construct the Golden Gate Bridge were paid off, and traffic was at a level thirty times higher than in 1937 when the bridge was opened. Concern developed in the California State Legislature to somehow augment the transportation capacity of the Golden Gate crossing. The Bridge District was given responsibility for all traffic in this corridor, and, Kowleski stated, the obvious transit options were buses and ferries.

The big jobs, Kowleski emphasized, were to select the vessels and the sites. Sausalito was an easy choice for southern Marin, at the dock of the old ferry terminal. To decide on a location for central Marin, the Bridge District conducted fifteen time-consuming studies, and Larkspur was eventually selected. The Bridge District's goal was to alleviate traffic congestion through central Marin, and sixty percent of Marin commuters were located within four miles of the Larkspur terminal.

The selection of the vessel technology also was a careful decision, Kowleski explained. The District wanted their ferries to have a 25 knot capability to be able to make the San Francisco-Larkspur journey in 32 minutes. They opted for light weight aluminum boats with emphasis on passenger comfort and exterior good looks.

The Golden Gate ferries commenced operation in 1976 and made the bay crossing between Larkspur and San Francisco in 35 minutes. Unfortunately, the boats produced a significant wake and northern Tiburon property owners began to complain of shoreline area damage effected by the waves. As a result, the Bridge District was forced to cut back speed to ten knots through the 2-mile Larkspur channel. The journey time increased to 40 minutes and patronage declined 25 percent during the second year of operation. In 1980, rising fuel prices led to the conversion of each boat's three gas turbine engines to two diesel engines, and the change from water jets to propellers. These changes cut the capability of the once speedy boats to 21 knots. Despite the speed disadvantage, over the past few years passenger levels have increased. Based on his experience, Kowleski summed up the keys to successful ferry boat operation: frequency, dependability, speed, fare structure, and attention to passenger amenities.

The next panel speaker, Scott Cowan of Harbor Bay Isle Associates, lent the perspective of a bay-side property developer. Harbor Bay Isle, Cowan described, is a master-planned 970 acre residential and business park in Alameda. It includes 3,200 residential homes, a 314 acre business park, and a plan for a "hovermarine" route. Harbor Bay Isle Associates wants to implement a high speed ferry service as an alternative to the peak period automobile commute to San Francisco.

The concept seemed feasible, but when Harbor Bay's planners explored the regulatory requirements for ferry operation, they learned of two major legislative obstacles. The Merchant Marine Act of 1920, also known as the Jones Act, prohibits the use of foreign vessels in commercial operation in the U.S. and limits the selection of vessels to domestically produced craft. For hovercraft, this restriction narrows the options considerably.

Harbor Bay also ran afoul of a second piece of restrictive legislation, which in general poses even greater obstacles for potential ferry operators. After the bay crossings were built, the bonds issued to pay for the construction carried covenants designed to eliminate competition for the new structure: no trans-bay ferry services could be operated within ten miles of any toll bridge. Although legislation was passed in 1986 to remove this restriction, it seems that since the bond issues and their covenants remain in effect for at least some of the toll crossings, the legal problem remains.*

The Harbor Bay Isle group was able to obtain a Jones Act waiver from the U.S. Maritime Administration and began a period of demonstration runs using a British-made high speed surface effects vessel. They received a favorable response from passengers and see a definite market for the operation, but the service is very expensive to operate. Cowan suggested that there is a need for governmental support of ferry service, and added that the need is not only financial. He described a "regulatory nightmare" for ferry operation and emphasized that the current restrictive situation is a regional problem. To get more ferries operating across the bay, Cowan recommended a concerted effort to remove regulatory restrictions, the development of public dock space by the city of San Francisco, and the provision of high speed vessels on lease terms from the government.

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* Subsequent to the symposium, it was learned that, after passage of the 1986 law permitting competition between commercial ferries and toll bridges, the state recalled and reissued the bonds for the Dumbarton, San Mateo, and Bay Bridges. The bonds for the Richmond-San Rafael Bridge are already paid. This leaves only the Carquinez, Benicia and Antioch Bridges with covenants restricting ferry competition.

The Red & White Fleet subsidiary of Crowley Maritime is the current provider of the bay's longest ferry route, the SF-Vallejo run. Red & White has declared its intent to terminate this deficit plagued service, which met with vigorous objections from governments and citizens of the affected Solano County communities. The issue is currently before the California Public Utilities Commission for resolution.

In response to proposals requested by the City of Vallejo, several possible operators have expressed interest in taking over the run. Don Selle represented North Bay Water Commuters, a citizen group working to ensure that Bay Area transportation providers know that Vallejo wants continued ferry service. Solano County will only continue to grow, argued Selle, and past trends indicate that thirty to forty percent of the new residents will work in San Francisco. Vallejo has an established San Francisco commute market, and more people could be riding the ferry. As freeway congestion worsens, it is likely that more people will.

Selle described how to make ferry service more attractive to the commuter: simplify access at both ends of the journey. Now, ninety percent of SF-Vallejo ferry passengers work within six blocks of the ferry building, probably because it is difficult to make connections to destinations further within the city. "Transit schedules are not coordinated across district lines," Selle exclaimed. If schedules were coordinated and the trip was simplified, total trip time would be reduced. He offered the tables shown on the following pages to summarize the cost and access options faced by North Bay commuters to downtown San Francisco. Selle reminded operators that the more ideal the commute conditions, the more operators can charge. Panel moderator Wolf Homburger concurred that door-to-door travel time is the factor that makes the most difference.

"Selecting the Appropriate Service for Particular Markets" was the topic for the next presentation, given by Morris Guralnick, a naval architect and marine engineer who heads his own consulting firm. Guralnick reiterated the general consensus of both transportation professionals and the public at large: highway traffic is out of control. And before we attempt to control it, Guralnick cautioned, we must first understand the economics of the situation, and how to get people out of their automobiles. The answer to the latter question is simply that the alternative must be obviously superior to autos.

Guralnick thinks a superior transit service can be offered with ferries, as long as several key criteria are met: provision of commuter service and off-hour service; conveniently located ferry terminals; accessible, secure parking lots; covered pedestrian access to boats; a bus feeder system; and frequent and reliable service. The obvious locations for new ferry commute services to San Francisco are Oakland, Richmond, and Redwood City, locations where water depths can accommodate the boats. In terms of time, it is essential that these services be competitive with equivalent automobile journeys. The Oakland-SF run should take 20 minutes to cover 6.5 miles; the 9.5 miles from Richmond to San Francisco should take 30 minutes, and the

COMMUTING TO SAN FRANCISCO

C O S T S
(round trip per day)

From/To	Method	Time*	Van	Bus	BART	Ferry	Miles (rd trip)	Car (mi x .23)	Prkng	Bridge Tolls	Total Per Day	Total Per Month
Benicia/SF	Vanpool		$3.36								$ 3.36	$ 74.00
	Bus/Pl Hill BART			$2.00	$4.90						6.90	151.80
	Car/Ferry					$5.90	14	$ 3.22	$ .36		9.48	208.56
	Car/Pl Hill BART				4.90		24	5.52		$ .25	10.67	234.74
	Car						76	17.48	5.50	.85	23.83	524.26
Fairfield/SF	Vanpool		$3.68								$ 3.68	$ 81.00
	Car/Ferry					$5.90	30	$ 6.90	$ .36		13.16	289.52
	Car/Concord BART				$5.30		44	10.12		$ .25	15.67	344.74
	Car						90	20.70	5.50	.85	27.05	595.10
Napa/SF	Vanpool		$3.68								$ 3.68	$ 81.00
	Bus			$5.00							5.00	110.00
	Car/Ferry					$5.90	50	$11.50	$ .36		17.76	390.72
	Car/El Cerr BART				$4.00		80	18.40		$ .25	22.65	498.30
	Car						102	23.46	5.50	.85	29.81	655.82
Vacaville/SF	Vanpool		$4.32								$ 4.32	$ 95.00
	Car/Concord BART				$5.30		60	$13.80		$ .25	19.35	425.70
	Car/Ferry					$5.90	58	13.34	$ .36		19.60	431.20
	Car						110	25.30	5.50	.85	31.65	696.30
Vallejo/SF	Vanpool		$3.41								$ 3.41	$ 75.00
	Guiton			$5.50							5.50	121.00
	BartLink/BART			2.00	$4.00						6.00	132.00
	Car/Ferry					$5.90	12	$ 2.76	$ .36		9.02	198.44
	Car/El Cerr BART				4.00		30	6.90			10.90	239.80
	Car						64	14.72	5.50	$ .85	21.07	463.54

*Time may vary due to accidents, highway construction or weather conditions

Where applicable, expenses figured using monthly commute passes/books

Car expense figures based on compact vehicle (includes: gas, oil, tires, insurance)
(from the California State Automobile Association, 12/87 report)

Vanpool dollar averages and mileages to SF - from Solano Rideshare data

Monthly commute totals based on 22 working days per month

SAN FRANCISCO FACT SHEET

PUBLIC TRANSPORTATION	DISTANCE FROM FERRY BLDG.	COST	TIME ROUTE/SCHEDULE
Muni Bus 32 (street level)	at Ferry Bldg. (Pier 1)	*75¢-exact change	complete Embarcadero including Fog City Diner, Pier 39, Fisherman's Wharf, and Hyde Street Every 15 minutes.
Muni Bus 14 (street level)	4 blocks @ Mission Street	*75¢-exact change	all of Mission St; final destination of bus is Daly City.
Cable Car	4 blocks @ Market/Calif. Sts.	*$1.50	California St. to Van Ness; can transfer at Powell St. to cable cars that go to Union Square or Wharf.
BART	4 blocks @ Market/Calif. Sts. (Embarcadero Center station)	*60¢ to San Fran stations	stops at Montgomery Street, Powell St. and Civic Center. Every 7 minutes during peak hours; every 15 mins. otherwise.
Muni (underground)	4 blocks @ Market/Calif. Sts.	*75¢-exact change	Every 7 minutes
Airporter Bus	4 blocks @ Market/Calif. Sts.	$6.00 to SFO	Every 30 minutes.
Taxi	Captain can call ahead, or 4 blocks @ Market/Calif. Sts.	$ depends on destination	
- - - -	- - - -	- - - -	- - - -
Muni Bus 42 (street level)	@ 630 Sansome Street	*75¢-exact change	goes to Wharf area (if you need to take the 2:10 p.m. ferry)
BartLink	see separate schedule		

***FastPass** - $25 per month - good for all Muni buses, Bart (SF stations only) and cable cars.

24 miles from Redwood city to San Francisco should take 45 minutes. To achieve ferry services with these qualities, he suggests that the system be run as a private enterprise. "The least important factor is cost," says Guralnick.

Mr. Guralnick also suggested that the size of vessels operated by the old ferry services was the key ingredient for their economic success. The ferry boats crossing the bay up through the late 1930's had a capacity of 2000 people, the new boats should have the potential to carry at least 1000. High passenger capacity, Guralnick concluded, should allow ferry services to operate on revenues alone without subsidies.

The second panel presentation of the morning featured three professionals with direct experience in ferry boat operation in the U.S. and Canada. From the Port authority of New York and New Jersey, Kate Ascher described the recent renaissance of ferry services between Manhattan Island and residential areas across the rivers. "I will probably raise more questions than I will answer," Ascher began. The similarities between New York City and San Francisco are numerous: the former is an island, the latter, a peninsula, both metropolitan areas have extensive interconnections by bridge and transit. Both areas are significantly constrained by topography and are characterized by extensive shoreline development. Both populations rely heavily on automobiles.

Two years ago, Ascher stated, New York had one public ferry service, the Staten Island Ferry, which is operated by the City of New York. Now, a dozen ferry services exist, and all but the Staten Island service are operating privately. The historic perspective on New York ferries, like those of the Bay Area, shows that many ferry services operated in the past, but from the 1930s to the 1950s all services were abandoned save the Staten Island Ferry. For twenty years it was the sole survivor of a once prolific network of ferry boats. As five bridges and eight tunnels were constructed to serve Manhattan, the ferry systems were systematically abandoned.

The new passenger services across the Hudson and East Rivers resulted from the coalescence of several formative conditions. By 1986, traffic congestion had increased dramatically, and extensive real estate development had taken place on the east and west sides of Manhattan, in Brooklyn, Queens, and northern New Jersey. At the institutional level, the role of public agencies in waterborne transportation had been minimal, but in 1986 a process evolved for permitting ferry operators, and the city made public landing sites available. An example is Manhattan's South Street Seaport, on the lower east side, which is a renovated dockside area which now houses restaurants and boutique shops and is within easy walking distance of Wall Street.

Once the procedural mechanisms facilitating ferry operation had been instituted, one and a half years later several ferry services were in operation. Ferries in New York can be categorized by three major types, Ascher summarized. One type, which is comparable to the SF-Vallejo service, is the long distance ferry, of which several have been serving northern New Jersey. These are 45 to 60 minute rides that cost up to $20.00 per round trip. Such premium fares eliminate the need for subsidies, and the services generally save the commuter time over the alternative rail route. A second type of ferry is what Ascher calls the "real estate ferry." These ferries generally access waterfront areas not well served by public transit and have tended to cover shorter routes. Premium fares are charged, typically $8.00 round trip, and passenger volumes are fairly small. Ferries serving major public transit needs are the third type of ferry. The Staten Island Ferry is the principal example in this category. Its 25 cent one-way fare is offset by the ferry's enormous ridership of 80,000 passengers per day. Finally, a special case ferry service is the run between Manhattan and La Guardia Airport. For air travellers, the $20.00 one way fare is an efficient alternative to an expensive and unpredictably long taxi ride. (See the paper submitted by Ascher for more detail.)

The Port Authority has recently reviewed proposals to offer a new ferry transit service between Manhattan and Hoboken, New Jersey, to be run by a private operator. The Port Authority will assist by providing terminals. Hoboken is a major rail transit hub, and plans call for a non-subsidized $2.00 one-way fare. Boats for this proposed service would have 150-300 passenger capacity. The City of New York has jurisdiction over ferries. The city issues operating permits and requires landing permits if the landing is on city property. Neither the City of New York nor the Port Authority see themselves in the business of operating or subsidizing new ferry services.

Ascher offered several comments on existing conditions and the future of ferry services. First, the ferry market in New York is extremely immature at the moment and the use of ferries is likely to grow. Barriers to entry are low; the availability of public landing sites serves to reduce capital costs of entry. As congestion in the New York area is worsening, public agency support for the ferry mode is increasing. No significant additions to highway capacity are planned. Present conditions will only be exacerbated by extensive new waterfront development that is forecasted for the New York area. In the future, ferry routes with good access will probably gain a loyal market. Ascher offered the analysis that much of the present renaissance is being driven by real estate development rather than ferry economics. Present use is not the kind that calls for 2000 passenger boats. The markets are more discrete and specialized, and boats with maximum passenger capacities of 100 to 200 people are most likely to succeed. For San Francisco, she concluded, reliability and location are probably more important than size.

The Black Ball Ferries on Puget Sound was the largest system of ferries in the U.S. after World War II. In 1950, the State of Washington assumed ownership and operation of the ferries, which today forms the nation's largest system. An affiliated company instituted the ferry system for British Columbia, Canada. Captain George Roberts, third generation head of the Black Ball Line, stated that a fully-integrated transportation system is the key to the success of ferries. The ferries are an element of a larger regional transportation system. For San Francisco Bay, Roberts has developed an integrated system concept. The key element is the separation of trucks from cars, with ferry services designed to meet the needs of the trucking industry.

The separation of trucks from personal vehicles would decrease congestion and accidents, Roberts asserted. Black Ball Vehicle Ferry Systems currently has two applications on file with the California Public Utilities Commission to provide freight ferry services.* One service would cross the bay, essentially paralleling four major bridges, offering morning and afternoon service for three hours each peak period. Each ferry would hold 200 trucks. In this roll on/roll off operation, drivers would remain in their trucks during the ten to fifteen minute crossing. A second barge system, for driverless trucks and containers, would relieve truck traffic along U.S. 101 and I-880 in the South Bay and I-80 as far as Sacramento. This service would provide roll-on, roll-off barges traveling the length of the bay with two departures daily. One vessel would leave from Sacramento and the other from the South Bay, with specified stops along the way. This freight ferry proposal is estimated to remove 25 million truck-miles of truck traffic per year from the highways and relieve the bridges of 40,000 truck crossings per day. Roberts has seen ferry systems work, and emphasized that such a fully integrated transportation service for the Bay Area would decrease the demand for new highway construction and additional mass transit, like BART.**

From the State of Washington, Donald Nutter, planning director of the Washington State Ferries, described the extent and diversity of the Puget Sound ferry services. "San Francisco and Seattle are similar," began Nutter, "They are both water-bound and water-focused." In the Seattle area, 23 vessels cover 9 ferry routes crossing Puget Sound. In 1987, the ferries carried 18.1 million persons and 7.6 million vehicles, which averaged about 50,000 people and 20,000 vehicles per day. Washington State Ferries are an integral part of the local transportation system and are a component of the state highway system. Financially, the Washington ferries receive substantial support. Federal assistance is used for purchasing boats, and operating costs are met in part through a state subsidy. Revenue from passenger fares covers about 70% percent of operating costs.

The tariff schedule for the Washington ferries is very complex. Frequent users are given a 40 percent discount and frequent usage is defined as at least 20 trips in 90 days. A typical one-way cross-sound passenger ticket, at the regular price, is $1.65. Commercial traffic,

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* Captain Roberts has also filed a third application with the PUC to provide vehicle and passenger ferry service across the Sacramento River between Pittsburg and Collinsville. Initially, this would be a passenger-only service connecting with peak period BART express buses. Ultimately, it would provide all-day passenger and vehicle transport, providing an alternate route and traffic relief for the Benicia and Antioch Bridges.

** As a follow-up to the symposium, Captain Roberts has asked that the Metropolitan Transportation Commission, with the possible assistance of the California Maritime Academy, conduct a detailed feasibility study for the proposed freight maritime-highway plan.

by contrast, pays substantially higher fares. The amount of commercial traffic carried on the Washington State ferries has declined over the years. Terminal access is problematic and delivery time uncertainties are a bigger consideration than in the past. Over the years truck terminals have relocated and trucking itself has become more economical. Today, the cost of driving around Puget Sound is usually competitive with the cost of ferrying the trucks.

A ferry boat system should be an element of a fully integrated transportation system. Under an extraordinary set of circumstances, a functioning ferry system could constitute the heart of the transportation system. In the event of a major earthquake in the San Francisco Bay Area, the waterborne element of the transportation system may be the only mode capable of remaining in operation.

In the first afternoon session, Richard Eisner, Bay Area Earthquake Preparedness (BAREPP), offered sobering remarks about the potential impacts of a major earthquake on highways and airports around the bay. "The core of the Bay area is in trouble," predicted Eisner, pointing to a map of the Bay Area demarcating unconsolidated soils. All major highways and airports are built in part on fill, which has the potential to liquify in a major earthquake. All roadways on fill, from freeways to surface streets, may fail.

Since the serious San Fernando earthquake of 1971 in Southern California, which measured 6.6 on the Richter scale, Caltrans has spent $50 million on strengthening structures, particularly overpasses, using cables at mid-span and abutments. However, these measures are designed only to prevent the structures from falling--not to keep them operational. The Bay Area's major bridges will survive a major quake, Eisner stated, since their foundations are firmly rooted in bedrock. "If you're driving across the Bay Bridge when the earthquake comes, it won't collapse, but you probably won't be able to get off it," Eisner warned. Although the bridges themselves are essentially secure, the approaches to the Bay Bridge will probably fail, especially the Bay Bridge toll plaza. North of the Golden Gate, the Waldo Grade will probably slide, and the area south of the bridge along Doyle Drive is also problematic.

For the East Bay, experts estimate a 20 percent chance of a major earthquake on the Hayward fault sometime in the next thirty years. The potential consequences are staggering: fatalities would total 3,000 to 8,000 people, and up to 30,000 would be hospitalized, mostly outside the region as a result of the destruction of local hospitals. In 1980 dollars, an estimated $44 billion in property damage would be incurred. "An earthquake is the hazard of choice," quipped Eisner, "It's the one disaster that's going to motivate the resources." The potential for a disaster of region-wide proportions demands redundant transport modes and residual capacity. Although ferry services might be classified as a redundant transport mode for crossing the bay, under today's congested conditions, the ferry mode augments an insufficient level of transport capacity. Indeed, true redundancy would seem a luxurious goal.

Emergency planning for a major earthquake is underway in Southern California, where an earthquake over 8.0 has not occurred since the Fort Tejon earthquake of 1857. An emergency response plan is being developed for the Los Angeles area, and will be adapted for Northern California upon completion. The hierarchy of jurisdictional response begins at the local level; the greater the extent of the damage, the more likely state and federal assistance will be available.

The afternoon panel discussion addressed "Access to Bay Area Ports." Three discussants, two from the Bay Area's major ports and one from Caltrans, offered remarks on how their respective agencies regard ferry services on the bay.

Representing the Port of Oakland, John Glover described the accessibility of the port for ferries. "We have good access," said Glover, "and the port is looking at Jack London Square as a ferry terminus for both commuter and recreational ferries." The Port of Oakland, a profit-making enterprise, works to facilitate the flow of people and goods through its properties. The further development of Jack London Square is being promoted by the port, and they are currently working on the relocation of the AMTRAK train station to the square from its present site.

The San Francisco waterfront was discussed by Randall Rossi, of the Port of San Francisco. Rossi began by noting that the surface of the bay is one of the few remaining options for moving people in and out of San Francisco, a city largely opposed to the construction of additional transportation infrastructure. Among the city's residents, concern has become more commonly voiced for greater connectivity to the surrounding region, particularly as corporations relocate major divisions to suburban business parks. Ferry service in San Francisco is associated with a certain degree of exclusivity, which has in part resulted from the choice of terminal technology. Because of slip and ramp designs, for example, the Golden Gate Bridge District facilities are not easily usable by other ferry operators. Like most symposium participants, Rossi would like to see a reinvigorated San Francisco Bay ferry system.

A thirty-two year veteran of Caltrans, Ed Boyle, offered remarks on systems management planning for Caltrans District 4 and the opportunities and constraints for ferry services within the larger transportation system. As Caltrans works to improve and expand the roadway network, they will incorporate improved access to ports in all projects, asserted Boyle. The feasibility of a truck-ferry system is attractive, since one large truck has the impact on traffic of 3.5 automobiles. "We are interested in working with ferry systems," stated Boyle, while he cautioned, "We still have to get people to those facilities." Access and flexibility are not unlimited. Nevertheless, within Caltrans systems management framework, ferries, like other transportation modes, can be accommodated.

Three afternoon workshops provided smaller group forums for discussion of particular ferry implementation issues. Conference participants attended either the vessel technologies workshop, the waterborne freight workshop, or the passenger ferry workshop. The results of these discussions are summarized in the following section.

Minutes of Workshop 1 (Vessel Technologies)

This workshop was asked to address pertinent facts and experiences with regard to alternative vessel technologies, to identify pertinent problems, and to develop any related recommendations. At the outset, the group was provided with the following questions to help stimulate discussion:

- Are the relative seat-mile costs in the 1984 U.S. DOT study (illustrated in the symposium resource paper) valid indicators of current vessel economics for Bay Area application? Is there solid contrary evidence?

- What are the trends in vessel life cycle costs and productivity? Is vessel technology changing rapidly?

- Are there significant legal and regulatory barriers to further technological progress in waterborne transportation? If so, what are the most promising opportunities for change?

- Are there specific environmental factors which encourage or discourage the use of particular vessel technologies in the San Francisco Area? If so, what are they, and why?

At the vessel technologies workshop, participants concurred that selection of appropriate vessels is a business decision, based on market availability of boats for a given set of conditions. Among the range of possible technologies, the three most likely choices for ferry boats appear to be conventional hulls, catamarans, and hydrofoils. Choice of vessel should be based on several criteria: the route to be served, the water depth, the attitude of prospective passengers, and the costs involved.

The background and functional characteristics of a number of alternatives were discussed:

1. Hydrofoils -- This technology was first designed by Alexander Graham Bell. The principal objective is maximum over-water speed. The speed advantage is based on using foils like wings to raise the hull above water and thereby significantly reduce drag. There are two basic types: surface piercing and the submerged hydrofoils such as developed by Boeing and Grumman. (Although these vessels are generally sensitive to debris, Boeing is said to claim that the front foil of their design can pass through a three foot diameter log.)

2. Air Cushion Vehicles (ACV), commonly called hovercraft. The U.S. Coast Guard has a few, and large hovercraft have been in service crossing the English Channel for years. A unique advantage is that these vessels require no water depth and can also travel across land. Vessels travel on cushions of compressed air trapped by soft-sided walls.

3. Surface Effects Ships (SES). When at speed, these vessels travel on cushions of compressed air trapped by hard-sided walls.

4. SWATH (Small Water Plane Area Twin Hull) Vessels.

5. Conventional Displacement Vessels.

6. Catamarans (multi-hull vessels).

7. Planing Vessels, using either a flat bottom or deep V.

8. Cable Propelled Vessels.

Propulsion systems provide another dimension of variation, including conventional propellers, jets, fans, cable-propelled vessels, and others. Hybrids of these technologies are also promising.

A significant issue for San Francisco Bay is water depth. Eighty percent of the bay is less than twelve feet deep, although there exist many deep water access points.

The group developed the following tables comparing the various technologies and identifying their appropriate uses.

TECHNOLOGY	ADVANTAGES	DISADVANTAGES
Hydrofoils	- Speed - Seakeeping] when on - Small wake] foils	- Technological risk (reliability) - Draft - Cost - Size limit (capacity) - Internal noise - Danger of foil damage
Conventional Displacement	- High capacity - Cost - Safety - Low technological risk (reliable)	- Low speed - Wake - Seakeeping - Draft
Catamaran	- Stability - Speed - Reliability - Low internal noise	- Cost - Draft - Beam (width)
Surface Effect Ships	- Draft (when on cushion) - Speed - Low wake	- Noise - Seakeeping - Cost (both operating and capital) - Technological risk
Air Cushion Vehicles	- Draft (when on cushion) - Speed - Low wake - Amphibious	- Noise (internal & external) - Cost - Air screws - Technological risk
SWATH	- Speed in a seaway - Seakeeping - Large deck area	- Low payload - Speed restriction - Cost - Draft - Reliability
Planing Craft	- Speed - Cost	- Seakeeping - Payload sensitive - Size limited
Cable	- Cost - Reliability - Safe - Simple	- Speed limited - Short routes - Dedicated routes (inflexible)

		TRAVEL DISTANCE	
		SHORT (TRANS-BAY)	LONG
WATER DEPTH	SHALLOW	ACV Planing Cable-propelled	ACV
	DEEP	Conventional Catamaran SES SWATH Cable-propelled	Hydrofoil Catamaran SES

	PAYLOAD SIZE	
	SMALL	LARGE
LOW COST	Planing	Conventional Catamaran Cable
HIGH COST	Hydrofoils SES ACV SWATH	

Minutes of Workshop 2 (Waterborne Freight)

This workshop was asked to address pertinent facts and experiences with regard to prospects for increased waterborne freight transportation in the San Francisco Area, to identify pertinent problems, and to develop any related recommendations. The group was provided with the following questions to help stimulate discussion:

- What are the principal market niches for waterborne freight movements in the San Francisco Bay Area.
- What cost and service factors are most critical to further developing a market for waterborne freight transport?
- Is there a suitable basis for estimating ton-mile costs for local movements of waterborne freight? How do these costs compare to comparable highway movements?
- Are there serious legal and regulatory barriers to increasing local waterborne freight transportation? If so, what are the most promising opportunities for change?
- What are the trends in life cycle costs and productivity of vessels suited for freight transport in the Bay Area? Is vessel and/or terminal technology in this area changing at a rapid rate?
- What commodity flow and economic data are available and necessary to plan adequately for future waterborne freight transportation in the San Francisco area?

Discussion at the waterborne freight workshop raised several questions requiring further inquiry. Compared to passenger service, the market for freight transport is less well known. Truck terminals are no longer located just in San Francisco and Oakland; many have moved to less congested, lower rent locations such as Union City and Hayward. Input from freight consolidators and terminal operators would be necessary in order to construct a viable freight ferry system.

Participants voiced concern for a more thorough understanding of the Bay Bridge bond issue, and whether the 1986 legislation really freed ferry operators from the restriction on operating within ten miles of any toll bridge.* One participant indicated that since the Bay Bridge

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* Subsequent investigation indicated that, following passage of the 1986 law permitting competition between commercial ferries and toll bridges, the state recalled and reissued the bonds for the Dumbarton, San Mateo, and Bay Bridges. The bonds for the Richmond-San Rafael Bridge are already paid. This leaves only the Carquinez, Benicia and Antioch Bridges with covenants restricting ferry competition. (See the footnote in the record of the concluding session.)

bonds were not yet paid off, the restriction of no competing ferry service within ten miles of the bridge still stands. For the 1986 legislation to take effect, the bridge bonds would have to be reissued.

Some encouragement for the future can be found in past San Francisco Bay ferry history. Up through the 1950's, freight ferry service operated between Richmond and San Rafael, and rail and freight car service was offered between Marin and Richmond, and between Richmond and San Francisco.* For the future, Black Ball Ferry Systems has applications on file with the Public Utilities Commission, but so far has not received a definitive response. Presently, Crowley Maritime is the only company possessing a PUC permit to operate ferries, and participants indicated that this company retains a dominant position among potential operators in the area.

Minutes of Workshop 3 (Passenger Markets and Implementation Issues)

This workshop was asked to address pertinent facts and experiences with regard to the markets for passenger ferry services in the San Francisco Area, to identify pertinent problems, especially those related to service implementation, and to develop any related recommendations. The group was provided with the following questions to help stimulate discussion:

- What is (are) the natural market niche (niches) for ferry service in the Bay Area? How large are these markets?

- What cost and service features are most important to further develop the market for passenger ferry transportation in the San Francisco area?

- Are there any significant legal and regulatory barriers to increased local passenger ferry services? If so, what are the most promising opportunities for change?

- What travel demand and economic data are available and necessary to plan adequately for future passenger ferry transportation in the San Francisco area?

- What are the roles of the public and private sectors in providing future ferry services? What are the specific advantages and disadvantages of each? What avenues for joint public-private enterprises exist, or might be developed, on either a temporary or permanent basis? What is the public sector role in the operation of other private mass transport modes (van pools, subscription buses, ..)?

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* Subsequent to the symposium, one participant reported that the Port of Sacramento has apparently identified a market for shipping 2,500 containers per year from Sacramento to the Port of Oakland, and is looking for a low cost operator to enter this market.

The workshop recognized the gamut of choices which confront potential operators of passenger ferry service on the bay, But before service can be implemented, certain questions must be resolved.

The question of regulation confounds many potential operators, since no one agency in the Bay Area now serves as a clearinghouse to help implement ferry service. The problem of access to capital is common to any transportation enterprise, and it is presently unclear whether ferries could tap sources of federal funds or other public subsidies.

Participants pointed out many benefits of ferry service, some of which are already widely enjoyed. After the Larkspur ferry terminal became established, significant commercial and retail development followed at Larkspur Landing. During the future reconstruction of I-880, the option of ferry service could become an effective alternative commute mode. Based on predictions for worsening future highway congestion and the examples from New York, people may be willing to pay more for a premium ferry service.

It was noted that the High Speed Water Transit Study (1985) concluded that the East Bay and North Bay markets make sense for ferry services; the South Bay, Pittsburg, and Antioch markets do not. In many cases, markets for ferry service may exist, but they also require suitable feeder services at each end. The success of the ferry service may depend on the nature of the non-ferry connecting services. As was experienced in Vancouver, a ferry service established to serve one travel direction may find that there also exists demand in the back-haul direction.

Caltrans is considering the development of a Benicia-Martinez ferry link during the upcoming Highway 80 and 680 reconstruction period. Some federal construction money may be available to designated ferry services in these corridors on a temporary basis as a freeway construction impact mitigation measure.

A participant from northern San Mateo County stressed the size of the untapped market that he feels exists in that community. The importance of coordination among different transit modes was emphasized.

The recent (1986) state legislation which eliminated the prohibition against common carrier ferries operating in competition with toll bridges specifically prohibits toll bridge revenues from being used to subsidize any common carrier ferry operation.

The workshop discussed the relationship between trans-bay ferry service and the covenants in the existing bonds issued to finance toll bridge construction. It was noted that eliminating this barrier to increased ferry services requires that the bonds for the competing bridges be recalled and reissued, perhaps at substantial public expense.*

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* See the footnote in the next section.

Minutes of the Concluding Session and Resolutions

The Symposium on Ferry Service on San Francisco Bay concluded with a discussion of the workshop reports and passage by acclamation of two resolutions related to problems facing the implementation of future ferry services. The texts of the resolutions read and agreed upon in general session are as follows:

1. __Finding__: The meeting recognizes that private operators still meet legal obstacles to operating ferries in competition with bay bridges, due to the covenants in the existing bridge bond issues.

   __Resolved__: This symposium appeals to the California Legislature to take further action to resolve the remaining conflicts between the 1986 law and covenants of the bay crossing bond issues, in order to remove the final remaining legal obstacle to common carriers providing trans-bay ferry service.

It was also agreed that the Bay Bridge bond issue must be clarified for the record.*

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* Following passage of the 1986 law permitting competition between commercial ferries and toll bridges, the state recalled and reissued the bonds for the Dumbarton, San Mateo, and Bay Bridges. The bonds for the Richmond-San Rafael Bridge are already retired, and therefore present no problem. This leaves only the Carquinez, Benicia and Antioch Bridges with covenants restricting ferry competition, giving Caltrans and the Ca. Transportation Commission (CTC) a fiduciary responsibility to oppose proposed ferry services operating within 10 miles of these bridges. In addition to solving the ferry competition problem, the trans-bay bridge bonds were able to be reissued at lower interest rates. However, in today's market, simply reissuing the bonds for the three other bridges would incur a substantial underwriting cost and additional debt-service costs, which the CTC is legislatively prohibited from doing. However, if reconstruction funds become available for one or more of these bridges, such as would occur if the toll increase proposition on the November ballot should pass, then the existing bonds would be recalled and reissued within a larger financing package, and the restrictive covenants could be eliminated. Otherwise, action is needed at the legislative level to authorize the additional cost involved in reissuing the existing bonds for the sole purpose of changing the covenants.

2. __Finding__: Extreme difficulty is faced by prospective San Francisco Bay Area private ferry operators in identifying and dealing with the highly fragmented system of public transit operating authorities and the multiplicity of other authorizing agencies.

   __Resolved__: This symposium recommends that the California Legislature provide the necessary authority and direct the Metropolitan Transportation Commission as follows:

   - to provide stronger coordination throughout the Bay Area transportation system, to eliminate counter-productive competition among operators which results in barriers to convenient and easy travel throughout the multi-county region.

   - to serve as the lead agency responsible for working with private operators in identifying and obtaining all of the necessary approvals and authorities required to operate regional transportation services such as ferry services.

It was agreed that better supporting information is necessary for the decision making process, and statistics on probable freight and passenger markets for ferries need to be assembled. The lead agency for information collection and dissemination should be the Metropolitan Transportation Commission, which should play a coordinating role for potential ferry operators.

Finally, participants called for a second meeting in one year's time to assess progress toward implementation of today's recommendations.

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II. RESOURCE MATERIALS

The following materials were provided by symposium participants either before or at the time of the meeting. They are presented here in the spirit of increasing information exchange. The opinions expressed in these documents do not necessarily reflect any consensus reached during the course of the meeting. The preparation of the first of these papers, by Sandy Stadtfeld, was supported by the symposium contracts with the MTC and California Sea Grant.

Written materials were provided by five participants. They have been reproduced essentially as submitted. The five papers are:

- Symposium Background Paper, by Sandy Stadtfeld
- Prepared Remarks by Morris Guralnick
- "Down to the Sea Again: The Resurgence of the Trans-Hudson Ferry," by Kate Ascher
- Introduction and Prepared Remarks on Freight Services Proposed by Captain George G. Roberts
- "Our Hydrofoil Boats," Materials Provided by Helmut Kock & Associates

SYMPOSIUM ON SAN FRANCISCO BAY FERRY SERVICE

BACKGROUND PAPER

Metropolitan Transportation Commission

June 8, 1988

Prepared by D. S. Stadtfeld
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PREFACE

This paper is intended to serve as a basis of discussion for a symposium on San Francisco Bay ferry service. It introduces the various topics that will be discussed in the same general order as the agenda of the symposium. This paper does not assume a position, nor can it address all of the issues related to San Francisco Bay ferry service. It should, however, provide a framework for constructive discussion among the participants in the symposium.

CONTENTS

(paging revised for the proceedings)

BACKGROUND

The San Francisco Bay Area has long been a growing and dynamic region, characterized by high levels of economic activity, trade, and personal mobility. As population and commerce in the region have increased, the street and highway transportation systems have become loaded to capacity. Personal automobiles, trucks and buses have proliferated in the last four decades, placing heavy demands on the local road system. On many local routes, demand during peak periods often brings traffic to a standstill. Such delays impose high costs of time and fuel on users, as well as costs that are borne by the system and the environment. Other modes are available, such as Bay Area Rapid Transit, CalTrain, and light rail systems. They do not, however, promise to relieve the intensifying demand on the highway system as population and economic activity in the Bay Area increase. It is clear that the transportation system must expand or adopt new technologies if demand is to be met.

San Francisco Bay itself is a resource that is currently underutilized as a medium of local transportation. Waterborne passenger services are available for excursions and on limited commute routes. The Golden Gate Bridge, Highway, and Transportation District operates four vessels in regular service between Larkspur and Sausalito and the Ferry Building. Crowley Maritime's Red and White Fleet routes connect Sausalito, Tiburon, and Vallejo with Fisherman's Wharf and the Ferry Building. Other private concerns operate on different routes and on smaller scales. The vast majority of travellers, however, use personal automobiles, bus transit, BART, or other modes for trans-bay trips. The bulk of freight movements between bay-side locations are likewise accomplished by truck. The mode choice of Bay Area trip makers places an increasing burden on existing highway and rail services, while the use of the Bay as a transportation mode is not actively or thoroughly pursued.

Until the construction of the Golden Gate and San Francisco-Oakland Bay Bridges in the late 1930s, San Francisco Bay was served by an extensive network of ferry routes. A number of railroad and transit concerns operated high-capacity passenger, automobile and railroad ferries, providing regular service between numerous locations on the Bay. With the advent of the bridges, commute mode choice shifted toward automobiles, buses, and rail, and finally almost entirely to personal vehicles. In addition, Ferry service between the East Bay and San Francisco was legislated out of existence by provisions against competition to the San Francisco-Oakland Bay Bridge. In 1944 the state of California passed a resolution authorizing the issuance of bonds up to a total value of 60 million dollars to help finance the debt incurred in construction of the bridge. Under the terms of this resolution, no mode of passenger transport may be operated from the East Bay to San Francisco and the Peninsula within ten miles of the Bay Bridge (with the exception of a possible Alameda-San Francisco ferry route). The last trans-bay competition to the Bay Bridge was discontinued in 1940 when Southern Pacific abandoned its ferry service between the Oakland Pier and the Ferry Building.[1] It has become apparent in recent years that legislation restricting competition with the Bay Bridge is not in the best interests of the public. In 1985, after a review by the Metropolitan Transportation Commission, the State Legislature passed and the governor signed a bill (SB 846) to remove restrictions on commercial common carrier competition with the Bay Toll Crossing. Today, the restrictions are less severe, but any trans-bay service competing with the Bay Bridge must be approved by the California Transportation Commission. (A copy of the final SB 847 is included at the end of this paper.)

As traffic conditions on the San Francisco Bay Area highway network have deteriorated in the last three decades, numerous proposals for the renewal of trans-bay ferry services have been advanced. Existing maritime concerns, private entrepreneurs, developers of bay-side properties, citizens' groups, and city and regional authorities have advocated the provision of ferry services, from short, limited routes to extensive and long range networks. While many of the proposals have thus far been economically impractical, there is definitely a basis of public an institutional support for ferry services on San Francisco Bay.

There are many examples worldwide of cities and regions in which ferry systems have succeeded in the provision of economically feasible transport services. In the United States, the Washington and Alaska state ferry systems are recognized as essential elements of the highway facilities in those states. Many ferry companies operate on the waters of New England and Long Island Sound, serving coastal and island communities. In foreign countries, the last twenty years have seen a proliferation of ferry services using high-speed surface vessels such as catamarans, hydrofoils, and hovercraft. Some of these technologies have gained a foothold in domestic passenger markets, including San Francisco Bay, where catamarans are now in service as excursion and ferry boats.

The various possible applications of ferry service are classified for the purposes of this discussion as passenger, freight, and emergency transportation services. Under the heading of passenger transport are included intercity commute services, "water taxis", and river and estuary crossings. The potential applications of ferry services in transporting freight may include the rerouting of truck traffic off of congested bridges and highways, intra-bay distribution of containerized cargoes, and facilitation of access to port facilities. Another application of San Francisco Bay ferries could be as reserve capacity for evacuation or essential services in the event of a natural or other disaster within the Bay Area.

It is clear that the San Francisco Bay Area is ideally suited for the institution of ferry services. The demand regularly placed on "conventional" modes is widely acknowledged as excessive. The Bay itself is a medium of transportation that may be an excellent alternative to these other congested modes. Technologies for all types of local waterborne transport have been proven in service in other ports around the world, and many may be particularly applicable here. However, it still remains for a ferry service to be instituted that can operate efficiently on San Francisco Bay by providing clear and broad advantages over other modes of transportation.

PASSENGER SERVICE

The inventory of passenger vessel services on San Francisco Bay is growing, but slowly. Currently there is one dedicated ferry service operated by a regional authority, the Golden Gate Ferries operated by the Golden Gate Bridge, Highway and Transportation District. One private firm, Crowley Maritime Corporation, operates scheduled passenger ferry services on its Red and White Fleet between the Ferry Building or Fisherman's Wharf in San Francisco, and Sausalito, Tiburon and Vallejo. There are several companies which operate passenger vessels suitable for ferry service, but which concentrate on excursions and charters. In addition to these established companies, there have been attempts by individual firms to institute scheduled services on limited point-to-point routes. Among these was the venture pursued by Harbor Bay Isle Associates of Alameda to establish a hovercraft service between the Harbor Bay Business Park and the San Francisco Ferry Building. None of these passenger services has yet proven an outstanding success in terms of ridership or profitability.

Recent and Current Experience

Golden Gate Ferries: The Golden Gate Bridge, Highway and Transportation District instituted ferry service between the Ferry Building and Sausalito in August, 1970 with the 113-foot vessel Golden Gate. In 1976 and 1977, the District acquired three 165-foot, aluminum hulled ferries constructed by Campbell Industries, Inc., of San Diego.[2] These vessels, the San Francisco, Marin, and Sonoma, were placed in service between the Ferry Building and Larkspur. Originally powered by gas turbine engines, the ferries were initially subject to excessive operating and maintenance costs, and were retrofitted between 1982 and 1985 with diesel engines. The ferries on the Larkspur route have a capacity of 725, while the Golden Gate has a capacity of 575.[3] Crossing times on the Sausalito route are about thirty minutes, and about forty-five minutes on the Larkspur route.[4]

The Golden Gate Ferry, while providing dependable service, has not proven itself an economically viable alternative to other modes, either for the bulk of the public or the District. The ferries are operated under large subsidies garnered from the District's other sources of revenue, including Golden Gate Bridge tolls and bus fares. Between 1978 and 1984, ridership on the ferries declined due to severe service cutbacks, but ridership has been steadily growing since full service was restored in 1986.[5] In 1985, of all the services provided by the Golden Gate Bridge district, the ferries had by far the highest costs per passenger and per passenger-mile.[6] (Table 1)

Red and White Fleet: Crowley Maritime Corporation's Red and White Fleet operates its service from Pier 41-43, adjacent to San Francisco's Fisherman's Wharf. Most of Crowley's revenues are generated by its extensive tug and barge services. The Red and White Fleet contributes a relatively small amount of the company's earnings, but benefits Crowley by providing regular cash flow and high visibility in the Bay Area.[7] The Red and White Fleet operates scheduled ferry service between Sausalito, Tiburon, and San Francisco aboard two 26-meter catamarans, the Catamarin and Dolphin. These vessels represent the only non-conventional high-speed surface craft in use as ferries on San Francisco Bay. They have passenger capacities of 405, and operate at cruising speeds of approximately 28 knots.

In addition to the Sausalito and Tiburon routes, Red and White has since June 1986 provided scheduled catamaran service between San Francisco and Vallejo. This route was initially intended as a means to carry visitors to Marine World, an attraction then recently relocated to Vallejo. The ferry was soon adopted as a viable commute mode by many residents of Vallejo and neighboring communities. With a one way trip time of 60 minutes, the Vallejo ferry is often faster and certainly more dependable than the highway commute. Crowley Maritime, however, has determined that the Vallejo service cannot be operated profitably, and intends to discontinue the route by December 31, 1988. The city of Vallejo is determined to maintain a ferry link with San Francisco, and has published a request for proposals for continuance of its ferry service after that date.[6]

Harbor Bay Isle Associates: Under the terms of the San Francisco-Oakland Bay Bridge bond issue of 1944, ferry service between Alameda and San Francisco may be permitted if approved by the bridge authority. This provision was invoked in 1984 to allow Harbor Bay Isle Associates to begin the test operation of a surface effect ship between Alameda and San Francisco. The vessel used for this trial was a Hovermarine 218 named the Hover Express. The vessel was never placed in revenue service, but was operated entirely to determine the feasibility of providing hovercraft service between Harbor Bay Business Park and other locations around the bay. In addition to the route linking Alameda and San Francisco, trials were conducted in service to Redwood City, Oakland, Larkspur, Richmond, Berkeley, Sausalito, San Mateo, and Tiburon. However, because the runs were relatively short and infrequent, insufficient data were obtained in the six months of operation to accurately determine operation and maintenance costs. It was, however, a promising demonstration of a vessel type that does not require extensive dredging and shore-side facilities.

New Proposals: There are several current proposals for new passenger services on San Francisco Bay. Black Ball Ferry Systems has applied to the California Public Utilities Commission for provision of ferry services between Collinsville and Pittsburg, on the Sacramento River. A new service has been instituted on the Oakland Estuary, providing water taxi service between Jack London Square in Oakland and Mariner Square in Alameda. There are several operators of excursion and charter vessels which would be eminently suitable for ferry service. Such an opportunity might allow these operators to markedly increase the utilization of their vessels and facilities, thereby possibly increasing their profitability.

Technology Review

Vessels used today in passenger service represent a broad range of marine technology. For the purposes of this discussion, two general classifications of vessels will be used, conventional hulls and high-speed surface craft. Under the classification of conventional vessels are the displacement and planing single-hull types. Displacement hull ferries are generally used in applications requiring high capacity and slower operating speeds, with ample space for maneuvering, mooring and access. Planing hulls require large amounts of horsepower relative to their size, and are not designed for stability, capacity, or comfort. These are typically not used in ferry service. High-speed surface craft include catamarans, hydrofoils, and hovercraft. These vessels are characterized by their higher speeds and unconventional means of "flotation" and propulsion. Catamarans are built upon two displacement hulls, the stability of which allow for high, full superstructure and large passenger capacity. Hydrofoils use displacement hulls to which are appended fully submerged or surface-piercing foils. At speed, these foils provide the lift which enables the vessel to operate with the hull clear of the water's surface. Hovercraft include air-cushion vehicles and surface effect ships. These types overcome water resistance by riding on a cushion of air pressure, and may also be used in amphibious applications. Another technology is the SWATH (Small Waterplane Area Twin Hull) vessel, which combines excellent stability in unfavorable sea states, with large carrying capacity. Any of these types of vessels may be particularly well suited to applications in ferry service.

The choice of technology for ferry service in a given market is based on a number of tradeoffs. The following parameters are primary among those that must be considered in making the choice of a vessel type for ferry service:

- -acquisition cost
- -terminal space required
- -maintenance requirements
- -passenger capacity
- -range of operation
- -maneuverability
- -economy of operation
- -depth of water
- -crew size
- -frequency of service
- -operating environment
- -operating speeds

There is wide variability in the costs likely to be incurred by the different available technologies depending on the duty cycle and other operating conditions involved. Nevertheless, a 1984 U.S. DOT study attempted to compare a number of specific vessel types, including several catamarans, surface effects ships, hydrofoils, and air cushion (amphibious) vehicles under standard assumptions for typical 20 mile and 70 mile urban services. The result of this study is reproduced in Figure 1.

There is a wealth of literature on the relative merits of the different types of vessels and their applications to ferry service around the world. The United States has been slow to adopt new vessel technologies, partly due to the restrictions of the Merchant Marine Act of 1920. Under the terms of this legislation, vessels built by foreign shipyards may not be employed in domestic commerce. Because most of the commercially viable high-speed vessels are built by foreign yards, they have not been used in ferry service in U.S. waters. This obstacle is gradually being overcome, as shipyards in this country are now producing high-speed passenger craft, and allowances are made in special circumstances to use foreign-built vessels. Exceptions to the restriction on using foreign-made vessels must be approved by the U.S. Maritime Administration, which in the past has been reluctant to grant such exceptions.

On San Francisco Bay, currently the only high-speed surface vessel in scheduled ferry service is the Catamarin, operated by the Red and White Fleet. The Blue and Gold Fleet also operates a catamaran, the Gold Rush, in charter and excursion service. There have been several ventures assessing the feasibility of other types of vessels, most notably the Harbor Bay Isle Associates' trials of a surface effect ship and hovercraft. In addition to these actual experiences, a number of proposals have been advanced to provide ferry service to various markets around the Bay using high-speed surface craft exclusively. An intensive review of five of these proposals was published in April 1985 by the Metropolitan Transportation Commission. This document provides an excellent perspective on the potential for future development of any type of ferry services on San Francisco Bay.

Demand and Public Perception

It is an acknowledged fact that the current population and level of economic activity of the San Francisco Bay Area place great demands on the region's existing transportation system. As the Bay Area continues to grow, the demand for transportation services will continue to intensify. This trend is daily made manifest by the increasing traffic volumes and travel times on major Bay Area freeways. There is no question that the Bay Area is characterized by a high demand for transportation, and that the existing highway and transit systems and operating practices are not adequate to accommodate projected increases.

Within the general demand for transportation, there is certainly a demand for the type of services that can be provided by a ferry system. This may be witnessed by the vast numbers of commuters that daily traverse the bridges that span the Bay, or travel long distances on highways that parallel navigable water routes. There have not been any recent surveys of potential ferry ridership that encompass the entire San Francisco Bay Area. Most of the feasibility studies that have addressed the potential for instituting ferry services consider particular routes or market areas within the region. Realistically, these can only indicate the travel preferences of a population sample under current conditions, or conjectures of future conditions. It is possible thus to approximate current demand for ferry services, but more difficult to assess the latent demand that might prevail in different future scenarios. Under the constraints inherent to such surveys, their results typically indicate that ferry ridership is most likely to be diverted from other transit modes, and less likely to decrease the use of personal automobiles.[9]

Acceptance of ferries by the public as a viable alternative mode of transportation is determined by a number of factors, among which are travel time, travel cost, convenience, passenger comfort, and the unique appeal of waterborne transport.[10] These are factors that influence ferry ridership in any location, but their relative importance varies from place to place. In the case of New York's Staten Island Ferry, travel time, travel cost, and convenience are the predominant factors influencing ridership. The ferry provides frequent departures, carries a large number of passengers, and at $.25 per round trip, is very inexpensive. Consequently the ferry is used by a large volume of lower-income riders, and has a very considerable ridership. It is also a major tourist attraction for the New York area. In the San Francisco Bay Area, the fares for ferry service are typically higher than those of other transit modes. The choice of the ferry as a commute mode is dictated more by the appeals of passenger comfort and of travelling on the Bay.[11] If, however, ferries are to become a viable alternative mode of transportation for the San Francisco Bay Area, they must be able to provide frequent, speedy, dependable service at a price more comparable to other modes, or be able to demonstrate more vividly to the public the superior aspects of maritime transportation.

Experience Elsewhere in North America

There are number of locations throughout the United States and Canada where passenger ferries are essential elements of the local transportation systems. These examples range from simple cable crossings of rivers to extensive ferry networks using large, high-capacity vessels.

Washington State Ferry System: The Washington State Ferries are owned and operated by the State of Washington, and comprise the nation's largest ferry system. Operating twenty-two vessels, the Washington State system has long been recognized as an essential component of the state's overall transportation system, as well as an indispensable feature of the maritime communities it serves. The Washington State Ferries use conventional displacement hull vessels, with capacities for large numbers of passengers and automobiles. While these vessels are incapable of high speeds, they are generally very dependable and provide regularly scheduled service. This is a feature which certainly influences ridership, as patrons are able to plan their travel schedules around ferry arrivals and departures. The Washington State system is used extensively by residents commuting among towns for work and school, but is also considered an important element of Washington's tourist industry.[12] The costs of the ferry system are financed largely by revenues from fares, with additional cross-subsidization from bridge tolls and the state's Motor Vehicle Fund. The amount of this cross-subsidization has increased steadily since the mid-1970s.[13]

The area served by the Washington State Ferries is very similar to the San Francisco Bay Area. The entire region focuses on Puget Sound in the same way that the Bay Area focuses on San Francisco Bay. There is a high degree of mobility between communities in both areas, necessitating travel that traverses or parallels navigable waterways.

In the Puget Sound area, however, many of these trips use the ferry system since direct highway-bridge links are generally unavailable. The same trips in the Bay Area would use the local bridges and highways.

New York City Ferries: New York harbor is currently served by two ends of the technological spectrum in U.S. ferry services. At one end are the Staten Island Ferries, slow, high-capacity vessels that carry large numbers of passengers at minimal cost. These older vessels are now being complemented by smaller, high-speed ferry services, a number of which are privately owned and operated. Seeing the need for efficient alternatives to the transportation problems which beset commuters to and from Manhattan, several private entrepreneurs have instituted trans-Hudson ferry services, using a variety of high-speed surface craft.

The environment in which new entrants to the New York commute ferry market must compete is very similar to that of the San Francisco Bay Area. Waterfront property suitable for use as terminal space is very expensive in both areas. The populace is in both cases accustomed to their accepted modes of travel, personal automobiles in particular. The central business districts are in both cases located on a peninsula or island connected to the rest of the urban area by bridges and tunnels. The experience of New York as a proving ground for a variety of commute ferry services will be a valid example for the San Francisco Bay Area.

Vancouver, British Columbia: Burrard Inlet separates the cities of Vancouver and North Vancouver, British Columbia. They are connected by the Lions Gate Bridge on the west and the Second Narrows Bridge on the east. In the early 1970s both bridges were deemed to be operating in excess of saturation volumes during peak travel periods. A third crossing, for passengers only, was considered essential. In 1974 The Bureau of Transit Services of the Ministry of Municipal Affairs of the Province of British Columbia initiated the development of a ferry service to traverse the 1.75-mile route. The design that was selected for the system incorporates two aluminum double-ended catamaran ferries and two floating terminal and berth structures. The ferries are 112 feet in length, operate at 13.5 knots, and have a capacity of 400 passengers. The ferry link, now known as the Burrard Inlet Seabus System, provides ferry departures from both terminals at ten-minute intervals, with one minute for simultaneous loading and unloading of the vessels. This system was instituted at a total cost of 35 million dollars, and has proven to operate with minimal lost service due to mechanical malfunctions.[14]

While the Burrard Inlet Seabus System was designed expressly for the particular characteristics of Vancouver, British Columbia, it is an example of a type of service that might be well applied in the San Francisco Bay Area. It is particularly noteworthy for its simplicity of concept, both with regard to the vessels themselves and the terminals. Such a system might be particularly effective on shorter routes on San Francisco Bay, between such cities as Alameda and San Francisco.

FREIGHT SERVICE

Local maritime freight transportation is not a market in which ferries participate on San Francisco Bay. There are in fact no dedicated freight ferries on the Bay, nor are there truck or railroad ferries currently in use. Waterborne freight movements within the Bay are generally accomplished by tugs and barges, numerous operators of which serve the Bay, Delta and coastal regions. The types of maritime freight transport extant within the Bay Area include local cargo movements by tug and barge, lightering services for ships at anchor, and local and coastal transport of petroleum products and chemicals.

There may be benefits inherent in scheduled waterborne freight services using tugs and barges or self-propelled freight carrying vessels. The rerouting of freight from trucks to waterways may be able to reduce the amount of congestion on the local highways. It could also reduce the delay and unreliability of certain freight movements, with consequent reductions in overall business logistics costs. Diversion of freight from the highways may also reduce the number of accidents associated with trucks, and could contribute to the longevity of the highways by reducing the amount of wear associated with heavy freight vehicles. An established water route for freight might be an effective alternative in the event of a major highway closure, and could be used for the provision of material transport in an emergency.

The criteria for the viability of a local freight service are similar to those for a passenger ferry service. Terminal space adjacent to the waterfront in the Bay Area is very expensive, and must be used efficiently. Frequency and dependability of service are extremely important, from both operational and marketing standpoints. Operating costs associated with crew and fuel must be minimized.

There are currently no proposals for freight ferry service as such. There is, however, a proposal before the state Public Utilities Commission for provision of roll-on roll-off barge service linking San Jose with Sacramento, with ports-of-call at a number of locations in between.[15] It is difficult at this point to determine how viable such a service might prove to be. Certain factors may arise to make this type of business very important. If volumes of local and international freights increase as projected, the number of trucks using the Bay Area highway system may dictate that alternative freight transport modes be implemented. In the event of partial or full regionalization of Bay Area ports, an internal maritime freight and logistics service might be essential for integrating the operations of the various facilities throughout the area. There is definitely a need for further study to investigate the demand and feasibility associated with scheduled freight services on the Bay and Delta.

EMERGENCY SERVICES

Given the steadily deteriorating service characteristics of its highway network, it is doubtful whether the San Francisco Bay Area has the transportation capacity readily available to provide evacuation and logistics services in the event of a major disaster. Should a catastrophe force the closure of one or more bridges or highway links, it may be essential to have reserve capacity on another route or alternative mode. The Bay and its tributary waterways would provide an excellent alternative to other, land-based transport routes for access to each of the area counties and many bay-side communities.

One of the arguments which has been advanced for the institution of both freight and passenger ferry services is that they would provide a substantial reserve capacity for use in the event of a disaster or closure of other transportation facilities. Passenger ferries, especially shallow-draft, high-speed vessels, might be effectively employed as a means of evacuating people from areas stricken or isolated by the effects of natural or man-induced disaster. Local cargo vessels might be used for the transport of essential materials to areas isolated by the loss of other transportation facilities. In the event of closure of one or more of the Bay Area's bridges, the capacity provided by a ready fleet of vessels might be necessary to maintain minimum flows of people and material along the route. This is another application of ferry service that is deserving of further study.

CONCLUSION

This paper has considered the possible applications of San Francisco Bay ferry service to passenger service, freight service, and emergency response. While it has touched but briefly on the aspects of each of these types of service, it should provide a starting point for further discussion within the context of the symposium. Given the wide range of expertise, interest and experience of the symposium participants, the discussion should elaborate thoroughly on each of the areas addressed in the paper, and identify those areas in which further study and development is necessary. The ideal outcome of this discussion would be a consensus among the participants for action to define and increase the role of ferry service on the San Francisco Bay.

Table 1

Golden Gate Ferry Operating Results in Constant Dollars (1982-1988)

	FY 82/83	FY 83/84	FY 84/85	FY 85/86	FY 86/87	1st Half FY 87/88
Operating $$ 1987 Dollars (Thousands)	$7,383	$6,973	$7,163	$7,694	$7,945	$3,842
Revenue Vehicle-Mi.	69,220	69,471	97,750	129,328	137,750	70,368
Passengers (Thousands)	1,134	1,024	1,145	1,285	1,439	777
Passenger-Mi. (Thousands)	10,427	9,442	11,149	12,977	14,735	8,013
Operating $$ per Passenger	$6.51	$6.81	$6.26	$5.99	$5.52	$4.94
Operating $$ per Pass.-Mi.	$0.71	$0.74	$0.64	$0.59	$0.54	$0.48
Operating $$ per Revenue Vehicle-Mile	$106.66	$100.37	$73.28	$59.49	$57.68	$54.60
Operating $$ per Revenue Seat-Mile*	$0.15	$0.14	$0.10	$0.08	$0.08	$0.08
Passengers per Revenue Vehicle-Mile	16.38	14.74	11.71	9.94	10.45	11.04
Passenger Mi. per Revenue Vehicle-Mile	150.64	135.91	114.06	100.50	107.00	113.87

* Assuming capacity of 700 passengers per vessel

Source: Golden Gate Bridge, Highway and Transportation District; Five Year Transit Development Plan; June 1988

Table 2

Annual Revenues for Golden Gate Bridge, Ferry, and Bus Services
Fiscal Years 1982-83 through 1986-1987

	REVENUES IN THOUSANDS OF DOLLARS				
MODE	FY 82/83	FY 83/84	FY 84/85	FY 85/86	FY 86/87
Bridge	$25,305	$26,010	$26,806	$26,800	$28,160
Bus Service	$19,847	$19,665	$22,717	$21,597	$19,720
Ferry Service	$3,049	$3,451	$4,301	$4,660	$5,005

Table 3

Annual Ridership for Golden Gate Ferry and Bus Services
Fiscal Years 1982-83 through 1986-1987

	RIDERSHIP IN THOUSANDS OF PASSENGERS				
MODE	FY 82/83	FY 83/84	FY 84/85	FY 85/86	FY 86/87
Ferry Service	1,088	1,025	1,156	1,279	1,436
Bus Service	10,998	9,712	8,655	8,712	7,997
Total Ridership	12,076	10,737	9,811	9,991	9,433

Note: The values in these tables do not agree fully with those in Table 1 because of adjustments to account for inflation and due to different methods of counting passengers used in the different sources of information.

Source: California, State of; A Report of the Golden Gate Bridge, Highway and Transportation District and the 50th Anniversary of the Golden Gate Bridge; Office of the Auditor General of California; Sacramento, CA; October, 1987

Table 4

Golden Gate Transit Services Operating Costs per Passenger and Passenger-Mile in Constant Dollars (1980-1985)

TRANSIT MODE	EXPENSE PER PASSENGER IN 1984 DOLLARS				
	FY 80/81	FY 81/82	FY 82/83	FY 83/84	1st Half FY 84/85
Bus	$2.57	$2.61	$2.77	$3.03	$2.99
Vanpool*	----	----	$3.55	$4.02	$3.59
Club Bus*	----	----	$3.66	$3.81	$3.67
Ferry	$5.93	$5.49	$6.48	$6.15	$5.45
System Average	$3.05	$2.93	$3.12	$3.36	$3.31

TRANSIT MODE	EXPENSE PER PASSENGER-MILE IN 1984 DOLLARS				
	FY 80/81	FY 81/82	FY 82/83	FY 83/84	1st Half FY 84/85
Bus	$0.17	$0.17	$0.18	$0.18	$0.18
Vanpool*	----	----	$0.08	$0.10	$0.10
Club Bus*	----	----	$0.07	$0.09	$0.08
Ferry	$0.61	$0.62	$0.70	$0.67	$0.55
System Average	$0.21	$0.20	$0.19	$0.20	$0.20

* Club Bus and Vanpool data not available before FY 82-83

Source: Golden Gate Bridge, Highway and Transportation District; _Five Year Transit Development Plan_; June 1985

Table 5

Fares and Frequencies on Ferries and Parallel Bus Routes

FREQUENCY OF SERVICE

Operator	Origin - Destination	Commute Service Frequency
G.G. Ferry	Larkspur-San Francisco	About every 30 min
G.G. Transit	Larkspur-San Francisco	About every 15 min
G.G. Ferry	San Rafael-San Fran.	About every 30 min
G.G. Transit	San Rafael-San Fran.	About every 15 min
G.G. Ferry	Sausalito-San Fran.	About every 60 min
G.G. Transit	Sausalito-San Fran.	About every 30 min
G.G. Transit	Tiburon-San Francisco	About every 20 min
Red and White	Tiburon-San Francisco	Three runs each AM/PM
Red and White	Vallejo-San Francisco	One run each AM/PM
Vallejo Tran. and BART	Vallejo-San Francisco	About every 15 min

TRIP FARES

Operator	Origin - Destination	Basic One-Way	Coupon Book *	Monthly Pass **
G.G. Ferry	Larkspur-San Francisco	$2.20	$1.98	---
G.G. Transit	Larkspur-San Francisco	$2.20	$1.98	---
G.G. Ferry	San Rafael-San Fran.	$2.32	$2.10	---
G.G. Transit	San Rafael-San Fran.	$2.20	$1.98	---
G.G. Ferry	Sausalito-San Fran.	$3.50	$1.67	---
G.G. Transit	Sausalito-San Fran.	$1.85	$1.67	---
G.G. Transit	Tiburon-San Francisco	$2.20	$1.98	---
Red and White	Tiburon-San Francisco	$4.00	$2.75	$2.48
Red and White	Vallejo-San Francisco	$6.95	$4.95	$3.25
Vallejo Tran. and BART	Vallejo-San Francisco	$3.50	$3.25	$3.10

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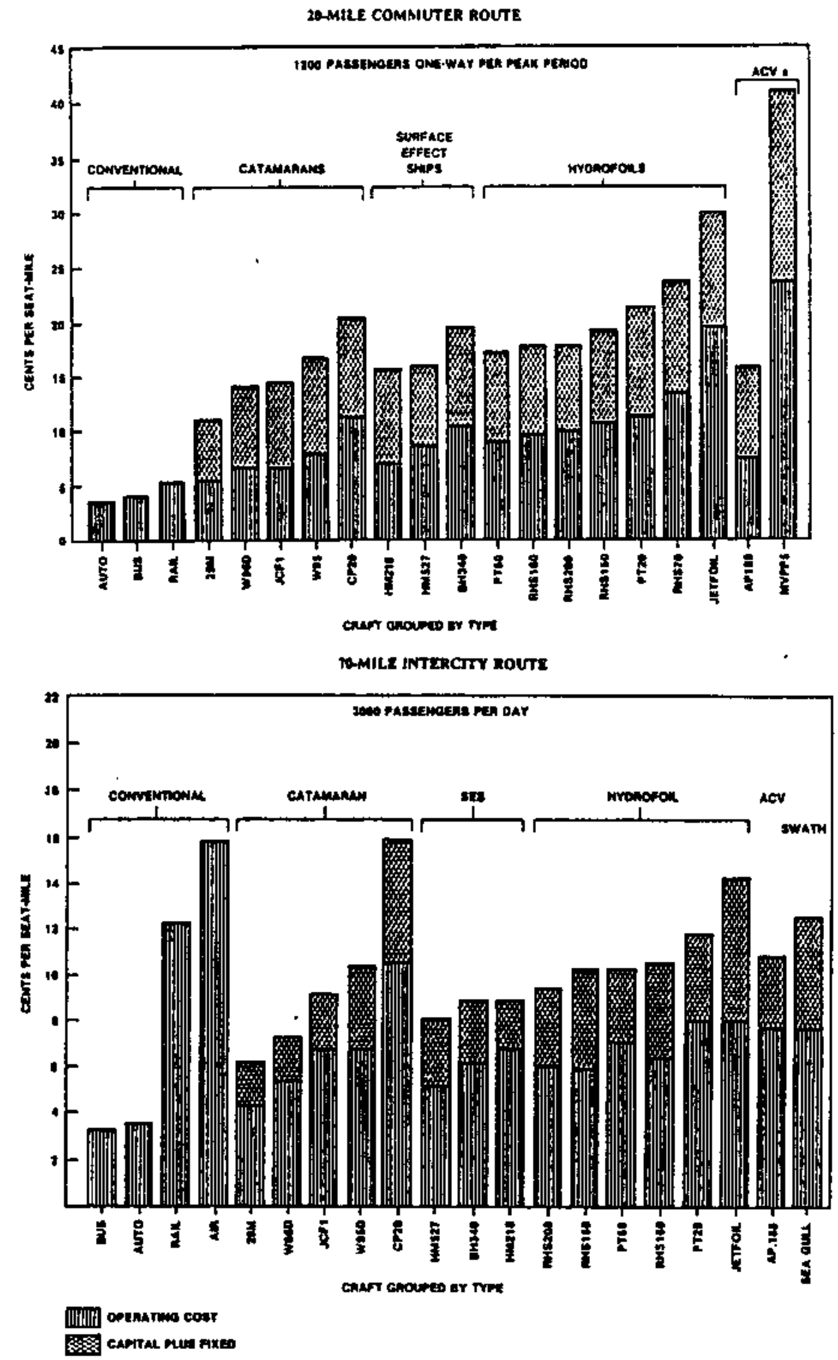
* Coupon books are available as follows:
G.G. Bridge, Hwy. & Transp. Dist. - 20 rides, 10% discount
Red & White Fleet - 18 rides, about 30% discount
Vallejo Transit - 10 rides, about 17% discount

** Per-trip fares with monthly passes are based on 40 one-way trips per month. Red & White passes cost $99.00 for the Tiburon-San Francisco route and $129.80 for the Vallejo San Francisco route. Vallejo Transit charges $44.00 for a monthly pass.

Figure 1

Comparative Seat-Mile Costs of Alternative Technologies



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Senate Bill No. 846

CHAPTER 1088

An act to amend Sections 30352, 30356, and 30800 of, and to add Section 30895.5 to, the Streets and Highways Code, relating to ferry boats.

[Approved by Governor September 23, 1986. Filed with Secretary of State September 24, 1986.]

LEGISLATIVE COUNSEL'S DIGEST

SB 846, Lockyer. Ferry boats.

(1) Existing law prohibits any ferry from operating within 10 miles of any toll bridge as long as any of the bonds issued to finance construction or modification of the bridge are outstanding and unpaid with specified exceptions, including any ferry authorized or permitted by the California Transportation Commission to be operated and maintained across San Francisco Bay between San Francisco and Alameda or across San Diego Bay, or ferry across San Francisco Bay in the vicinity of the San Francisco-Oakland Bay Bridge established and operated by the commission or the Department of Transportation and with the approval of the Metropolitan Transportation Commission.

This bill would delete all of the above-stated exemptions from the prohibition on ferry crossings except for the exemption for ferries crossing San Diego Bay and would exclude vessels operated by common carriers providing transportation service subject to the jurisdiction of the Public Utilities Commission from the prohibition. The bill would also remove toll ferries operated by common carriers providing transportation service subject to the jurisdiction of the commission from jurisdiction of the Department of Transportation.

(2) Under existing law, the Metropolitan Transportation Commission may allocate funds derived from toll bridge revenues to public entities and to the Department of Transportation for the establishment and operation of ferry systems within the region under the commission's jurisdiction.

This bill would prohibit the commission from approving the use of toll bridge revenues to subsidize the establishment or operation of a ferry system operated by a common carrier providing transportation service subject to the jurisdiction of the Public Utilities Commission.

The people of the State of California do enact as follows:

SECTION 1. Section 30352 of the Streets and Highways Code is amended to read:

30352. As long as any of the bonds issued pursuant to this chapter for the acquisition, construction, enlargement, extension, or change

in design or structure of any toll bridge or other highway crossing acquired or constructed pursuant to this chapter or the transportation facilities or additional transportation facilities thereon or thereto are outstanding and unpaid, any ferry or any similar means of crossing the waters within 10 miles from either side of the toll bridge shall not be operated, except as between the particular points of landing between which the ferry or other similar means of crossing was operated and only as to the particular classes of service in which the ferry or other similar means of crossing was actually engaged at the time the construction of the toll bridge or other highway crossing was authorized by the commission. Any ferry or other similar means of crossing shall not be restored to operation between any points of landing or as to any class of traffic operation discontinued subsequent to the authorization by the commission of any bridge or highway crossing.

"Ferry," as used in this article, includes vessels of any kind or character operating upon the inland waters of this state for the transportation of persons or vehicles other than railway freight cars, but excludes vessels operated by common carriers providing transportation service subject to the jurisdiction of the Public Utilities Commission.

SEC. 2. Section 30356 of the Streets and Highways Code is amended to read:

30356. The limitations and provisions of this article do not apply to any ferry across San Diego Bay.

The provisions and limitations of this article do not prevent the operation of any ferry or other similar means of crossing authorized or permitted by either of the following:

(a) The California Transportation Commission during the period of time that any toll bridge or other highway crossing is obstructed to traffic because of accident thereto or repair thereof, or is for any reason unable to fully accommodate traffic.

(b) The Public Utilities Commission.

SEC. 3. Section 30800 of the Streets and Highways Code is amended to read:

30800. The department has exclusive jurisdiction and, except as provided in this article, may grant upon the terms, limitations, conditions, and restrictions and under the supervision as in its judgment are necessary or proper, franchises, privileges, or licenses for the construction or operation of toll bridges, toll roads, and toll ferries and for the taking and keeping of tolls from the bridges, roads, and ferries situated wholly or in part within the state. "Toll ferries" do not include vessels operated by common carriers providing transportation service subject to the jurisdiction of the Public Utilities Commission.

SEC. 4. Section 30895.5 is added to the Streets and Highways Code, to read:

30895.5. The commission shall not approve the use of toll bridge revenues to subsidize the establishment or operation of ferry systems operated by common carriers providing transportation service subject to the jurisdiction of the Public Utilities Commission.

FOR THE SYMPOSIUM ON BAY AREA FERRY SERVICE
UNIVERSITY OF CALIFORNIA
INSTITUTE OF TRANSPORTATION STUDIES

Remarks by Morris Guralnick 8 June 1988

There is a general consensus that the automobile traffic condition in the San Francisco Bay Area is growing out of control and that something should be done to improve it. Among suggestions for improving this condition is the one of rebuilding a water transportation system which incidentally would help restore a mode of gracious living such as existed here many years ago. Perhaps when all the bridges and freeways were planned, no one anticipated that the use of private automobiles would get out of hand so steps were taken to construct the system of people movement around automobiles. Now we realize that some other form of transportation should be built to supplement the present system and that the other form should be water transportation. Of course, today, we have access to more advanced technology so we should be able to improve on the systems which existed in the past.

There are many ideas to consider before we get to the technology of vessels which might be conceived to carry commuters, visitors, and casual travelers. I shall limit these remarks, leaving for others the consideration of moving cargo and such matters as politics and legalities. From my point of view, once a competent group of analysts has investigated the economics of a passenger system and has established its parameters, the naval architects can be called upon to design suitable vehicles.

I should like to talk mostly about the economics of a conceived plan. To my way of thinking, the most important matters to address are first, how to get people out of their automobiles and into ferries; and secondly, how to provide transportaion facilities for the anticipated future growth of this area. Those items are the most inportant to my mind. Any plan has to be so superior to the use of automobiles as to leave no question about choice. In order to succeed, we must make the public an offer which they cannot refuse. Under present and envisioned future circumstances, this should be reasonably easy.

As applied in the past, the automobile provided door-to-door service. Today, that idea has a severe price tag with frustration, air polution, a terrible accident rate, and excessive cost. These factors are what a water transportation system must replace with another method of getting around which is so much more attractive as to induce drivers to leave their vehicles at home.

For the purpose of discussion, I suggest that we consider establishing a system which would carry passengers between Oakland, Richmond, and Redwood City to the Ferry Terminal in San Francisco. The first crossing is about 6 and 1/2 miles; the second, about 9 and 1/2 miles; and the last, about 24 miles. This ssuggestion is not rigid; an analysis could easily improve upon the idea. Perhaps Belmont or Menlo Park would be a better choice than Redwood City. Also, there is no need to discuss service to Tiburon, Larkspur, and Vallejo because service to those cities is already in place. This would be essentially a commuter network with off-hour service to provide for the casual traveler.

To assist me in thinking about this plan, I questioned several of my friends who are now commuters and asked them specifically: What elements would have to be available in a ferry system which would induce them to leave their automobile at home in favor of using ferries? The replies I received from several different people were surprisingly consistent. I shall list them in the order of importance expressed by those commuters:

(1) Conveniently located ferry terminals. The three locations mentioned would make a good start.

(2) Parking lots at the terminals (except San Francisco). These must be large enough to accommodate everyone who would drive to the terminal, double or triple decked if necessary to provide adequate space. Access to the boats must be under cover for weather protection.

The parking lots must be protected from vandals and thieves.

(3) There should be some bus feeder service for people who would not drive to the terminals. This is not to be a door-to-door service but better than the present BART arrangement. Existing bus service in San Francisco is adequate but might need improvement in the future.

(4) Time spent on the ferries is important. The Oakland passage should take twenty minutes; the Richmond passage, half an hour; and the Redwood City passage, three quarters of an hour. The first two times would be quite easy to achieve but the last would require high-speed vessels. Those elapsed times would be better than anyone could make today in an automobile.

(5) Frequency of service. For commuters, morning and evening departures from the three terminals and San Francisco should be provided every half or quarter hour but this frequency could be an eventual goal. Off hours should have one hour intervals until midnight to accommodate casual travelers.

(6) The least important factor is cost. People are now spending large amounts of money to travel to work and home. However, to make the ferry system attractive especially in the future, the fares should be as low as possible consistent with a self-supporting

operation. Future subsidies will be hard to come by. The fares should include the cost of terminal parking or feeder bus service. The fares should be considerably less than the total cost of auto travel including amortization, insurance, parking, and fuel.

I have one personal comment,- any ferry system should be operated as a private enterprise. We have enough experience with public operation of transportation systems to be satisfied that private operation would be an improvement.

One of the parameters which made the former ferry systems succeed was vessel capacity. Those old ferries carried about 2000 people each. I suggest that modern ferries should be planned around capacities of between one and two thousand people. This would at least militate in keeping down the fares and would provide other amenities on the boats. However, the size of the vessels must be predicated upon careful analysis. If an unprejudiced study for any leg of the system showed it could not be made to pay based upon revenue alone, we should forget it. On the other hand, I believe, these systems could be made to operate in the black without subsidies. This opinion is based upon the difficulties of continuing to plan present and future ridership by further increasing the use of automobiles.

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Volume 1 Number 1, Spring 1988 (The Port Authority of New York and New Jersey)

Down to the Sea Again

The Resurgence of the Trans-Hudson Ferry

by Kate Ascher

Ferry transportation has the curious distinction of being both our oldest and newest form of trans-Hudson transportation. Over the past two years, at least a dozen ferry services have appeared in the harbor, serving not only communities along the Jersey shoreline, but also locations in Brooklyn and Queens, as well as two of the region's three airports. The proliferation of these small commuter services is not surprising given the congested state of peak-hour travel in the region. Nor is it a phenomenon unique to the New York-New Jersey area; the combination of road congestion and increased waterfront development activity has prompted similar ferry initiatives in Boston, Vancouver and London. But nowhere has the introduction of regular ferry service revived as rich and long-standing a tradition as it has in this region—and no part of that tradition is as fascinating as the story of the Hudson River ferries.

In the age of the automobile and the train, we tend to think of trans-Hudson crossings in terms of fixed facilities—bridges, tunnels, and railroads. Yet for hundreds of years no direct connection across the Hudson River existed. Ferryboats were the sole means of transporting both passengers and goods to Manhattan, and as such were the economic lifeline of the region as a whole. As one commentator remarked, "the dependence of the metropolitan area on ferry transportation was nearly absolute and the extent of these maritime operations was unparalleled among the cities of the world."[1]

Ferries continued to play a dominant role in regional transportation well into this century. In 1910, 125 ferry services united the region—35 of them spanning the Hudson. Ferry landings dotted both sides of the Hudson, as well as the shorelines of Brooklyn, Queens, Staten Island, and the lesser islands of Upper New York Bay and the East River. The development of these services, and in particular the impact of technology and competition, varied considerably from route to route. The short, heavily-traveled East River ferry routes, for instance, were replaced by road and rail bridges at relatively early dates. The Staten Island ferry, in contrast, has operated continuously on a much longer route for over 200 years. Yet the longest, and perhaps the most colorful, history is that of the trans-Hudson ferry—subject of the following pages.

The Earliest Ferries

The earliest forms of waterborne transportation in the region were not ferries at all, but boats of various sizes and shapes belonging to Indian traders.

Information for this article was drawn from a number of sources. The author is particularly indebted to Raymond Baxter and Arthur Adams, whose book Railroad Ferries of the Hudson (Lind Publication: Woodcliff Lake, N.J., 1987) provides perhaps the most comprehensive treatment of this subject to date.

These vessels—including canoes, skiffs and rafts—operated on a variety of routes, but no evidence of any regular service exists. The first 'formal' ferry service appeared in 1640, and operated between the rich farmland of Brooklyn and lower Manhattan. Passengers blew a horn left hanging on a tree by the river to summon the ferryman, who would interrupt his farm chores to row them across in a small skiff. This route later became the Fulton ferry and still later the site of the Brooklyn Bridge.

In 1654, provisions for the licensing of ferries by local officials came into effect. Seven years later, William Jensen received an exclusive—but not unconditional—"right of ferriage" to operate the first Hudson River ferry between Communipaw (Jersey City) and New Amsterdam (lower Manhattan). The fare under Jensen's franchise was regulated and discrimination on the basis of size of cargo or nature of party was prohibited. Adequate shelter was required to be provided, and schedules were regulated loosely.

For over a century, the Communipaw ferry was the only commercial trans-Hudson service. In the late 18th century, however, two additional ferry services were established. One began operating from Cortlandt St. in lower Manhattan to Paulus Hook (Jersey City), where it connected with the stagecoach line to Newark and Philadelphia. A second ferry was initiated from Vesey St. to Hoboken, this one connecting with a stage line to Hackensack. Known as the "Horsimus Ferry," after the creek at the south end of Hoboken, it was initiated by real estate owners in Hoboken in an effort to increase the value of their holdings.

By 1786 the Communipaw ferry had ceased operating, a victim of competition from the new Paulus Hook operation. However, the other services operated regularly throughout the late 18th century with only a brief interruption during the Revolutionary War. While the routes themselves remained stable, the franchises to operate them changed hands frequently and were generally auctioned to the highest bidder. The franchise contract itself became a more substantial document over time, stipulating hours of operation, waiting times, vessel size and fares. The fare structure was based on an extensive schedule of prices for individual cargo items; a hogshead of wine, for example, cost eight shillings to transport across the river in 1799, while a mahogany chair cost only two pence.

During most of the 17th and 18th centuries, ferryboats remained relatively simple "row and sail" vessels. The very earliest were flat boats, propelled by one or more oarsmen (although passengers assisted in rowing when they were in a hurry). In the 18th century ferry sailboats, called periaugers, were introduced. They were fifty feet long, with a mast at the bow and a large central space for horses and carriages. While they were the first boats to rely on other than human power, it is not clear that these vessels represented a significant transportation improvement. The wind was often unreliable, and journey time across the Hudson varied from 30 minutes to three hours.

A more reliable method of crossing was introduced on the Hoboken run in the first decade of the 19th century. "Horse" or "team" boats relied on teams of mules or horses to power a barge-like vessel. These craft, holding up to 200 people, were not really single boats, but consisted of three parallel hulls separated by a pair of paddle wheels. Pairs of animals walked on a treadmill, turning a vertical shaft which was geared to a waterwheel. Similar boats were put into operation on the East River and in Newburgh, N.Y.

The Introduction of Steam

After years of stagnation, the first dramatic improvement in ferry technology occurred in the early 19th century. No single event in ferry history is as widely remembered as the introduction of the steamboat *Clermont* by Robert Fulton in 1807—and no event more misunderstood. For while is is true that commercial steam navigation was born on the Hudson, its development owes as much to the scientific and commercial efforts of Robert Livingston and his brother-in-law John Stevens as it does to those of Fulton. The interaction among these three individuals, at first cooperative and later competitive, characterizes one of the most exciting periods in modern ferry history.

Both Livingston and Stevens owned significant tracts of land on the Hudson—Livingston upriver, opposite Saugerties, and Stevens at Hoboken. Both were intrigued by the commercial promise of steamboat technology, and in 1798 worked together to construct and operate a small steamboat on the Passaic River in New Jersey. From that point on, however, their efforts to develop and market steam power diverged. Livingston, who at the time was Chancellor of New York State, quickly realized the commercial potential of the new technology and secured a 20-year monopoly on Hudson River steamboat operations. Soon after, in 1801, he was appointed Minister to France and his experimentation with steamboat technology shifted to the Seine. While in France he met Robert Fulton, by trade a marine engineer, and the two formed a partnership to exploit the Hudson River monopoly upon their return to the States.

Colonel John Stevens, founder of the great engineering dynasty which would later give its name to the Stevens Institute of Technology, displayed a passionate interest in steam power and its applications to rail and ferryboat travel. In 1802 he introduced a small twin-screw steamboat to the waters of the Hudson. While the vessel was not powerful enough for commercial operation, by 1807 Stevens had developed a larger steam-driven paddle-wheel boat for operation from Hoboken to New Brunswick. Though this vessel, the *Phoenix*, was technologically sound, Stevens was denied permission to operate it on the intended route due to pressure exerted by the Livingston-Fulton monopoly. (The vessel was instead put to use on the Delaware River between Philadelphia and Trenton.)

Stevens responded to the *Phoenix* incident by challenging the legality of the Livingston-Fulton monopoly. Although the court upheld the monopoly arrangement, the legal ruling had surprisingly little effect upon Stevens's technological or commercial activities. Shortly thereafter, he procured the franchise for ferry service from Hoboken and in 1811 introduced the first commercial steam ferryboat on the Hudson. Stevens's new service, which ran from Hoboken to lower Manhattan (Vesey Street) attracted considerable interest and patronage and operated successfully for two years. Once again, legal problems with the Livingston-Fulton monopoly arose, and steam service was withdrawn in 1813. Teamboats continued operating on this line until 1817, when Stevens sold the franchise.

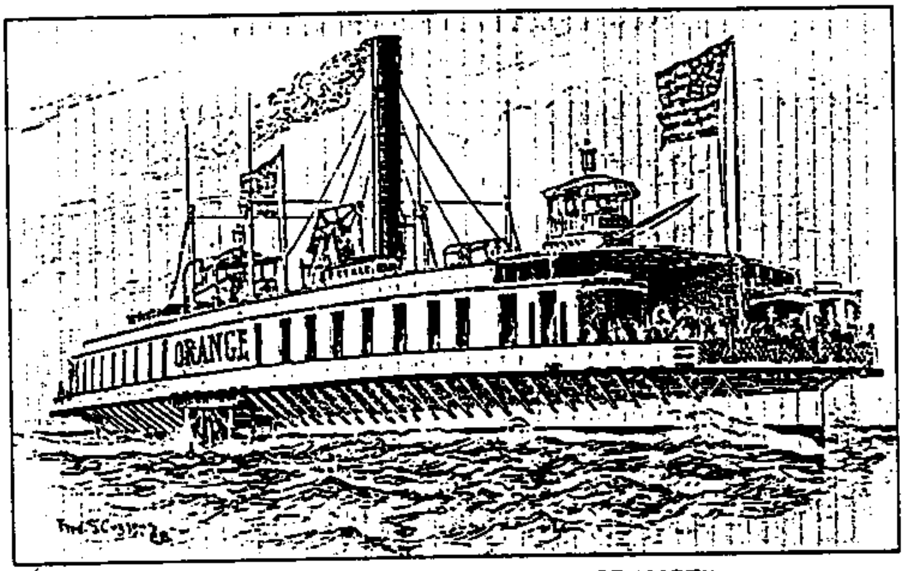
Despite Fulton's successful introduction of the steamboat *Clermont* on the NY-Albany route in 1807 and Livingston's successful defense of his monopoly, it was not until 1811 that the partnership introduced ferry service in New York harbor. Shortly after the Stevens vessel's debut at Hoboken, Livingston and Fulton began operating half-hourly steam service on the Paulus Hook-lower Manhattan route. Two years later, the pair successfully raised $50,000 to build additional boats, and founded the York and Jersey Ferry Company. Although steam propulsion improved crossing times significantly (the trip took only 15 minutes), the company was unable to generate sufficient revenue to cover its costs and applied to the Common Council of New York for assistance. The Council responded by granting a fare increase, and hence set a precedent for charging premium fares for steam travel.

The conflict between the Livingston-Fulton and Stevens camps was resolved in 1821, three years before the Supreme Court (in the famous *Gibbons v. Ogden* steamboat case) ruled monopoly pacts a violation of the interstate commerce clause of the Constitution. The two sides agreed to a licensing arrangement which enabled steam service to operate out of Hoboken. After repurchasing the Hoboken franchise, Stevens founded the Hoboken Steamboat Ferry Company and began regular steam service from Hoboken to Vesey St. So popular was this line that within two years two additional routes—one to Spring St. and another to Canal St.—were in operation.

The competitive rivalry between Stevens and Livingston-Fulton did much to hasten the development of ferryboat technology, and hence the development of the regional economy. Though the steamboats they devised have long since disappeared, a number of the technological innovations they fathered are still in use today, almost two centuries later. Fulton's floating bridge, for example, which rises and falls with the tide as a result of a system of counterbalancing weights on the shore, remains the principal method of providing level passage between vessels and shoreside facilities. Likewise, Stevens's spring pile system, based on flexible timber slip walls in a funnel-like configuration, remains a standard approach to guiding ferry boats into terminal slips under strong current conditions. Both can still be seen in New York harbor—a living testament to the creative and commercial genius of the steamboat pioneers.

The Age of Rail

During the first half of the 19th century, the ferries developed as small independent businesses. By the middle of the century, however, ferries were becoming big business. In this case the big businesses were the railroads, who saw ferry transportation as an "intermodal" extension of long distance rail service. From about 1840, powerful railroad interests set their sites on ferry routes which could be integrated into existing or planned rail services. Five major centers of rail/ferry activity emerged on the New Jersey side—Hoboken, Exchange Place, Weehawken, Communipaw and Pavonia. From these sites, a


THE HOBOKEN FERRY-BOAT "ORANGE"

range of services operated to terminals in midtown and lower Manhattan, as well as to Brooklyn.[2]

The railroads treated ferry service as an integral part of their business and invested considerable resources in new technology. Over time, both performance and reliability improved. Boats became larger and more stable as more powerful engines were developed. The screw propeller began replacing the paddle wheel in the late 19th century, although paddle wheels remained on the Hudson well into the 20th century. The first iron-hulled vessels appeared in the 1870's and 1880's, many of them built in local shipyards. Both iron and wood-hulled vessels were double-ended, for quick on and off-loading of passengers and cargo.

While technology played an important role, passenger amenities and comfort were of equal, if not greater, concern to the railroads. As vessels grew larger, they also grew more luxurious. Ladies' cabins were introduced as early as 1823; smoking rooms for men boasted shining spittoons. Vessels on longer runs offered dining rooms, private staterooms, and toilets—many of them done in elaborately carved wood. The boats carried several thousand passengers with up to 100 crew members, including musicians, shoe-shine boys, bartenders, porters and waiters.

Landside facilities were no less luxurious, particularly those constructed in the late 19th and early 20th centuries. As sprawling multi-level structures, the terminals were carefully designed to segregate pedestrian and vehicular traffic. They boasted well-appointed waiting rooms and elegant restaurants, and offered a variety of commercial services to passengers. Attention to detail was overwhelming. At the Liberty St. terminal, for example, attendants dispensed face towels in the men's room and all horsedrawn vehicles were

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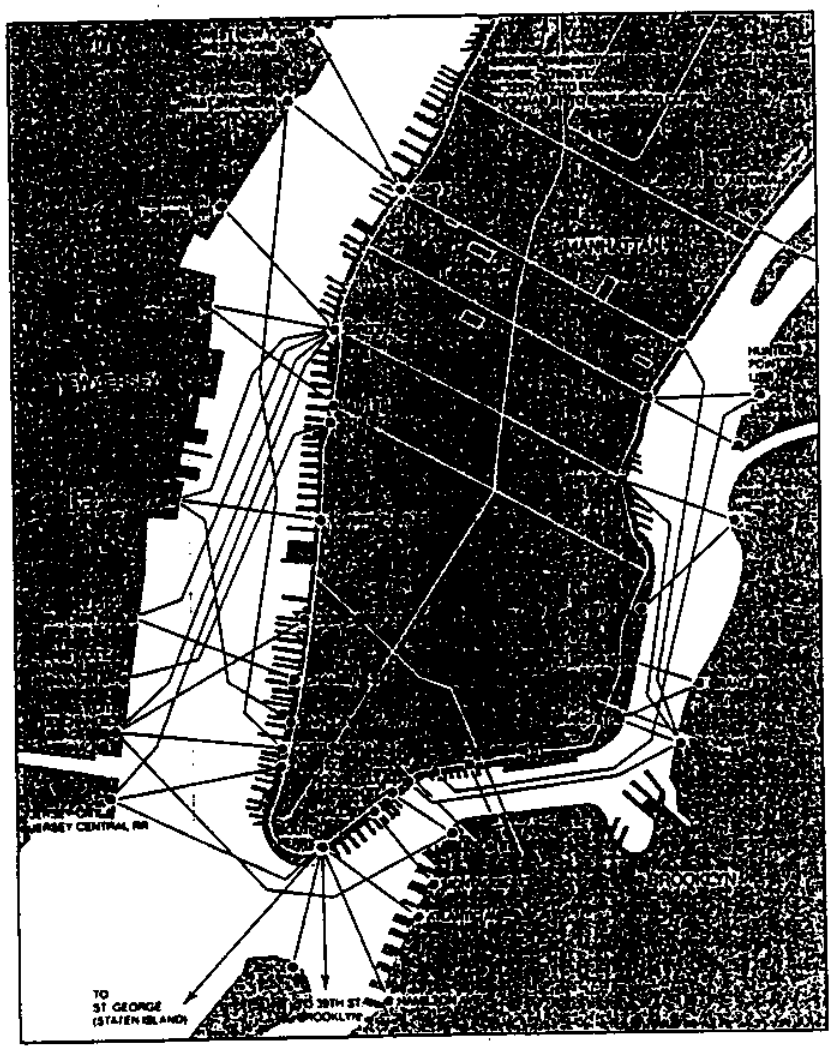
New York Harbor Ferry Routes
(Circa 1910)



followed by a porter with a broom and shovel. The stationmaster is reported to have worn white gloves and a high starched collar.

The interface between ferry and rail transportation was smooth and, for the passengers, relatively painless. Boats were scheduled to meet train connections, and no additional ticket was required. (Only later, when the ferries began attracting local commuter traffic, was a separate charge levied for ferry travel.) Long-haul passengers rarely, if ever, carried their own luggage. Porters unloaded bags directly from trains onto the vehicles that would deliver the passengers to their New York destinations.

Freight traffic was equally important to the railroads' business. Nearly all passenger ferry routes catered to vehicle traffic, with double-decked vessels introduced to separate passengers from the carriages. The railroads also relied on 'lighters', barges designed specifically to move the contents of railroad boxcars across the river or to ships waiting in the harbor. Car floats, barges with tracks to accept entire rail cars, were introduced later as a way of expediting freight movements across the river.[3]

Years of Decline

By the turn of the century, rail travel—and hence ferry travel—had expanded dramatically. Consolidation in the railroad industry made access to Manhattan from distant points easier than ever before. At the same time, the substantial improvement in ferry service encouraged a new generation of local ferry commuters. As a result of the dramatic growth in both of these markets, the years between 1890 and 1920 saw unprecedented levels of capital investment on the part of all major ferry operators. Larger, propeller-driven vessels were ordered, and elaborate new terminals were constructed along both the New Jersey and New York waterfronts.[4]

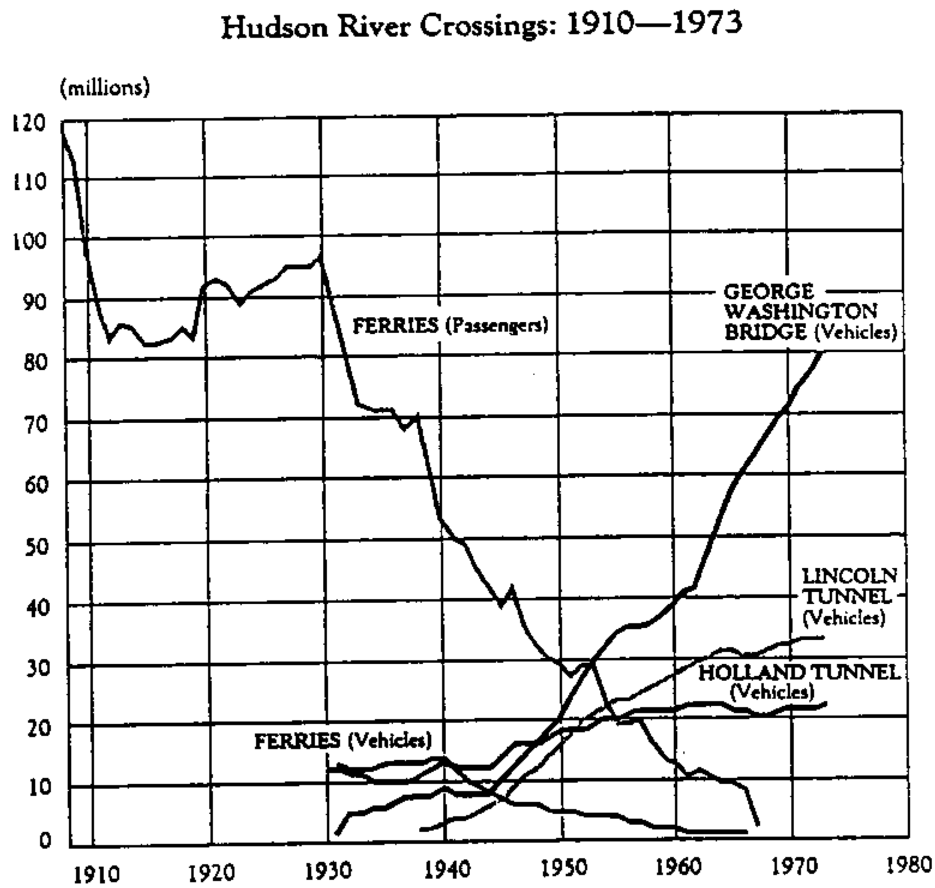
It is ironic that this period of major re-equipping and expansion of service coincided with the first serious challenge to the trans-Hudson ferry market. By 1910, two direct rail connections from New Jersey to New York had been established. The first belonged to the Hudson and Manhattan Railroad, which began running from Hoboken to 19th St. in 1908 and from Hoboken to lower Manhattan one year later. The second was completed in 1910 by the Pennsylvania Railroad, which had long viewed a direct connection to Manhattan as the only way to compete seriously with Cornelius Vanderbilt's New York Central Railroad. Its rail tunnel ran from Newark to 33rd St. and 8th Ave. in Manhattan, where it met another tunnel projecting eastward to the large Pennsylvania Railroad terminal at Long Island City.

The new rail tunnels caused passenger traffic to drop off on certain routes, but ferries remained the only way to transport vehicles across the river. As a result, increasing emphasis was placed on freight services and boats were redesigned to accommodate more vehicles. Only two lines—one from Exchange Place to W. 23rd St. and another from Exchange Place to Brooklyn—were abandoned in the years immediately following the introduction of direct rail service, although a number of other minor lines were abandoned during the early 1920's.

The opening of the Holland and Lincoln Tunnels, in 1927 and 1937 respectively, and the opening of the George Washington Bridge in 1931, had a far more significant impact upon rail and ferry travel. All three facilities catered to vehicular traffic, and hence to both passenger and freight transportation needs. Passengers shifted first to buses and then to private cars; freight customers came to rely increasingly on truck delivery. The drop-off in business was dramatic: at Hoboken, for example, ferry patronage dropped between 30 and 40 percent in the two years following the opening of the Holland Tunnel.

Increasing road travel and access was as much an intra as an interstate phenomenon, and hurt the railroads as much as it hurt the ferries. Substantial

Portfolio



sources of revenue, such as contracts with the U.S. Post Office for mail transport, were lost as highways became more efficient means of travel. The railroads were forced to undertake major cost-cutting exercises on both rail and ferry sides of their business. As rail schedules and networks were trimmed, hours of service on many ferry lines were curtailed sharply, and further consolidation of terminals followed. Investment in new ferry equipment dropped off and idle vessels were shifted to charter or upriver ferry activities.

Use of private cars, buses and trucks grew throughout the 1940's and 1950's, and the Interstate Commerce Commission received a continuous stream of petitions from railroads keen to abandon trans-Hudson ferry service. In most cases these petitions were granted, despite local pressure to maintain service. Occasionally, however, overwhelming political pressure led to the continuation of ferry service well beyond its useful economic life. The Pennsylvania Railroad for instance, was at one time forced to continue its Cortlandt St. run due to pressure from the mayor of Jersey City, despite the fact that the Hudson and Manhattan Railroad covered precisely the same route. Only when a new administration took office was it permitted to abandon the service.

Ferryboats continued to ply the waters of the Hudson until 1967, when the Hoboken to Barclay Street service was discontinued. The last crossing on this line closed the door on 300 years of continuous ferry service on the Hudson, and was memorialized by James Morris in *The Great Port:*

> *And when the dowdy old boat came in at last, and we crowded aboard her in the darkness, what a half-forgotten New York, innocent and high-spirited, came to life under her influence! The Hoboken High School band, in scarlet with white-feathered helmets, played lustily in the bows. Streamers fluttered. Corks popped. Somebody shouted "Ferry Power!" To a great cheer and a blowing of sirens, echoing from vessel to vessel along the Hudson, the Erie-Lackawanna ferry set off on her last voyage. She moved very slowly, wallowing, and as we labored across the stream the Hoboken High School band broke into "Auld Lang Syne." A maudlin excitement seized us then. There was a wild laughing rush for the life jackets, until everybody was festooned with bright red, and some people were wearing four or five. The old engines hissed, the sirens hooted, "Auld Lang Syne" rang raggedly through the night, and with a great cheer we bumped our way into the dim pillared labyrinth of the Erie-Lackawanna Railroad and Ferry Station, Hoboken, New Jersey. It was all over.*

The Resurgence of Ferries

In the 20 years since the Hoboken to Barclay St. ferry made its last crossing, economic growth in the metropolitan region has placed significant demands upon the trans-Hudson transportation network. The number of commuters traveling into Manhattan each day increased by 23 percent between 1980 and 1986 alone. Delays on tunnels and bridges have become commonplace, despite the introduction of express-bus and high occupancy vehicle lanes. (The Lincoln Tunnel Express Bus Lane, for instance, now handles 1600 buses daily, but the facility remains overcrowded.) Trans-Hudson rail service has improved markedly since the takeover of the Hudson and Manhattan Railroad by the Port Authority in the early 1960's, yet growth has consistently outstripped capacity and crowding continues to be a problem.

The first signs of interest in reviving trans-Hudson ferry service occurred in 1984, when private interests petitioned the City of New York to allow them to run ferry service from points in New Jersey to Manhattan. No action was taken by the city until 1986, when the Department of Transportation issued its "Waterborne Transportation Policy Statement." In an effort to encourage the development of private, unsubsidized ferry services, the city promised to institute a rapid procedure for issuing permits and to make available docking space and parcels of city-owned land for terminals.[3] The city also specified that new services should be provided on a premium-fare basis.

Several new ferry services were introduced in 1986. The Direct Line Corporation instituted service from the Atlantic Highlands in New Jersey to Pier 11 on the East River in lower Manhattan. Despite the premium price charged for the trip ($19.50 round-trip), demand grew consistently and service has since been expanded to four other locations in New Jersey. Service from Weehawken to midtown Manhattan (38th St.) was introduced by Arcorp

Industries in December 1986. Though only one boat was put into service initially, two larger vessels were purchased in 1987 and a second service, running from Weehawken to Slip 5 near South Ferry, was initiated in late 1987. Several routes between Brooklyn, Queens and Manhattan have also been introduced, including service between Pier 11 and LaGuardia Airport's Marine Terminal.

The commercial motives of the new ferry operators vary. Both Arthur Imperatore, principal of Arcorp Industries, and Walter Mihm, President of Direct Line, have real estate holdings along the New Jersey waterfront and are clearly interested in increasing the value of these properties. But while Imperatore has focused exclusively upon routes serving his properties, Mihm and Direct Line have demonstrated a broader interest in the ferry business itself, undertaking services on a variety of routes in conjunction with other corporate entities. Service to LaGuardia from Pier 11, for example, has been designed to meet the Pan Am Shuttle schedule and receives heavy promotional support from the airline.[5] Service from Samuel Lefrak's Newport development in Jersey City was initiated as major components of the real estate project were completed.

Commuter services have not been the only area of significant growth in the harbor. The number of sight-seeing, pleasure and entertainment cruise passengers has increased consistently since 1980 and a number of new services have been introduced. Several companies now offer moonlight and cocktail cruises to supplement their lunch and dinner cruises. Commuter ferry operators have themselves increased their off-peak activities, and now offer a variety of transportation/entertainment packages to introduce their services to theatre-goers, sports fans and trade show audiences.

New York Harbor Ferry Services
(as of March 1988)

Operator	Route	Estimated Daily Ridership	One-Way Fare ($)
Arcorp Industries	Weehawken - 38th Street	2100	4.00
	Weehawken - Slip 5 (Battery)	250	5.00
Direct Line	Highlands - Pier 11 (E. River)	600	10.00
	Keyport - Pier 11	160	10.00
	Bayonne - Pier 11	270	4.00
	Fulton Landing - Pier 11	190	2.00
	Rockaways/Breezy Pt. - Pier 11	140	5.00
	LaGuardia Airport - Pier 11[1]	60	20.00
	Newport (Jersey City) - Pier 11	40	3.00
	Elizabeth - Pier 11	270	5.00
Coastal Marine Transport Lines	Jersey City (Port Liberte) - Pier 11[2]	10[3]	3.00
Manhattan Express	69th St. (Brooklyn) - Pier 11	320	3.00
New York City - D.O.T.	Staten Island Ferry	80,000	.25[3]

[1] Under contract to Sloan Marine [2] Residents only [3] Round-trip fare

A Look Towards the Future

Recent events in the harbor clearly demonstrate a growing interest in commercial ferry service. But the extent and nature of that interest—both on the part of the operator and the commuter—is not yet well defined and any forecast of likely diversion to ferry service would be premature. It is possible, however, to identify several of the factors likely to affect the development of ferry travel in New York harbor over the next several years.

Foremost among these is persistent peak-hour congestion in the metropolitan area. Unless the region experiences an unexpectedly severe recession, demand for both inter- and intrastate transportation will remain strong. Capacity to meet this demand, however, will grow only incrementally in the short term. Rail and vehicle access to Manhattan from New Jersey will continue to improve, but no additional fixed crossings are planned. Substantial landside transportation improvements have been proposed, including a light rail line along the New Jersey waterfront and a reconstruction of the West Side Highway in Manhattan, but these larger projects have long lead times and are unlikely to offer significant relief to intrastate travelers until the mid 1990s.

Continued congestion will help sustain a sizable market for ferries, both for interstate trips and for point-to-point journeys along the waterfront. So long as time is money to commuters—and recent experience suggests that it is—congestion will allow operators to charge premium prices for time-saving services. This, in turn, may attract new entrants into the industry and result in the introduction of small commuter services in areas with particularly severe mobility problems.

Barriers to entering the ferry industry are low. The capital and operating costs associated with ferry service have dropped sharply, thanks to the slump in the oil industry and to advances in technology. Many of the boats now operating in the harbor are oil rig crew boats purchased at below-market prices and refurbished at low cost by shipyards in the Gulf. Terminals are basic but functional, often consisting of no more than simple barges or floats. The biggest obstacle to entering the ferry business has been and remains procuring appropriate landing sites, but this too will become less formidable as regional transportation agencies make additional landing sites available.

These agencies are just beginning to show their support for the development of the ferry market. New York City has already made three sites available (Pier 11 on the East River, Slip 5 at the Battery Maritime Building and the Fulton Ferry Landing in Brooklyn) and is currently preparing others. The Port Authority has announced its intention to support a substantial ferry service from Hoboken to lower Manhattan in an effort to relieve overcrowding on its PATH network. Consistent with both New York City policy and the lessons of history, the bi-state agency is looking to the private sector both to implement and to operate the service and is presently considering proposals from several interested parties. Both the city and the Port Authority are key participants in the newly-established New York Harbor Private Ferry Operators Council, which serves as a forum for airing the industry's concerns.

Waterfront development is another factor that will support the development of the market for waterborne transportation. Thirty-five million square feet of office and commercial space and 35,000 dwelling units have been proposed along the Hudson in New Jersey; several large developments along the Manhattan, Queens and Brooklyn waterfronts are also planned. These projects will put severe pressure on existing roadways and mass transit networks. In a number of cases, landside access to sites is so poor that developers are considering waterborne transit as an integral part of their project plans. The Harborside project at Jersey City, for example, includes in its proposed next phase substantial facilities for ferry transportation. Real estate developer Hartz Mountain Industries has recently stated its intention to establish a private transportation network—including buses, vans and ferries—to provide service to both waterfront and inland properties.

Taken together, these four factors—peak hour congestion, low barriers to entry, public support and waterfront development—point to an expansion in the range and volume of ferry services in the harbor. Just how significant an impact this will have upon our regional transportation network is unclear. In the short term, these services will cater primarily to mass transit users, providing particular relief to rail and subway systems. In the longer term, however, intrastate and long-distance services may prove an attractive alternative to commuters who currently drive to work and thus alleviate congestion on the region's roads and highways.

Within the span of two centuries, the history of ferries on the Hudson has come full circle. Small, premium-priced private ferries are once again running from Weehawken and Jersey City and will soon be operating from Hoboken—all traditional centers of ferry activity. Less romantic perhaps than their ancestors, these new ferries offer passengers comfort and convenience and offer municipal officials a new way of tackling the problem of regional mobility. That this new approach to trans-Hudson transportation is in fact a very old one is a testament to the lasting importance of the region's waterways in the economic life of the metropolis.

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[1] Condit, Carl *The Port of New York* (University of Chicago Press, Chicago, 1980), 241.

[2] Additional 'recreational' ferry services operated upriver, including one from Edgewater to 125th St in Manhattan and another from Alpine to Dyckman St.

[3] Although lighters disappeared from the harbor in the late 1960's, car floats can still be seen operating from Greenville Yards in New Jersey to points on Long Island.

[4] The Erie-Lackawanna Rail and Ferry Terminal in Hoboken, completed in 1906, is one of the few terminals of that era still standing. Although sections of it have been removed, the level of workmanship and detail are still evident in both rail and ferry portions of the structure.

[5] This service is operated for Direct Line by Sloan Marine Co.

Introduction for Captain George G. Roberts

Background

Grandson of Captain George Roberts, a pioneer mariner of the Pacific Northwest, who helped found the Alaska Steamship Co., known as Black Ball line, and the Puget Sound Navigation Co., known as Black Ball ferries.

His father continued the family steamship and ferry business as a member of the 'Founders' Syndicate' and the Board of Directors.

Captain Roberts learned the business as a company cadet with Grace Line, and was the youngest Ship's Master on Grace Line Vessels at that time.

During WWII he sailed the North Atlantic and Mediterranean War Zones, in command of the George C. Childress, a Liberty Ship and later the S.S. Santa Rita, a specially constructed C2 type vessel for Grace Line's post war commercial trade.

After WWII, Captain Roberts supervised the W.R. Grace cargo operation in the Pacific Northwest.

In the early 1950's, he joined his family's business and was sent to pioneer a vehicle ferry system along the British Columbia coast. In this position he helped create one of the world's largest fully integrated ferry highway systems.

In 1957 Captain Roberts relocated to the Bay Area with his family and founded a company to improve marine equipment, with distributors located in every major U.S. port.

During the past 15 years he has been involved designing and developing improved vessels, terminals and systems for use in the marine industry.

In 1986 he formed Black Ball Vehicle Ferry Systems to bring vehicle ferries back on the Bay and reintroduce one of the oldest house flags to maritime operations, the Black Ball Line inaugurated in 1816.

JUNE 8, 1988

FERRY SYMPOSIUM TALK

MY BACKGROUND AND EARLY TRAINING ARE THE BASIS FOR MY DEEP INTEREST IN FERRY OPERATIONS. I AM THE THIRD GENERATION OF DOMESTIC FERRY OPERATORS IN MY FAMILY AND WAS TRAINED TO MANAGE THE LARGEST FLEET OF FERRIES IN THE UNITED STATES. THE FOUNDATION OF MY TRAINING WAS TO THINK "TOTAL SYSTEM", NOT JUST ISOLATED FERRY RUNS; TO SEE THE 'BIG PICTURE' OF THE GEOGRAPHIC REGION AND TO PLAN FOR AN INTEGRATED FERRY AND HIGHWAY SYSTEM.

IN ORDER TO DESCRIBE TO YOU TODAY THE FREIGHT SERVICE WE'VE DEVELOPED FOR THE SAN FRANCISCO BAY, IT IS IMPORTANT FIRST TO GIVE YOU THAT 'BIG PICTURE' OF THE TOTAL SYSTEM AND HOW THE FREIGHT SERVICE IS AN INTEGRAL PART OF IT.

THERE IS NO REASON WHY THE SAN FRANCISCO BAY AREA CAN'T HAVE A COMPLETELY INTEGRATED AND SUCCESSFUL TRANSPORTATION SYSTEM SIMILAR TO VANCOUVER, BRITISH COLUMBIA. A SYSTEM THAT COORDINATES THE SERVICE OF PASSENGER FERRIES, BART AND BUSES FOR FOOT TRAFFIC AND LINKS VEHICLE FERRIES AND HIGHWAYS TO RELIEVE HIGHWAY AND BRIDGE CONGESTION.

BY WAY OF EXAMPLE, I'D LIKE TO TAKE A FEW MOMENTS TO GIVE YOU THE BACKGROUND OF THE BRITISH COLUMBIA FERRY SYSTEM.

ALEX M. PEABODY, CHAIRMAN OF THE BOARD OF DIRECTORS OF THE PUGET SOUND NAVIGATION CO. AND ITS SUBSIDIARIES, BLACK BALL LINE AND BLACK BALL FERRIES, CANADA, HAD A NATION-WIDE REPUTATION FOR HIS INNOVATIVE PLANNING AND SOUND FISCAL BASE. IT WAS UNDER HIS DIRECTION THAT I WAS SENT TO VANCOUVER TO MANAGE THIS MASSIVE PIONEERING VENTURE.

WHEN I ARRIVED IN THE EARLY 50'S THE BRITISH COLUMBIA TRANSPORTATION SYSTEM WAS ANTIQUATED, UNLIKE THE CURRENT SYSTEM THAT MR. DEMORO DESCRIBED IN HIS RECENT CHRONICLE ARTICLE, MAY 31ST.

WE MODERNIZED THE ENTIRE BRITISH COLUMBIA SOUTHERN COAST AND THE GULF OF GEORGIA CROSSING, BY DESIGNING AND ENGINEERING A FULLY INTEGRATED, INTERMODULAR FERRY, HIGHWAY, TRUCK, AUTOMOBILE, BUS AND FOOT PASSENGER TRANSPORTATION SYSTEM.

THE SUCCESS OF TODAY'S EFFICIENT BRITISH COLUMBIA TRANSPORTATION SYSTEM IS BASED ON THE FACT IT WAS PLANNED AS A TOTALLY INTEGRATED SYSTEM FROM THE BEGINNING.

IN ORDER TO RESOLVE THE BAY AREA TRANSPORTATION CRISIS IT IS IMPERATIVE THAT A TOTALLY INTEGRATED SYSTEM BE IMPLEMENTED HERE.

THIS IS WHAT I HAVE DEVELOPED OVER THE LAST 5 YEARS, AN INTEGRATED TRANSPORTATION SYSTEM THAT WILL SERVICE THE 6,000 SQUARE MILES OF THE GREATER SAN FRANCISCO BAY AND RIVER METROPOLITAN REGION. FERRIES ARE THE HEART OF THE ENTIRE SYSTEM, THE KEY COMPONENT, WHICH HAS BEEN MISSING FROM TRANSPORTATION PLANNING FOR FIFTY YEARS.

THE TRANSPORTATION WOES OF THE BAY AREA CAN NOT BE SOLVED BY DUPLICATING THE BRITISH COLUMBIA, OR WASHINGTON SYSTEMS, HOWEVER. WE FACE A MORE COMPLEX SITUATION, WHICH WILL REQUIRE JUDICIOUS APPRAISAL TO DETERMINE A SATISFACTORY COURSE OF ACTION.

AS I BEGAN DEVELOPING THE SYSTEM FOR THE BAY, I FOCUSED ON THREE KEY ELEMENTS.

FIRST, DURING PEAK TRAFFIC PERIODS OUR HIGHWAYS AND BRIDGES ARE OVER CAPACITY, WITH GRIDLOCKS OCCURRING REGULARLY. BECAUSE OF THIS CONGESTION TRUCKS AND AUTOMOBILES ARE NO LONGER COMPATIBLE ON THE HIGHWAYS. .PA

A RECENT CALTRANS REPORT STATES, I QUOTE: "ACCIDENTS INVOLVING TRUCKS AND AUTOMOBILES HAVE BEEN INCREASING OVER 10 PERCENT A YEAR...LARGE TRUCK ACCIDENTS CAN CAUSE SEVERE CONGESTION, AN AVERAGE OF 2,500 VEHICLE HOURS OF DELAY TO MOTORISTS PER ACCIDENT."

"...SEPARATING TRUCKS AND PASSENGER VEHICLE TRAFFIC HAS PROVEN SUCCESSFUL IN REDUCING DELAY AND ACCIDENTS, EXAMPLES OF THIS ARE ROUTE 580, THE MACARTHUR FREEWAY IN OAKLAND AND ROUTE 5 NORTH OF LOS ANGELES."

ANOTHER CALTRANS QUOTE STATES: "BECAUSE OF THEIR SLOW ACCELERATION, BRAKING DISTANCE REQUIREMENTS AND LONG TRAILERS, TRUCKS TAKE UP MUCH MORE ROADWAY SPACE, THEREBY LIMITING THE TOTAL VEHICULAR CAPACITY OF THE HIGHWAY."

I REALIZED THAT A MAJOR PART OF THE SYSTEM SHOULD BE DIRECTED TO THE TRUCKING INDUSTRY.

I ALSO FOCUSED ON THE UNIQUE NATURAL CONTOUR OF THE WATERWAY ITSELF AND THE APPROPRIATE VESSEL DESIGN FOR SHORT RUNS. A SHORT FERRY RUN OF 20 MINUTES OR LESS DOES NOT REQUIRE A SUPER FERRY, AS USED ON LONG RUNS IN WASHINGTON STATE AND BRITISH COLUMBIA. THE DESIGN CRITERIA NEEDED TO REFLECT THE TARGETED USE, I.E. THE DISTANCE OF THE RUN, THE TYPES OF VEHICLES BEING CARRIED, AND THE AVAILABILITY OF SERVICE.

I KNEW THAT IT WAS POSSIBLE TO DESIGN FERRIES TO MEET THE TRUCKING INDUSTRY'S NEEDS, TO PROVIDE THEM A MORE COST EFFECTIVE MEANS OF TRANSPORTING THEIR CARGO AND AT THE SAME TIME, TO RELIEVE THE HIGHWAYS AND BRIDGES OF ADDED CONGESTION.

I CURRENTLY HAVE ON FILE WITH THE PUBLIC UTILITIES COMMISSION THREE APPLICATIONS, WHICH WILL PROVIDE FERRY SERVICE TO TRUCKS AND COMMERCIAL VEHICLES.

THE FIRST SERVICE WILL RELIEVE BRIDGE AND HIGHWAY CONGESTION DURING PEAK PERIODS BY PROVIDING TRUCKS AN ALTERNATE MEANS OF CROSSING THE BAY AT BRIDGE CROSSINGS. DURING THE 3 PEAK HOURS IN THE A.M. AND IN THE P.M., TRUCKS WILL BE DIRECTED ONTO VERY LARGE, DOUBLE DECKED, DOUBLE ENDED SELF-PROPELLED FERRIES.

IF YOU'D LIKE TO REFER TO OUR HANDOUT, THE FERRY DESIGN IS DRAWN ON THE REVERSE SIDE. EACH FERRY HOLDS 200 TRUCKS AND THE UNIQUE DESIGN ALLOWS 10 LANES TO UNLOAD AND LOAD IN 5 MINUTES. THERE ARE NO PASSENGER ACCOMMODATIONS. THE DRIVERS REMAIN IN THEIR TRUCKS AS THEY WOULD ON THE HIGHWAY. THE TRANSIT TIME IS BETWEEN 10 AND 15 MINUTES. .PA

THE 2ND SERVICE WILL DIVERT LONG-HAUL DOMESTIC TRUCKS FROM THE AREAS HIGHWAYS. THE FERRIES WILL BE DOUBLE DECKED WITH A CAPACITY OF 100 FORTY FOOT TRUCKS OR TRAILERS. THEY

WILL BE TUG PROPELLED USING THE RAFT-PUSH-TOW SYSTEM.

A RAFT IS COMPOSED OF A NUMBER OF FERRIES, TUG-PROPELLED, AND TEMPORARILY JOINED TOGETHER FOR WATER TRANSIT.

THE TERM "FERRY" IS USED INSTEAD OF "BARGE" BECAUSE THIS SERVICE IS A DOMESTIC, SCHEDULED, ROLL-ON/ROLL-OFF SYSTEM CONNECTED WITH THE PUBLIC HIGHWAYS.

TWO RAFTS WILL DEPART DAILY, ONE FROM THE SACRAMENTO AREA, THE OTHER FROM THE SOUTH BAY AREA. STOPS WILL BE MADE AT TERMINALS ALONG THE WAY -- DROPPING AND ADDING FERRIES. A VERY EFFICIENT SYSTEM, USING EXPRESS AND LOCAL FEEDER TUGS HAS BEEN DEVELOPED TO ALLOW NEXT DAY DELIVERY. THIS START-UP SERVICE, OPERATING 6 DAYS PER WEEK, IS EXPECTED TO REMOVE 25 MILLION LONG HAUL DOMESTIC TRUCK MILES FROM THE REGIONS HIGHWAYS PER YEAR.

TO GIVE YOU AN IDEA OF THE TREMENDOUS CARRYING CAPACITY AND COST EFFECTIVENESS OF THE SYSTEM, LETS LOOK AT THE I-80 CORRIDOR BETWEEN SACRAMENTO AND SAN FRANCISCO, WHICH IS THE MOST CONGESTED HIGHWAY BRIDGE CORRIDOR IN THE REGION.

OUR VEHICLE FERRIES SERVICING THE CORRIDOR HAVE THE CAPABILITY OF REMOVING 40,000 TRUCKS PER DAY FROM THE BRIDGES ALONE.

THE ESTIMATED COST OF THIS INTEGRATED NETWORK, INCLUDING THE FERRIES, TERMINALS, APPROACHES AND HIGHWAY IMPROVEMENT IS $250 MILLION DOLLARS. KEEP IN MIND THAT THE IMPLEMENTATION WOULD REQUIRE MINIMUM HIGHWAY DISRUPTION.

ON THE OTHER HAND, FOR THE SAME RELIEF, USING CALTRANS STANDARD HIGHWAY BRIDGE SYSTEM, THE COST WOULD BE AN ESTIMATED 2.8 BILLION DOLLARS, WITH TREMENDOUS DISRUPTION TO TRAFFIC OVER A 5 YEAR PERIOD.

ACCORDING TO MY ESTIMATE, WE ARE APPROACHING A $2.5 BILLION DOLLAR BLUNDER.

IT IS MY BELIEF THAT THERE IS AN OPPORTUNITY AND CRITICAL NEED NOT ONLY FOR FREIGHT-RELATED FERRIES BUT FOR A TOTAL FERRY SYSTEM ON THE BAY NOW.

IT'S DECISION TIME!

DO WE WANT A FULLY INTEGRATED COST EFFECTIVE TRANSPORTATION SYSTEM FOR THE BAY AREA?

IF SO, WHAT IS THE IDEAL SCENARIO TO MOVE AHEAD?

1) STOP ALL NEW APPROVED CONSTRUCTION OF HIGHWAYS AND BART.

2) REMOVE THE RESTRICTIVE TOLL BRIDGE BOND LANGUAGE PROHIBITING FERRY COMPETITION.

3) CONDUCT A STUDY TO VERIFY THAT OUR SYSTEM, NOW UNDER APPLICATION WITH THE PUBLIC UTILITIES COMMISSION, PROVIDES A VIABLE AND COST EFFECTIVE SOLUTION TO THE VAST BAY AREA TRANSPORTATION DILEMMA.

4) DEVELOP A TOTALLY INTEGRATED MASTER PLAN TO INCORPORATE ALL MODES OF TRANSPORTATION INTO A CONSOLIDATED BAY AREA SYSTEM.

WORKING TOGETHER, THE PUBLIC AND PRIVATE SECTORS CAN CREATE AN EFFICIENT TRANSPORTATION SYSTEM FOR THE GROWING NEEDS OF THE BAY AREA.

THINK FLOATING HIGHWAY

CURRENT BAY AREA TRANSPORTATION SITUATION

- Highway congestion at critical levels.
- Accidents, stalls, bad weather create gridlocks.
- Bridge Capacity insufficient to handle peak periods.
- Bay Area "on the verge of economic disaster caused by immobility." Steve Weir, MTC
- Bridge closure prohibits vehicles crossing waterway.
- Pollution increasing.

IDEAL BAY AREA TRANSPORTATION SCENARIO

- Eliminate highway congestion.
- Reduce load on Bay Bridge.
- Provide alternative means to cross Bay.
- Reduce accidents.
- Eliminate tax burden.
- Decrease pollution.
- Implement in short time frame, with no disruption to traffic.

ALTERNATIVES—WHICH CREATE THE IDEAL SCENARIO?

HIGHWAY SYSTEM EXPANSION .... NO
ANOTHER BRIDGE CROSSING .... NO
A TUBE UNDER BAY .... NO
LAND MASS TRANSIT SYSTEM .... NO
WATER HIGHWAY SYSTEM .... YES

A total water transportation system has been developed to use the "water highway" stretching through the middle of the Bay Area from Sacramento to San Jose. (See reverse side). The Major part of the system will provide efficient scheduled vehicle ferry service to the trucking industry at a significant cost savings to their current operating cost. Other aspects of the system include a mass evacuation system in the event of a major disaster.

This water transportation system was developed by Black Ball Vehicle Ferry Systems and is currently under application with the Public Utilities Commission.

This Spring 1988 the Metropolitan Transportation Commission is sponsoring a Ferry Symposium to study this and other water oriented options. It is BBVFS's conviction that now is the time for the transportation industry to support the exploration of a water transportation system. Working together we can create a smooth running transportation system for the growing needs of the Bay Area residents and businesses.

For information on the Ferry Symposium write to:

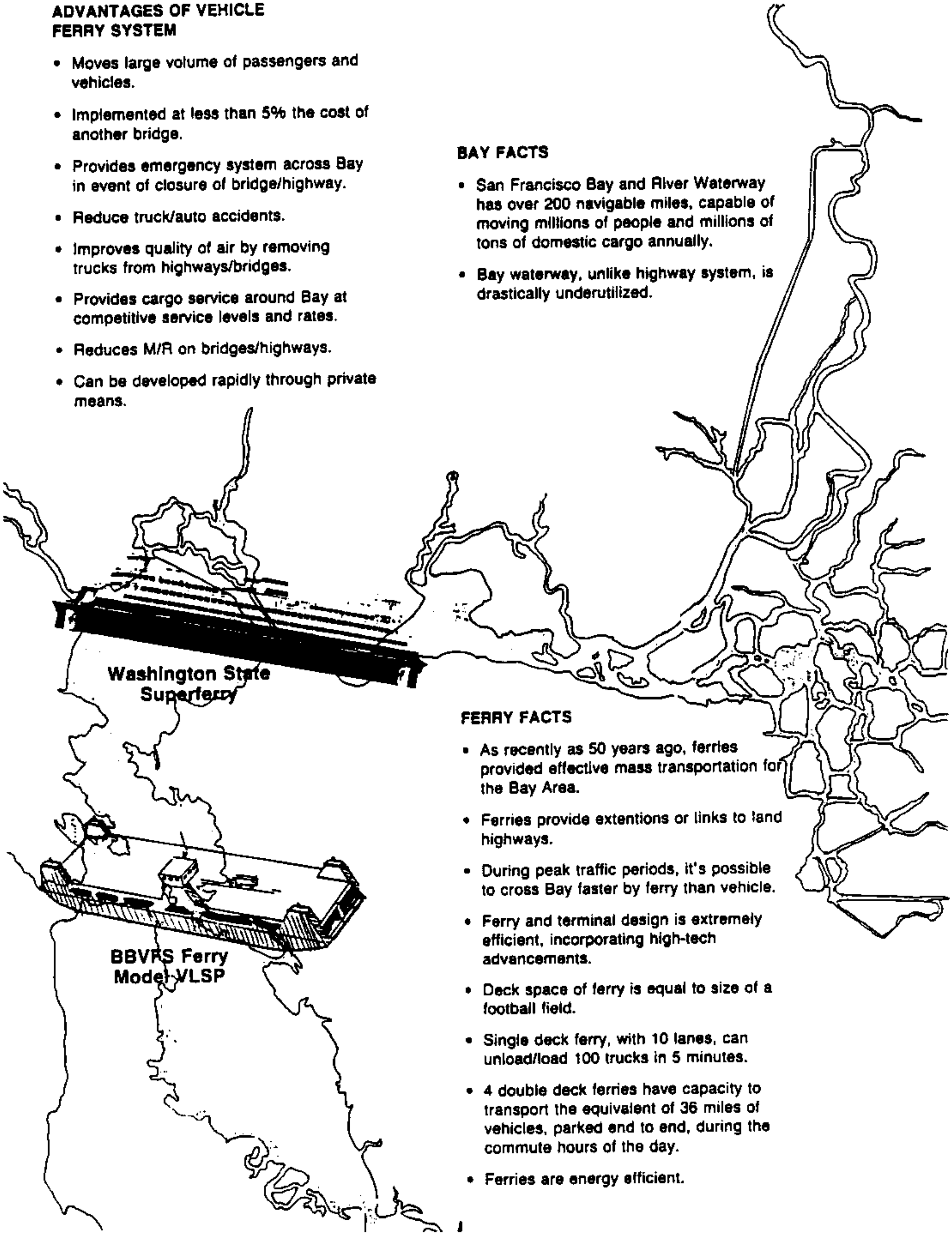
Professor Adib Kanafani
Institute of Transportation Studies
109 McLaughlin Hall
Berkeley, California 94720

For information from BBVFS write to:

Captain George G. Roberts
840 Adobe Drive
Santa Rosa, CA 95404

ADVANTAGES OF VEHICLE FERRY SYSTEM

- Moves large volume of passengers and vehicles.
- Implemented at less than 5% the cost of another bridge.
- Provides emergency system across Bay in event of closure of bridge/highway.
- Reduce truck/auto accidents.
- Improves quality of air by removing trucks from highways/bridges.
- Provides cargo service around Bay at competitive service levels and rates.
- Reduces M/R on bridges/highways.
- Can be developed rapidly through private means.



BAY FACTS

- San Francisco Bay and River Waterway has over 200 navigable miles, capable of moving millions of people and millions of tons of domestic cargo annually.
- Bay waterway, unlike highway system, is drastically underutilized.

FERRY FACTS

- As recently as 50 years ago, ferries provided effective mass transportation for the Bay Area.
- Ferries provide extentions or links to land highways.
- During peak traffic periods, it's possible to cross Bay faster by ferry than vehicle.
- Ferry and terminal design is extremely efficient, incorporating high-tech advancements.
- Deck space of ferry is equal to size of a football field.
- Single deck ferry, with 10 lanes, can unload/load 100 trucks in 5 minutes.
- 4 double deck ferries have capacity to transport the equivalent of 36 miles of vehicles, parked end to end, during the commute hours of the day.
- Ferries are energy efficient.

O U R

H Y D R O F O I L B O A T S

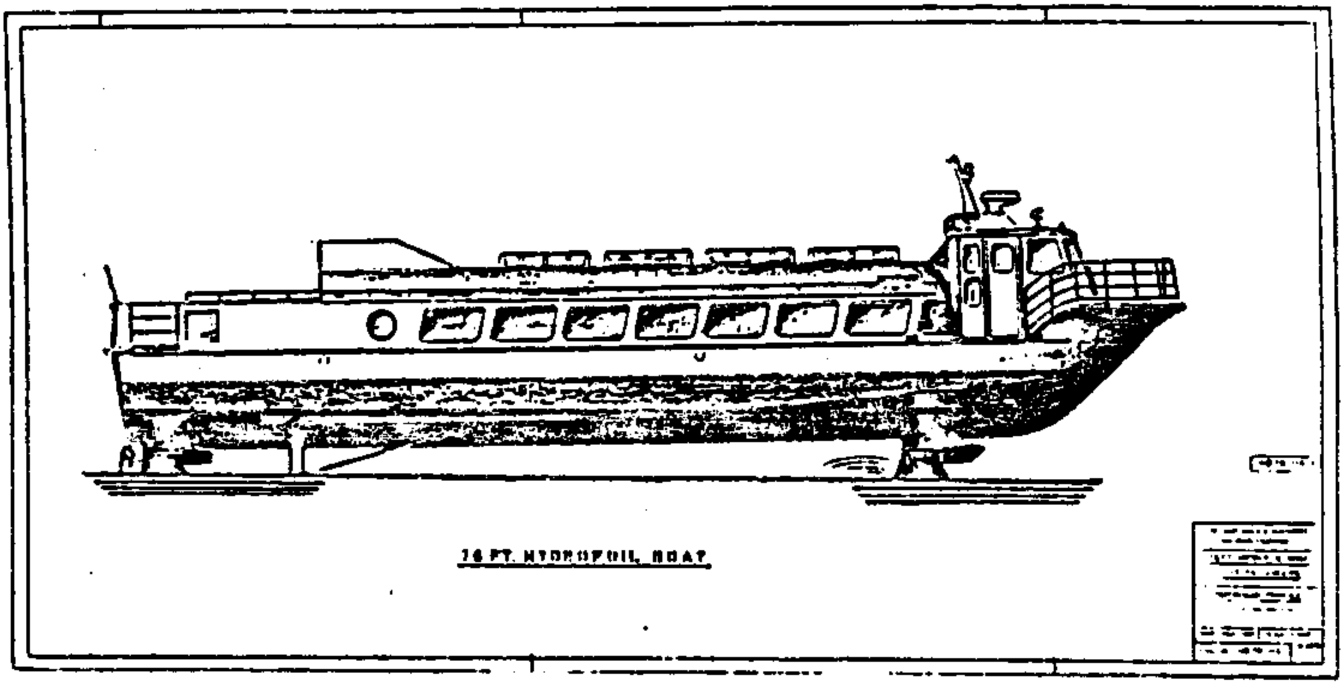
THE MOST EFFICIENT, FASTEST, SMOOTHEST AND MOST ECONOMIC
WAY OF TRANSPORTATION ON THE WATER

THREE TIMES MORE MILAGE PER GALLON FUEL
THEN THE BEST CONVENTIONAL PLANING HULL

WITH A SIMPLE, STURDY AND ECONOMIC FOIL SYSTEM
WHICH COMBINES AND SURPASSES THE BEST CHARACTERISTICS
OF THE HUNDREDS OF HYDROFOIL BOATS OPERATING AROUND THE WORLD

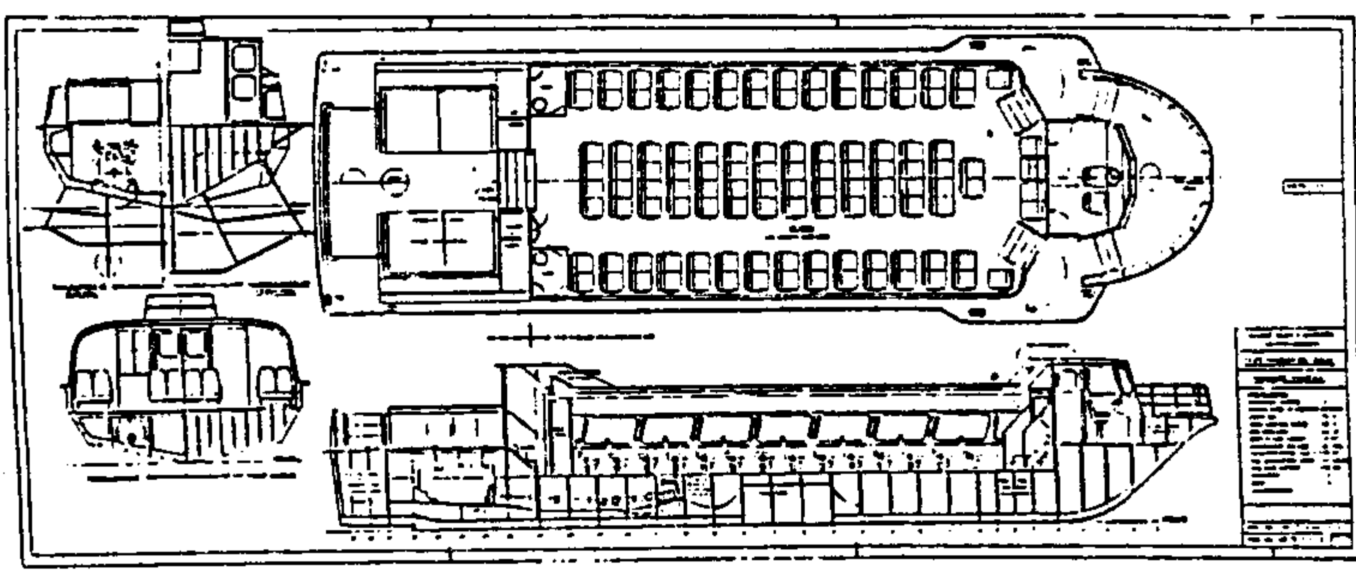
THE ANSWER FOR CITIES WITH WATER WAYS
TO SOLVE THEIR TRANSPORTATION PROBLEMS

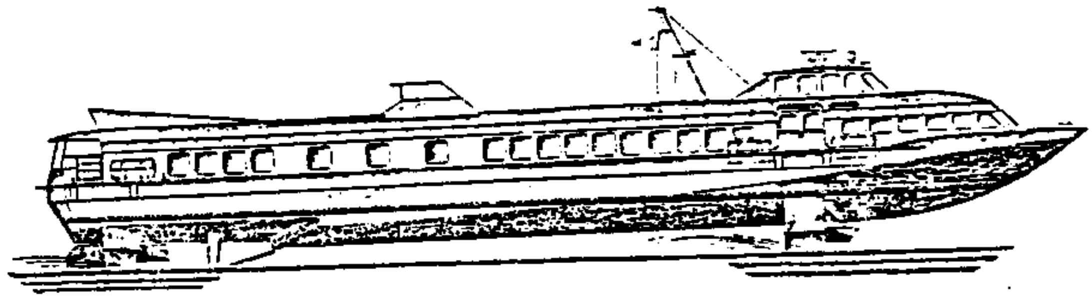
H E L M U T K O C K & ASSOCIATES
Design Engineering Construction
4125 W. Point Loma Blvd.
Apt. 209
San Diego, Ca. 92110
(619) 224-6657



76 FT. H Y D R O F O I L B O A T

115 P A S S E N G E R S, COMMUTER

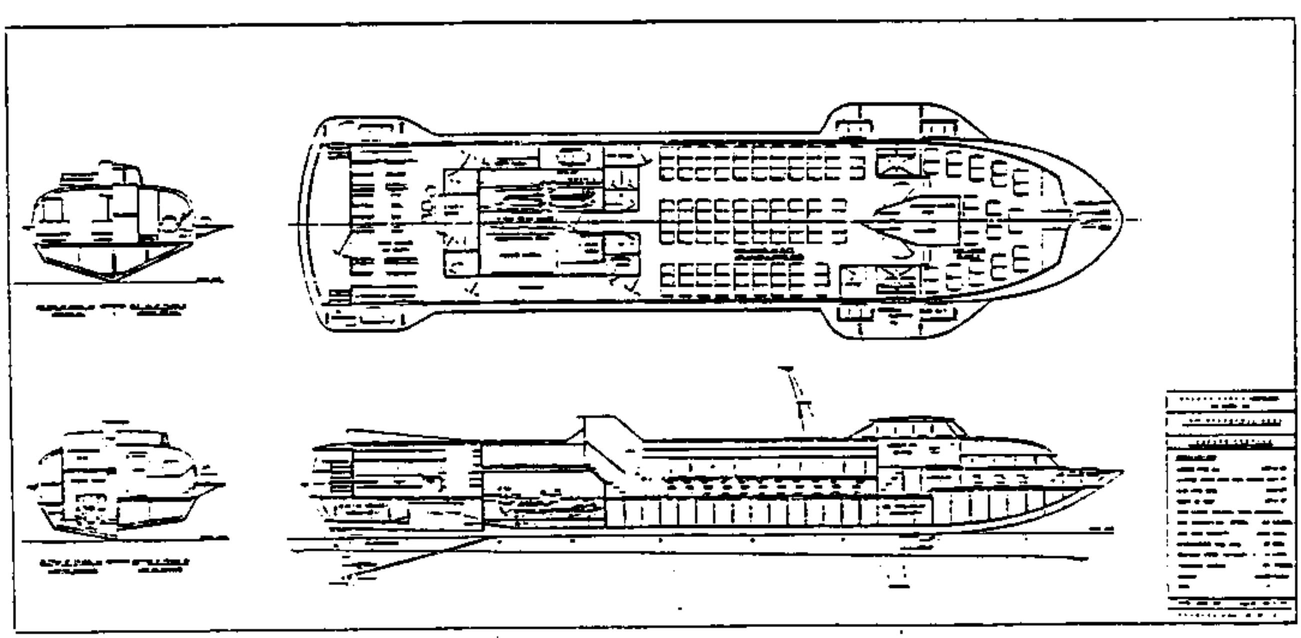


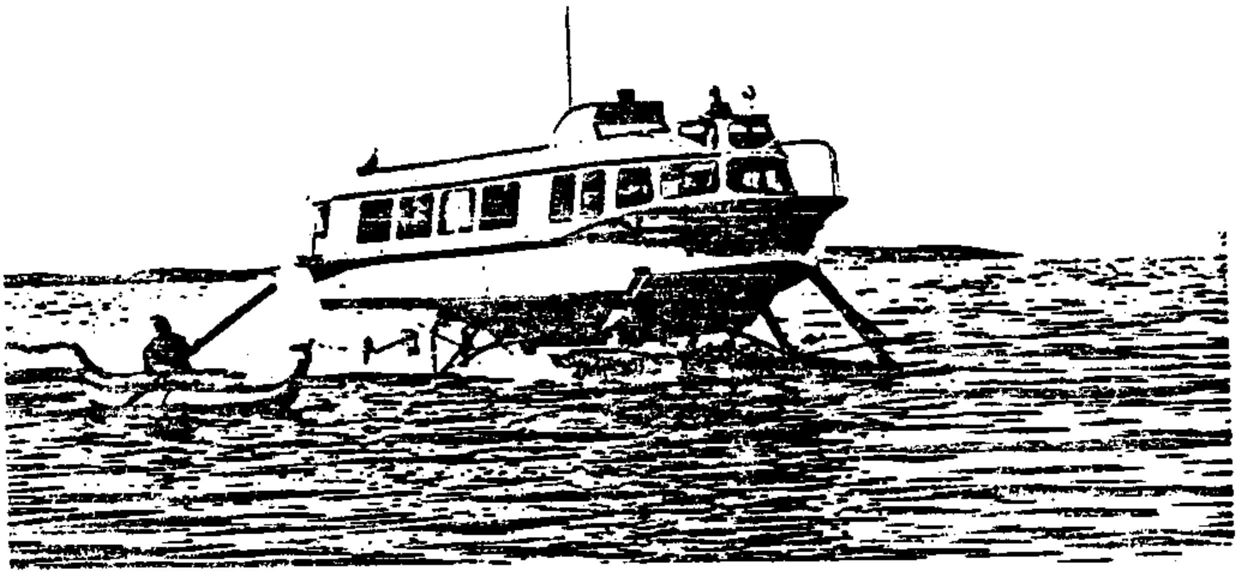


112 FT. H Y D R O F O I L B O A T

159 P A S S E N G E R S, COMMUTER

Cruising speed	40 m.p.h.	35	knots
Length over all		112'- 0"	
Beam over deck		25'- 0"	
Width over foil fences		33'- 0"	
Draft at rest or hull borne		11'- 0"	
Displacement full load		68	tons
Power: Twin diesel engines, total		3,200	H.P. Max.
Twin Propeller			
Fuel consumption, Approx.		85	Gal/Hr.
Office			
Galley			
Restrooms 4			
Airconditioning			
Crew: Pilot, Copilot-mechanic, Deckhand, Hostess			





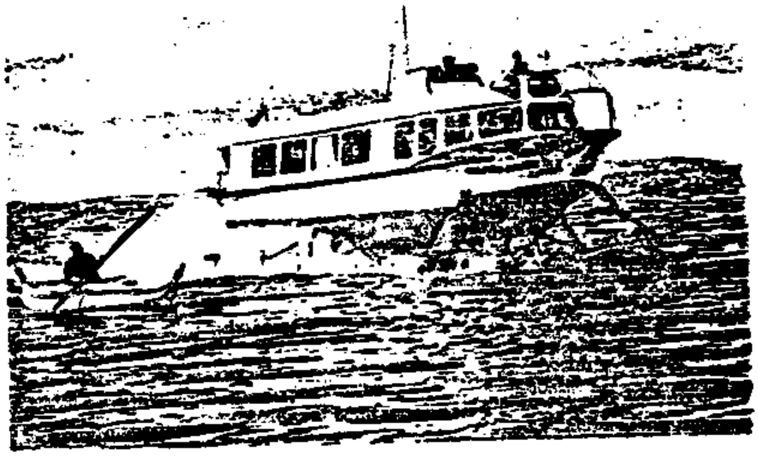
50 FT. H Y D R O F O I L B O A T

" B O L I V I A A R R O W "

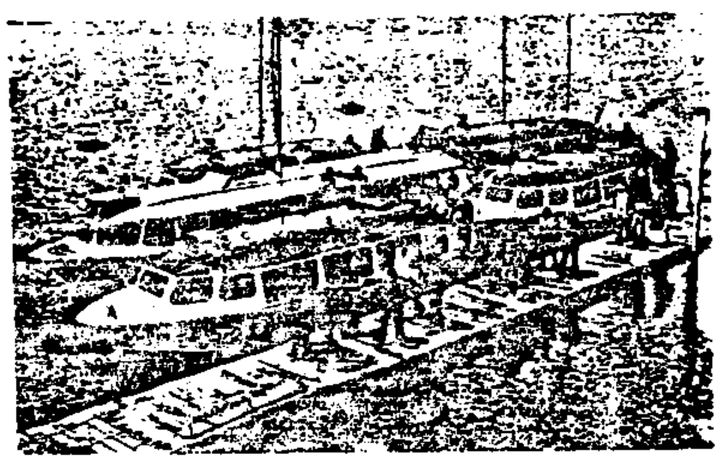
LAKE TITICACA, BOLIVIA

H E L M U T K O C K, DESIGNER AND BUILDER

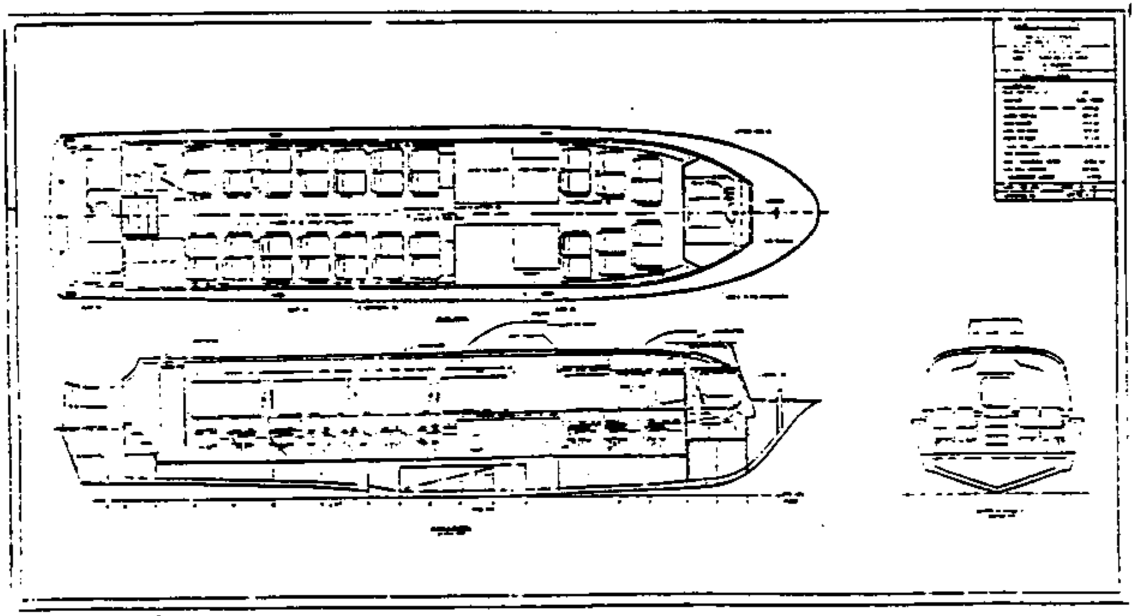
OWNER & OPERATOR, CRILLON TOURS.LTDA. LA PAZ, BOLIVIA



50 FT. HYDROFOIL BOAT
"BOLIVIA ARROW"
LAKE TITICACA, BOLIVIA



FOUR 35 FT. HYDROFOIL BOATS AROUND 50 FT. "BOLIVIA ARROW"
ON LAKE TITICACA, BOLIVIA



HYDROFOIL BOAT "BOLIVIA ARROW"

LAKE TITICACA, BOLIVIA

OWNER & OPERATOR: CRILLON TOURS LTDA., LA PAZ, BOLIVIA

Designet and built by HELMUT KOCK with bolivian native crew in Huatajata, lake Titicaca in Bolivia, at 12,000 feet above sea level, year 1976 and in operation since Febr. 1977.
All material, equipment, engines, tools and machinery were imported from USA.
The entire boat and the foils are of welded aluminum construction.
The foils are of the H. Kock design,

PARTICULARS:

Passenger capacity	40
Luggage	2,000 lb.
Cruising speed	32 knots
Length over all	50' - 0"
Beam over deck	11' - 6"
Width over foils	16' - 0"
Draft at rest	7' - 0"

Displacement full load 14 tons
Power: twin Cummins Diesel VT8-370
350 SHP. each, total 700 SHP.
less 30% by 12,000 Ft.
altitude over sea level.
Fuel consumotion 27 gallons Hr.

JANE'S YEARBOOKS

SURFACE SKIMMERS 1986

HYDROFOILS

HELMUT KOCK

4125 West Point Loma Blvd, Apartment 209, San Diego, California 92110, USA
Telephone: (619) 224 6657

Helmut Kock, designer of the Honald Albatross hydrofoil, which operated New York's first commercial hydrofoil service, and former chief engineer of International Hydrolines Inc, has designed and built a 15·27m (50ft) hydrofoil ferry for Crillon Tours of La Paz, Bolivia. The craft, the *Bolivia Arrow*, was built during 1976 at Huatajata, on the shore of Lake Titicaca (3,700m; 12,000ft) and entered service in February 1977.

All materials, equipment, engines, tools and machinery were imported from the USA. The entire craft is of welded aluminium and was built by Helmut Kock with the aid of a few Bolivian Indians who, in order to undertake the work, were taught how to use modern hand and electric tools and automatic welding techniques.

He has been responsible for modifying the three Sea World hydrofoils to improve their load capacity and performance.

BOLIVIA ARROW

Crillon Tours Ltd, La Paz, Bolivia, has operated four of Helmut Kock's 20-seat Albatross craft on tourist routes across Lake Titicaca since the late 1960s. The need to cope with increasing tourist traffic and to provide a craft capable of crossing the full length of the lake led to a decision by Darius Morgan, Crillon's chief executive, to build a craft tailored to the company's requirements on the shore of the lake. Construction of the *Bolivia Arrow* began in December 1975 and it was launched in September 1976. The craft entered service in February 1977. It is designed for medium range fast ferry services on rivers, bays, lakes and sounds.

FOILS: Surface-piercing trapeze foil system with 'W' configuration pitch stability subfoil. Welded aluminium construction designed by Helmut Kock, US patent no 3, 651, 775.

POWER PLANT: Twin Cummins VT8-370 diesels, each developing 350shp at sea level and oversize to compensate for loss of power due to altitude. Each engine drives its own propeller via an inclined shaft. Engine room is amidships, after the third row of seats.

ACCOMMODATION: Crew comprises a captain, deckhand and a tourist guide. The captain is accommodated forward in a raised wheelhouse. His seat is on the hull centreline with the wheel, engine controls and main instrumentation in front. Passengers are accommodated in a single saloon with seats for 40. Seats are arranged in ten rows of two abreast, separated by a central aisle. A washbasin/WC unit is provided and also a luggage compartment. All void spaces are filled with polyurethane foam.

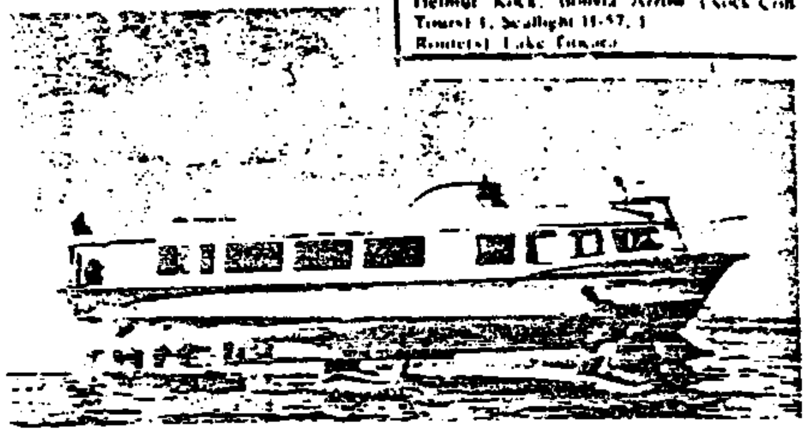
DIMENSIONS
Length overall: 15·24m (50ft)
Hull beam: 3·55m (11ft 8in)
Width across foils: 5·79m (19ft)
Draft, hullborne: 2·28m (7ft 6in)

WEIGHTS
Displacement fully loaded: 14 tons

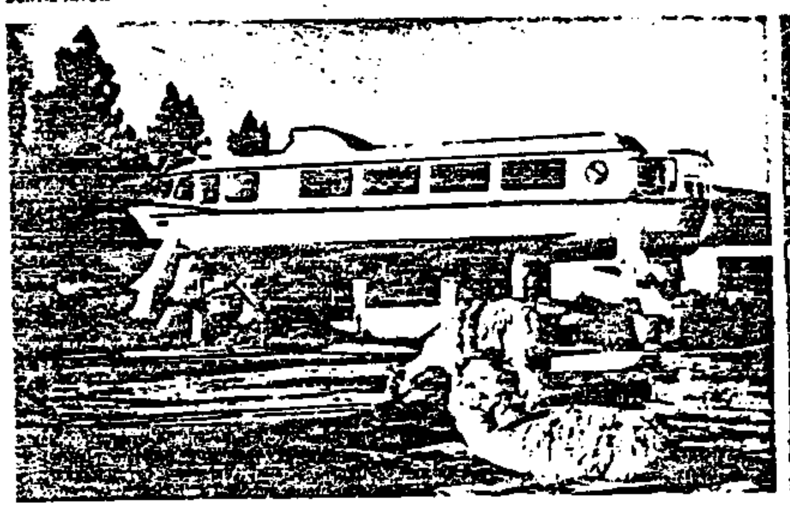
PERFORMANCE
Cruising speed: 32 knots

BOLIVIA
CRILLON TOURS LTD

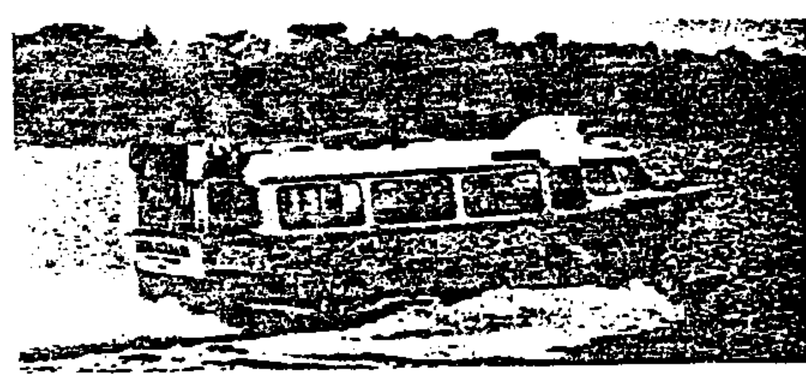
PO Box 4785, Av Camacho 1223 [illegible] La Paz, Bolivia
Telephone [illegible] 20222
Telex [illegible]
Cables [illegible]
Officials
Darius Morgan, *General Manager*
Helmut Kock, *Hydrofoil Designer and Consultant*
Type(s): Albatross (Honold) 4, modified Helmut Kock, Bolivia Arrow (Kock Craft) Tourist 1, Seaflight H-57, 1
Route(s): Lake Titicaca



Bolivia Arrow



Bolivia Arrow showing foil system



Helmut Kock Albatross hydrofoil *Flecha Guarani* operating on Lake Itaipai, Paraguay

HIGHLIGHTS OF THE HELMUT KOCK HYDROFOIL SERVICE

Helmut Kock (HK) Hydrofoils offer highly versatile, cost-efficient, comfortable and safe high speed marine transportation for the San Francisco Bay Area and its environs. The Semi-Submerged Foil System (SSFS) patented by Mr. Kock combines the best features of both submerged and surface-piercing foil systems. HK Hydrofoils range in size from 22 passenger to 300 passenger craft. The MTC'S E 5 report, states that "based on educated judgment crafts capable of carrying 60 - 120 passengers appear to be most appropriate for urban use, depending on local traffic demands."

ECONOMICS

1) Compared to any existing high speed passenger ferry in the United States Forum's 66,72, 78 and 89 passenger SC hydrofoils have by far the lowest fuel consumption and operating costs. (Less than $135 per hr.)
2) Built in California -- boosts economy and creates jobs.
3) For the 66 to 89 passenger craft, costs range from under $800,000 to under $1,000,000.
4) Construction time for the 66 and 72 passenger vessels is 4 to 6 6 months.

ENVIRONMENTAL ASPECTS

1) No water pollution
2) Lowest fuel consumption of any high-speed marine vessels -- hence emissions into the air are minimal.
3) Total impact -- reduction of Bay Area air pollution by diverting people from cars and hence reducing motor vehicle transportation.
4) Almost no wake (this is a safety factor as well).

SAFETY

1) Good speed for Bay Area water traffic conditions. In the past excessive speed by high speed marine vessels has been associated with collisions and injuries.
2) High degree of precision in maneuverability.
3) Exceptionally short stopping distance and time from full speed.
4) Single level construction enhances stability.
5) No stairs (stairs are a hazard on high speed marine vessels).
6) Experience has demonstrated that the patented Kock foils will shear through most flotsam (debris) without damage or interruption of service.
7) Kock foils shear off at fixed impact level and in the unlikely event of major collision or grounding, the foil shearage will absorb the shock of impact and protect the passengers.

8) In the millions of passenger miles and nearly 25 years of operation there has never been a passenger injury or insurance claim on any of the 6 Kock hydrofoils which remain under Mr. Kock's control.*

PRACTICALITY

1) Comfortable seating -- airline quality.
2) Patented semi-submerged foil design offers superior stability, maneuverability, and protection against the roll, heave and pitch of rough seas.
3) Fore and aft stabilization foils and patented short semi-submerged foils provide mechanical advantage against water forces.
4) Although hydrofoils are already rated as quiet in a major MTC study, a new Kock noise-control feature will give SC hydrofoils an even more quiet ride.
5) SC hydrofoils are inherently stable and possess a superior repair record.
6) Smaller passenger vessels offer greater flexibility when used in fleets.
7) When ferries are carrying near-capacity loads, larger craft experience longer delays in loading and unloading (not unlike problems encountered in getting off a crowded 747 airplane).
8) Practicality -- easy to train hydrofoil crews, offering advantages in back-up personnel in case of pilot illness or vacation.

Standard hydrofoils have offered 30 years of solid, safe and proven performance throughout the world. They are used extensively in Europe, Asia, South America, Africa and the Soviet Union. They provide speedy, reliable transportation in the rough waters of Northern Europe as well as in the log-infested waters, of Northern Russia and Siberia. These are the efficient, yet simple workhorses of the world's waterways.

*There are also no known injuries or insurance claims related to any of the other Kock hydrofoils, most of which Mr. Kock has kept track of.

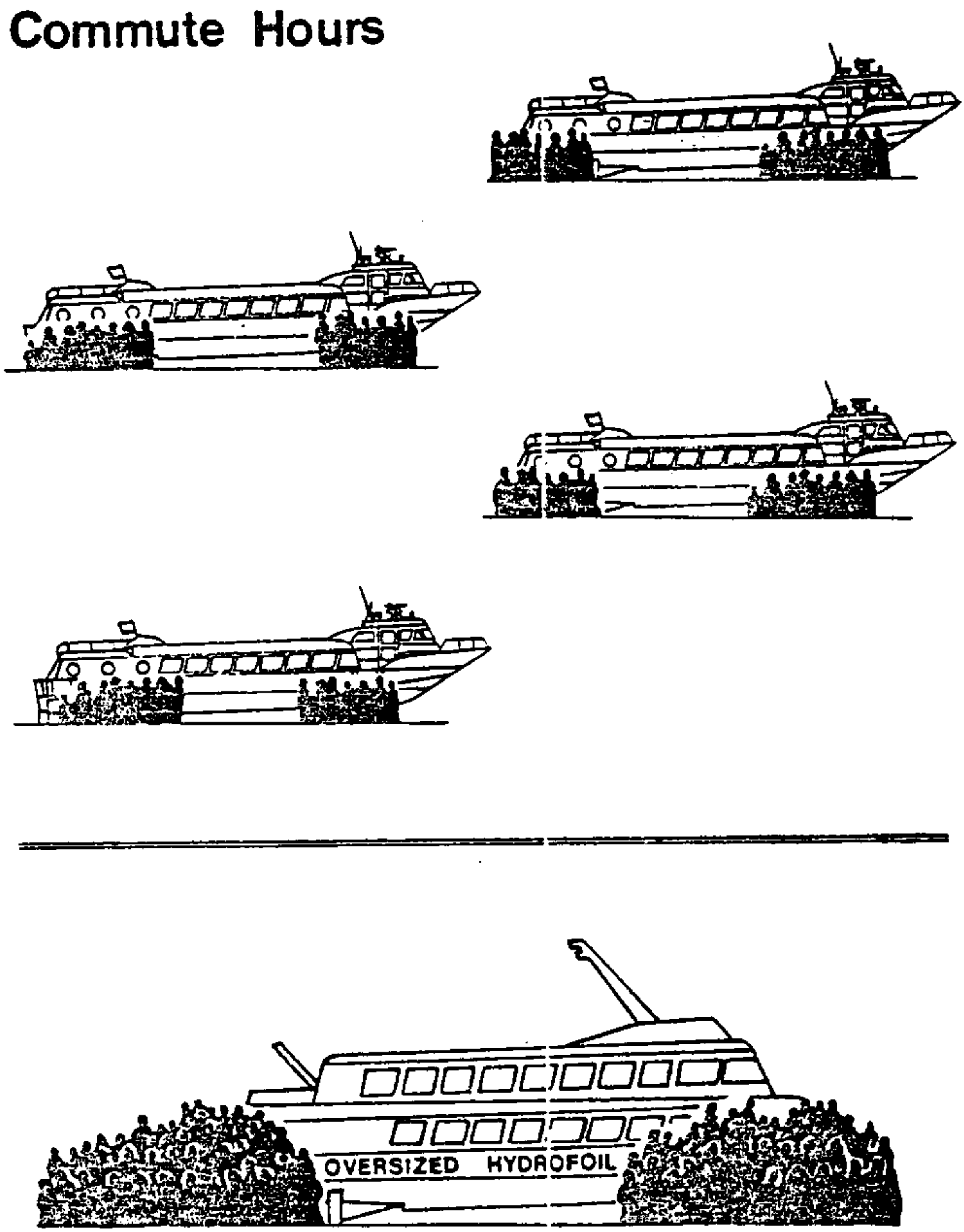


FIGURE II

The crowding problem of the oversized hydrofoil is characterized by congestion and crowding at the vessel s doors. Each 72- passenger Hydrofoil has 2 doors for easy embarcation and debarcation.

March, 1985

ADVANTAGES OF HYDROFOIL SERVICE

1) In case a vessel breaks down service is still available via the other two vessels. Reliability is a key factor in commuter transportation service.

2) Frequency of service -- commuter service approximately every 15 minutes versus every 80 minutes; non-commute hour service every 30 minutes versus every 80 minutes.

3) Cheaper to operate and more profitable during non-commute hours when hydrofoil route service drops to 2 vessels. One vessel would be diverted to non-commute capital making enterprises such as tourism, charters or sporting event group trips. The money earned in the latter enterprises will help keep down the cost of commuting.

ESTIMATED CAPITAL COSTS

400 passenger catamaran	$1.8 million	(800 commuter round trips)
two 89 passenger hydrofoils	$1.9 million	(623 commuter round trips)
three 89 passenger hydrofoils	$2.8 million	(890 commuter round trips)

ESTIMATED OPERATING COSTS

	catamaran	1 hydrofoil	fleet of 3 hydrofoils
Fuel	$70/hr	$42/hr	$105/hr
Maintenance and other operating costs	$50/hr	$10/hr	$ 25/hr
TOTAL	$120/hr	$52/hr	$130/hr

Crew costs for one catamaran are equivalent to those of a fleet of 3 hydrofoils (based on average use of 2½ hydrofoils throughout the daily service period).

CONCLUSION

The extra costs for a fleet of 3 hydrofoil vessels are minimal over time and worth the flexibility. Additionally, that flexibility allows use of the vessel for profit earning enterprises which could place the entire operation well into the black, although the commuter operation by itself may be able to do that (depending upon insurance and other costs). The frequency and reliability of the service is what is most important to getting people out of their cars and relieving highway congestion. A new service for the San Francisco -- Marin corridor using a fleet of 3 hydrofoil vessels could be very successful. This service could begin in 6 to 8 months, with the first vessel built and delivered within about 5 months. The licensee is located in San Diego.

SAMPLE ROUTE SCHEDULE FOR HYDROFOIL SERVICE BETWEEN ALAMEDA AND SAN FRANCISCO

ROUTE #2

EAST BAY TO SAN FRANCISCO FERRY TERMINAL

Distance:	6, 7, or 8 N.M. (Nautical Miles) Depending on selected departure site. For the purpose of this sample, We are using distance of 8 N.M.
Trip Time:	14 Minutes O.W. (One Way)

Proposed Schedule: East Bay to San Francisco Route

Leave East Bay	Ar. S.F.		Leave S.F.	Ar. East Bay
5:50 A.M.	6:04 A.M.		6:14 A.M.	6:28 A.M.
6:38 A.M.	6:52 A.M.		7:02 A.M.	7:16 A.M.
7:26 A.M.	7:40 A.M.		7:50 A.M.	8:04 A.M.
8:14 A.M.	8:28 A.M.		8:38 A.M.	6:52 A.M.
9:02 A.M.	9:16 A.M.	-+-	10:10 A.M.	10:24 A.M.
10:34 A.M.*	10:48 A.M.			

-+-Crew Lunch 9:25 to 10:00
Crew has 10 Min. Break 10:55 to 11:05

Tourism 11:10 to 2:40 - 7 Trips

New Crew at 12:30

			2:50 P.M.*	3:04 P.M.
3:14 P.M.	3:28 P.M.	-o-	4:15 P.M.	4:29 P.M.
4:39 P.M.	4:53 P.M.		5:18 P.M.	5:32 P.M.
5:42 P.M.	5:56 P.M.		6:18 P.M.	6:32 P.M.
6:42 P.M.*	6:56 P.M.		7:10 P.M.	7:24 P.M.

-o-Crew Lunch 3:35 to 4:05
Crew has 10 Min. Break 5:00 to 5:10

Crew Hours: 5:30 A.M. to 8:00 P.M.

13 Hours of Operation: CREW 1 - 6-1/2 Hours
CREW 2 - 7 Hours
(Engine shut down during crew lunches)

Pilots have 8 minute breaks between each arrival and departure. Deckhands and stewardesses are eligible to alternate in taking 5 minute breaks between selected arrivals and departures.

NOTE: Passengers begin boarding 10 minutes prior to the first departure. Concurrent embarcation and debarcation takes 7 to 8 minutes, even with disabled passengers: embarcation or debarcation alone take only 3 to 5 minutes. Docking and launching times are included in the 10 minute arrival-departure interval. Actual published schedules will include diagrams with arrows.

PROPOSED WEEKEND TOURISM AND SHOPPER'S SPECIALS FOR ROUTE #2

Shopper's Specials

Leave East Bay	Arrive S.F.
9:25 A.M.	9:39 A.M.

Tourist Runs S.F.

(20 Min. Tours of S.F. Bay at 10 N.M./Tour)

Leave	Return
9:45 A.M.	10:05 A.M.
10:15 A.M.	10:35 A.M.
10:45 A.M.	11:05 A.M.
11:15 A.M.	11:35 A.M.
11:45 A.M.	12:05 P.M.
12:15 A.M.	12:35 P.M.

Crew Lunch 12:40 to 1:10

Leave	Return
1:15 P.M.	1:35 P.M.
1:45 P.M.	2:15 P.M.

Shopper's Specials Return

Leave S.F.	Arrive East Bay
2:25 P.M.	2:39 P.M.

Crew Hours 9:00 A.M. to 3:00 P.M.

(Engine shut down during crew lunch)

5-1/2 Hours of Operation

Pilots have 8 minute breaks between each arrival and departure. Deckhands and stewardesses are eligible to alternate in taking 5 minute breaks between selected arrivals and departures.

NOTE: Passengers begin boarding 10 minutes prior to first departure. Concurrent embarcation and debarcation takes 7 to 8 minutes, even with disabled passengers: embarcation or debarcation alone take only 3 to 5 minutes. Docking and launching times are included in the 10 minute arrival-departure interval. Actual published schedules will include diagrams with arrows.

*Weekend Shopper's and Tourist's Special Excursions. To be coordinated with local merchants and possibly subjected to discounted fares.

PROJECTIONS: ROUTE #2

MONTHLY CAPACITY DATA: EAST BAY TO SAN FRANCISCO ROUTE

(Rounded off to the nearest seat)

Commuter Runs:
HB65-81: 20 O.W. trips/day x 21.1 workdays/month**= 422 x 81 seats = 34,182 seats

Weekday Tourism: (20 minute trips on S.F. Bay)
HB65-81: 7 trips/day x 21.1 weekdays/month = 147.7 x 81 seats = 11,964 seats

Weekend Tourism: (20 minute trips on S.F. Bay)
HB65-81: 8 trips/day x 9.2 weekend days/month**= 73.6 x 81 seats = 5,962 seats

Weekend Shopper's Specials:
HB65-81: 2 trips/day x 9.2 weekend days/month = 18.4 x 81 seats = 1,490 seats

661.7 trips/month

MONTHLY DISTANCE TRAVELLED (IN NAUTICAL MILES: N.M.)

EAST BAY TO SAN FRANCISCO ROUTE

Commuter Runs:	8 N.M./trip x 20 trips/day x 21.1 days/mo.	=	3,376 N.M.
Weekday Tourism:	10 N.M./trip x 7 trips/day x 21.1 days/mo.	=	1.477 N.M.
Weekend Tourism and Shopper's Specials:	10 N.M./trip x 8 trips/day + 8 N.M./trip x 2 trips/day = 96 N.M. x 9.2 days/month	=	883 N.M.
	661.7 trips/month		5,736 N.M.

MONTHLY OPERATIONAL DATA: (Rounded off to nearest dollar amount)

Weekday Data (Commuter, Tourist, and Special Service)

13 hours of operation/day x 21.1 days/month = 274.3 Engine hrs/month

Weekend Data (Tourist and Shopper Service)

5-1/2 hours of operation/day x 9.2 days/month= 50.6 Engine hrs/month

324.9 Engine hrs/month

HB65-81

324.9 hours/mo x 48 gallons/hr = 15,595.2 gallons/month
14,491.2 gallons/mo x $1.20/gallon = $17,389

**Number of commuter days monthly calculated in consideration of 8 yearly holidays. On holidays our Hydrolines will hold a weekend tourist and shopper special schedule with the exceptions of Christmas Day and Thanksgiving Day when service will be suspended.

PROJECTIONS: ROUTE #2

ANTICIPATED MONTHLY INCOME: EAST BAY TO SAN FRANCISCO ROUTE FOR HB65-81

(Rounded off to nearest dollar amount)

Commuter Runs and Weekday Specials

50% occupancy

20 trips/day x 21.1 days/month x $2.25/seat x 40-1/2 seats = $38,455

25% occupancy

20 trips/day x 21.1 days/month x $2.25/seat x 20-1/4 seats = 19,228

Weekday Tourism

50% occupancy

7 trips/day x 21.1 days/month x $6.00/seat x 40-1/2 seats = 35,892

25% occupancy

7 trips/day x 21.1 days/month x $6.00/seat x 20-1/4 seats = 17,946

Weekend Tourism

50% occupancy

8 trips/day x 9.2 days/month x $6.00/seat x 40-1/2 seats = 17,885

25% occupancy

8 trips/day x 9.2 days/month x $6.00/seat x 20-1/4 seats = 8,942

Weekend Shopper Special Excursions

50% occupancy

2 trips/day x 9.2 days/month x $ .90/seat x 40-1/2 seats = 670

25% occupancy

2 trips/day x 9.2 days/month x $ .90/seat x 20-1/4 seats = 335

SAMPLE ROUTE SCHEDULE FOR HYDROFOIL SERVICE BETWEEN OAKLAND AND SAN FRANCISCO AIRPORTS

ROUTE #3

OAKLAND INTERNATIONAL AIRPORT TO SAN FRANCISCO INTERNATIONAL AIRPORT

Distance: 9 N.M. (Nautical Miles)
Trip Time: 15-1/2 Minutes O.W. (One Way)

Proposed Schedule: Oakland International Airport to San Francisco International Airport Route

Leave OAK	Arrive SFO	Leave SFO	Arrive OAK
6:00 A.M.	6:16 A.M.	6:30 A.M.	6:46 A.M.
7:00 A.M.	7:16 A.M.	7:30 A.M.	7:46 A.M.
8:00 A.M.	8:16 A.M.	8:30 A.M.	8:46 A.M.
9:00 A.M.	9:16 A.M.	9:30 A.M.	9:46 A.M.
Crew Lunch 9:55 to 10:25			
10:30 A.M.	10:46 A.M.	11:00 A.M.	11:16 A.M.
11:30 A.M.	11:46 A.M.	12:00 P.M.	12:16 P.M.
12:30 P.M.	12:46 P.M.	1:00 P.M.	1:16 P.M.
Crew Change			
1:30 P.M.	1:46 P.M.	2:00 P.M.	2:16 P.M.
2:30 P.M.	2:46 P.M.	3:00 P.M.	3:16 P.M.
3:30 P.M.	3:46 P.M.	4:00 P.M.	4:16 P.M.
4:30 P.M.	4:46 P.M.	5:00 P.M.	5:16 P.M.
5:30 P.M.	5:46 P.M.	6:00 P.M.	6:16 P.M.
Crew Lunch 6:25 to 6:55			
7:00 P.M.	7:16 P.M.	7:30 P.M.	7:46 P.M.
8:00 P.M.	8:16 P.M.	8:30 P.M.	8:46 P.M.

Crew Hours: 5:30 A.M. to 9:30 P.M.

15 Hours of Operation: CREW 1 - 7-1/2 Hours
CREW 2 - 7-1/2 Hours
(Engine shut down during crew lunches)

2 separate part-time weekend crews

Pilots have 10 to 12 minute breaks between each trip. Deckhands and stewardesses eligible to alternate in taking 10-minute breaks between selected arrivals and departures.

NOTE: Passengers begin boarding 10 minutes prior to the first departure. Concurrent embarcation and debarcation takes 7 to 8 minutes, even with disabled passengers: embarcation or debarcation alone take only 3 to 5 minutes. Docking and launching times are included in the 10-minute arrival-departure interval. Actual published schedules will include diagrams with arrows.

Service will be in full operation 365 days a year.

PROJECTIONS: ROUTE #3

Monthly Capacity Data: Oakland Airport to San Francisco Airport Route for HB63-60

28 O.W. trips/day x 30.4 days/month = 851.2 trips/month x 60 seats = 51,072 seats

Monthly Distance Travelled (in Nautical Miles: N.M.)
Oakland Airport to San Francisco Airport Route

9 N.M./trip x 28 trips/day x 30.4 days/month = 7,661 N.M.

Anticipated Monthly Income: Oakland Airport to San Francisco Airport Route

50% occupancy
28 trips/day x 30.4 days/month x $8.00**/seat x 30 seats = $204,288

25% occupancy
28 trips/day x 30.4 days/month x $8.00**/seat x 15 seats = $102,144

12-1/2% occupancy
28 trips/day x 30.4 days/month x $8.00**/seat x 7-1/2 seats = $ 51,072

Inter-Airport: $8.00 per person**

Monthly Operational Data: Oakland Airport to San Francisco Airport Route

15 hours of operation/day x 30.4 days/month = 456 Engine hours/month

456 Engine hours/month x 38 gallons/hour = 17,328 gallons

17,328 gallons x $1.20/gallon = $20,794

**NOTE: $8.00 is for the water portion. We estimate an additional 75¢ per person bus connection at each airport. This amount is paid directly to the bus or if we charge $9.50 for the full service we pay the corresponding bus portion. We will try to coordinate our operation with an already existent service, such as those which operate from the parking lots, and we will seek subsidy from Oakland International Airport ($1.50/passenger to cover ground portion of transportation.)

See Discount Fare Chart for ways to lower cost to consumers.

SUMMARY OF HYDROFOIL BOATS PER COUNTRY FROM THE OPERATORS LISTING IN JANE'S SURFACE SKIMMERS 1983.

COUNTRY	CIVIL	NAVY	COUNTRY	CIVIL	NAVY
Albania		32	Italy	62	7
Argentina	3		Japan	31	
Australia	6		Korea	3	
Austria	1		Mexico	1	
Belgium	1		Morocco	3	
Bolivia	6		Norway	6	
Brazil	9		Pakistan		6
Bulgaria	16		Philipines	2	4
Canada			Poland	17	
China		150	Romania		19
Cuba	5	6	Spain	2	
Denmark	6		Tanzania		4
Egipt	3		Turkey	4	
Finland	1		United Kingdom	6	
France	1		Uruguay	2	
West Germany	1	3	Venezuela	3	
Greece	17		Yugoslavia	17	
Hong Kong	26		Zaire		3
Hungary	1		U.S.A.	5	6
Indonesia	2		U.S.S.R.,Rusia	3,000	180
Iran	2				
Ireland					
Israel		2	TOTAL	3,272	422
New Zealand	1				

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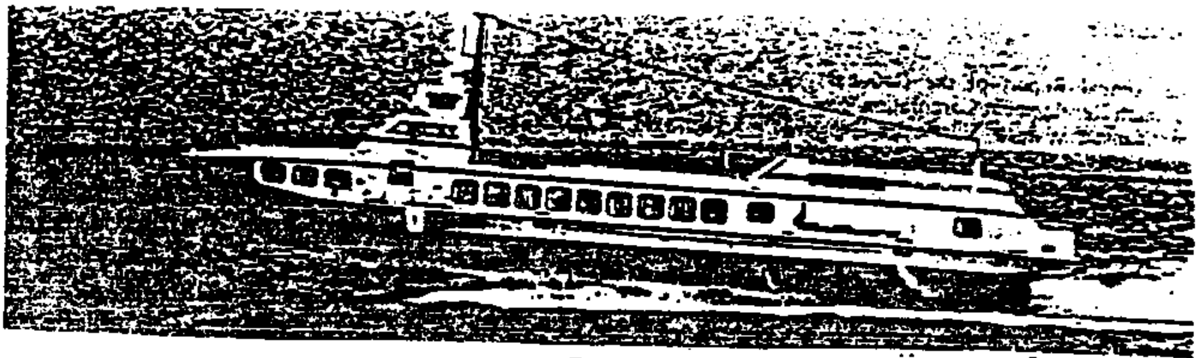
Cover photograph: One of the busiest fast ferry terminals in Europe is featured on the cover of this year's fast ferry directory issue. Approximately 1½ million passengers travelling between Copenhagen and Malmo pass through DSO's Copenhagen terminal each year. The total number of passengers using the route since it opened in 1965 has now passed 27 million. Pictured here are 50% of the company's present fast ferry fleet, Westamaran 95s Tranen *and* Tunen *plus the* [illegible] *33 CPV* Lommen



Fast ferry directory 1987

Extract of Hydrofoil Operators from the HIGH-SPEED SURFACE CRAFT magazine September- October 1987

High-Speed Surface Craft's 1987 Fast ferry directory reflects the rash of orders and deliveries during the past 12 months. As usual, the following listing errs on the side of caution, where an operator's recent status cannot be confirmed, it has been omitted.

Even so, the number of companies, outside the USSR, known to have been operating craft, or have outstanding orders, on August 31 is more than 150 and the number of ferries in service now exceeds 500. As before, a fast ferry, for the purposes of this survey, is defined as a craft able to carry a minimum of 50 passengers and having a full load speed capability of at least 25 knots.

Undoubtedly, several active companies are missing from the following pages because no information about their current operations could be confirmed. The companies that are included are listed alphabetically with details of their fleets in date acquisition order. Where two dates are given, the first is the year of construction, the second is the year the craft was introduced by the existing operator. Details of all multi-stop routes are listed at the end of the directory.

Adriatica di Navigazione
Italy

A Rodriquez PT.50 was introduced by Adriatica di Navigazione alongside its ships on a network of routes between the island of Tremiti and points on the south-east Italian mainland in 1964. An RHS 160 joined it in 1975 and a second PT.50, leased from Aliscafi-SNAV, has also been operated since 1986. Last year the company placed an order for an RHS 160F.

Nibbio	Rodriquez PT.50	1964
Diomeden	Rodriquez RHS 160	1975

Tremiti-Peschici
Tremiti-Rodi Garganico
Termoli-Tremiti
Vasto-Tremiti
Ortona-Tremiti

Aerobarcos do Brasil (Transtur)
Brazil

Transtur operates both hydrofoils and surface effect ships on routes out of Rio de Janeiro. Services were introduced with a pair of PT.20s in the early 1970s and six more have since been purchased from other companies. Three Hovermarine 216s, originally ordered in 1974 by Services de Transportes da Baia (STBG), were also taken over in 1977. The company's sole RHS 110 was completed by Rodriquez as an Aliyacht cruising hydrofoil and later modified to a ferry configuration.

Flecha de Niterói	Rodriquez PT.20	1969-1970
Flecha do Rio	Rodriquez PT.20	1970
Flecha Fluminense	Rodriquez PT.20	1962-1971
Flecha das Ilhas	Rodriquez PT.20	1965-1971
Flecha de Itaipú	Rodriquez PT.20	1962-1972
Flecha de Angra	Rodriquez RHS 110	1970-1976
Flecha do Ipanema	Rodriquez PT.20	1963-1978
Flecha de Icaraí	Rodriquez PT.20	1964-1978
Flecha da Ribeira	Rodriquez PT.20	1964-1978

Rio de Janeiro-Niteroi
Rio de Janeiro-Paqueta Island
Rio de Janeiro-Ribeira

Alilauro Aliscafi del Tirreno
Italy

Alilauro Aliscafi del Tirreno introduced its first fast ferries in 1968. Currently, it has six types of hydrofoils and catamarans based in Napoli. In the past year, the company's Rodriquez PT.50 and one of its Kometa Ms have been renamed. Other routes in south-west Italy are also operated by an associate company, Alivit Due, using a combination of newly acquired craft and hydrofoils transferred from Alilauro.

Alimarte	Rodriquez PT.50	1961-196
Aliapollo	Sormovo Kometa M	197
Alivulcano	Sormovo Kometa M	1970-197
Alivenere	Sormovo Kometa M	197
Alisorrento	Sormovo Kometa M	197
Alivesuvio	Sormovo Kometa M	
Aliatlante	Ordzhonikidze Kolkhida	198
Alieolo	Ordzhonikidze Kolkhida	198

Napoli-Ischia
Napoli-Forio
Napoli-Sorrento
Sorrento-Capri
Napoli-Capri
Salerno-Capri (July-August)

Aliscafi-SNAV
Italy
Aliscafi-SNAV introduced the world's first coastal hydrofoil route in 1956 when it put a Rodriquez PT.20 into service between Messina, Sicily, and Reggio di Calabria. The company now has the biggest hydrofoil fleet outside the USSR operating on its own routes and leased to other companies. A Westamaran 95, acquired from another Italian operator, was also added to the fleet in 1984. Two craft, the second RHS 200 built and the RHS 150F, have been based in the United States Virgin Islands since May 1986. Aliscafi-SNAV presently has two RHS 160Fs and two RHS 150Ms on order. In the past year, both the operator's RHS 160s have been renamed.

Freccia delle Eolie	Rodriquez PT.20	1957
Freccia del Tirreno	Rodriquez PT.20	1957
Freccia d'Oro	Rodriquez PT.50	1959
Freccia dello Stretto	Rodriquez PT.20	1960
Freccia del Peloro	Rodriquez PT.20	1961
Freccia di Sorrento	Rodriquez PT.50	1959-1964
Freccia del Vesuvio	Rodriquez PT.20	1966
Freccia delle Isole	Rodriquez PT.50	1966
Freccia Atlantica	Rodriquez PT.50	1960-1967
Sun Arrow	Rodriquez PT.50	1968
Freccia Adriatica	Rodriquez PT.50	1969
Freccia di Reggio	Rodriquez PT.20	1961-1970
Freccia dello Ionio	Rodriquez PT.20	1970
Freccia di Procida	Rodriquez PT.20	1970
Freccia di Sicilia	Rodriquez PT.50	1964-1977
May W. Craig	Rodriquez RHS 160	1979
Freccia del Sud	Rodriquez PT.50	1960-1978
Superjumbo	Rodriquez RHS 200	1981
Aligrado	Rodriquez PT.20	1962-1982
Dynasty	Rodriquez RHS 150F	1983
Princess Zoe	Rodriquez RHS 160	1974-1984
Freccia di Lipari	Westermoen PT.50	1962-1984
Freccia del Mediterraneo	Rodriquez PT.50	1963-1984
St. Christobal	Rodriquez RHS 200	1984-1986
Alijumbo Eolie	Rodriquez RHS 160F	1986

Anzio-Napoli (June-September)
Anzio-Ponza
Casamicciola-Napoli (June-September)
C. d'Orlando-Lipari (June-September)
Messina-Reggio Calabria
Milazzo-Rinella
Napoli-Capri
Palermo-Lipari (June-September)
Reggio Calabria-Stromboli (June-September)
Reggio Calabria-Vulcano (June-September)
Rinella-Napoli (June-September)
Trapani-Kelibia (June-September)
Trapani-Napoli (June-September)
Vibo Valentia-Lipari (July-September)
St. Juan-St. Thomas

Alimar
Argentina
Alimar has operated three PT.50s between Argentina and Uruguay for almost 25 years. The route is now operated jointly with Belt.

Flecha de Buenos Aires	Rodriquez PT.50	1962
Flecha de Colonia	Rodriquez PT.50	1963
Flecha del Litoral	Rodriquez PT.50	1963

Buenos Aires-Colonia

Alivit Due
Italy
Alivit Due, an associate company of Alilauro Aliscafi del Tirreno, operates two Kometas, originally delivered to Alilauro and transferred in 1985, a Seaflight H.57 and a newly acquired Kolkhida on services along the south-west coast of Italy and in the south of Sicily.

Alioceano	Seaflight H.57	1968-1985
Alisaturno	Sormovo Kometa M	1972-1985
Alieros	Sormovo Kometa M	1973-1985
Aligea	Ordzhonikidze Kolkhida	[illegible]

Boyo Kisen
Japan
A Hitachi PT.20 was the first fast ferry to join Boyo Kisen's passenger/vehicle fleet and a PT.50 was added in 1973. Services are operated in southern Japan between Honshu and Shikoku islands.

Shibuki No 2	Hitachi PT.20	1969
Shibuki No 3	Hitachi PT.50	1973

Yanai-Matsuyama

Atlas Turisticka Plovidba
Yugoslavia
Atlas operates a fleet of Kometa hydrofoils each summer on tourist excursions from ports along Yugoslavia's Adriatic coast. Three Kometas built in 1966-67 have been replaced by newer craft.

Krila Dalmacije	Sormovo Kometa	1968
Krila Dubrovnika	Sormovo Kometa	1968
Krila Istre	Sormovo Kometa	1968
Krila Kostrene	Sormovo Kometa	1971
Krila Zadra	Sormovo Kometa	1971
Krila Hvara	Sormovo Kometa	1980
Krila Braca	Sormovo Kometa	1981

Tourist excursions throughout the Adriatic from the Yugoslavian mainland to the islands and northern Italy (March-October)

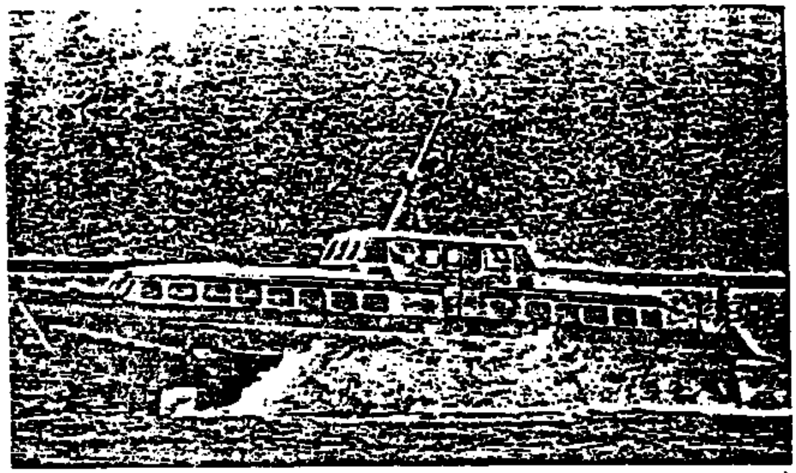
Belt
Uruguay
After purchasing a Hovermarine 218 in 1978, which was never operated on the Colonia-Buenos Aires route, Belt acquired two RHS 140s from other operators in 1980 and a third in 1985. The HM 218 was eventually sold in 1986. The route is now operated jointly with Alimar.

Colonia del Sacramento	Rodriquez RHS 140	1971-1980
Tyrving	Rodriquez RHS 140	1972-1980
Farallon	Rodriquez RHS 140	1972-1985

Colonia-Buenos Aires

Campania Regionale Marittima (CAREMAR)
Italy
Already an established passenger/vehicle ferry operator in southern Italy, CAREMAR put three hydrofoils into service in 1977-79 on routes in the Bay of Naples. In May 1986, *Alioth* was transfered to two new routes based on Formia following the delivery of an RHS 160F. Another RHS 160F entered service this year. TOREMAR in north-west Italy and SIREMAR in Sicily are associate companies.

Albireo	Rodriquez RHS 140	1977
Algol	Rodriquez RHS 160	1978
Alioth	Rodriquez RHS 160	1979
Alnilam	Rodriquez RHS 160F	1986
Aldebaran	Rodriquez RHS 160F	1987


One of Aerobarcos do Brasil's PT.20s

Ceres Hydrofoil Group
Greece
Ceres' introduced its first Kometa hydrofoil in 1975 and now has a fleet of 15 running from the Athens area to the Saraonic islands and Peloponnese.
In 1985, two Kolkhida hydrofoils entered service on a new route in the northern Sporades. A third was delivered in 1986.

Flying Dolphin I	Sormovo Kometa	1975
Flying Dolphin II	Sormovo Kometa	1975
Flying Dolphin III	Sormovo Kometa	1976
Flying Dolphin IV	Sormovo Kometa	1976
Flying Dolphin V	Sormovo Kometa	1976
Flying Dolphin VI	Sormovo Kometa	1976
Flying Dolphin VII	Sormovo Kometa	1976
Flying Dolphin VIII	Sormovo Kometa	1977
Flying Dolphin IX	Sormovo Kometa	1977
Flying Dolphin X	Sormovo Kometa	1978
Flying Dolphin XI	Sormovo Kometa	1979
Flying Dolphin XII	Sormovo Kometa	1979
Flying Dolphin XIV	Sormovo Kometa	1981
Flying Dolphin XV	Sormovo Kometa	1981
Flying Dolphin XVI	Sormovo Kometa	1981
Flying Dolphin XVII	Ordzhonikidzie Kolkhida	1985
Flying Dolphin XVIII	Ordzhonikidzie Kolkhida	1985
Flying Dolphin XIX	Ordzhonikidzie Kolkhida	1986

Piraeus-Aegina
Volos-Moudania
Zea-Kythina
Zea-Nauplion

Ceskoslovenska Plavba Dunajska
Czechoslovakia
Services on the River Danube to Austria and Hungary are operated by CSPD using Soviet-built hydrofoils.

Raketa	Sormovo Raketa
Meteor	Sormovo Meteor
Voschod	Sormovo Voschod

Bratislava-Budapest
Bratislava-Vienna

Compañia Trasmediterranea
Spain
Two Boeing Jetfoil 929-115s joined Compañia Trasmediterranea's passenger/vehicle ferry fleet in 1981. A high-speed service in the Canary Islands had opened the previous year using a leased Jetfoil 929-100.

Princesa Guayarmia	Jetfoil 929-115	1980-1981
Princesa Guacimara	Jetfoil 929-115	1981

Las Palmas-Santa Cruz de Tenerife

Condor
Guernsey
Hydrofoil services within the Channel Islands and to St. Malo, France, were introduced by Condor in 1964 using a Rodriquez PT.50. The company has since operated another PT.50, an RHS 140 and a Westamaran 100T in addition to its present fleet. In April, a service across the English Channel to Weymouth was introduced.

Condor 4	Rodriquez RHS 140	1974
Condor 5	Rodriquez RHS 160	1976
Condor 7	Rodriquez RHS 160F	1985

Guernsey-Weymouth (April-October)
St. Malo-Alderney (April-September)
St. Malo-Guernsey (March-November)
St. Malo-Jersey (March-November)

COVEMAR Eolie
Italy
Based in S.M. Salina, COVEMAR Eolie operates a single Rodriquez PT.20 hydrofoil on routes to several other islands in the Eolie group and the north-eastern coast of Sicily.

Freccia della Salina	Rodriquez PT.20

Lipari-Filicudi-Alicudi
Lipari-Panarea-Stromboli
Lipari-Vulcano-Milazzo
S.M. Salina-Lipari

Dampskibsselskab Øresund
Denmark

Viggen	Rodriquez RHS 140	1973

Far East Hydrofoil
Hongkong
The largest Boeing Jetfoil operator in the world, Far East Hydrofoil introduced the first of four Hitachi built PT. 50s in 1964. Four Rodriquez RHS 110s, a single RHS 160 and two Supramar PTS 75 Mark IIIs subsequently joined the fleet in the mid-1970s. All the Rodriquez craft have since been sold and the others were also disposed of during 1986.

The first pair of Jetfoil 929-100s were delivered by Boeing Marine Systems in 1975. Seven more 929-100s and three 929-115s were then purchased from other operators or BMS. In 1986, a patrol variant was acquired from the Royal Navy. This is currently being modified to a ferry configuration and should enter service before the end of the year.

Madeira	Jetfoil 929-100	1974-1975
Santa Maria	Jetfoil 929-100	1975
Flores	Jetfoil 929-100	1974-1978
Corvo	Jetfoil 929-100	1974-1978
Pico	Jetfoil 929-100	1974-1978
Sao Jorge	Jetfoil 929-100	1976-1980
Acores	Jetfoil 929-100	1976-1980
Urzela	Jetfoil 929-100	1976-1981
Ponta Delgada	Jetfoil 929-100	1977-1981

Terceira	Jetfoil 929-115	1979-1981
Horta	Jetfoil 929-115	1980-1983
Funchal	Jetfoil 929-115	1979-1983
Lilau	Jetfoil 929-115	1979-1987

Hongkong-Macau
Kowloon-Macau

Giuseppe Rum
Italy
Giuseppe Rum acquired the only Seaflight L90 hydrofoil built from another Italian operator in 1985 and introduced it on a route between southern Tuscany and the island of Giglio.

Squalo Bianco	Seaflight L90	1973-1985

Han Ryeo Development
South Korea
The last PT.20 built by Rodriquez was delivered to Han Ryeo which has subsequently introduced an Hitachi PT.20, an RHS 110 and the first RHS 70 to be built in South Korea by Hyundae Heavy Industries under license from Rodriquez.

Angel I	Rodriquez PT.20	1971
Angel III	Hitachi PT.20	
Angel VII	Rodriquez RHS 110	1972-1981
Angel IX	Rodriquez/Hyundae RHS 70	1985

Pusan-Yeosu

Hankyu Kisen
Japan
An associate company of the Hankyu Railway Group, Hankyu Kisen has introduced four Hitachi PT.50 and two Hitachi PT.20 hydrofoils since 1964 on routes in southern Japan linking Honshu and Shikoku islands. The PT.20s have now been retired.

Hoo	Hitachi PT.50	1972
Zuiho	Hitachi PT.50	1972
Kaio	Hitachi PT.50	1975
Hosho	Hitachi PT.50 Mark II	1983

Kobe-Naruto
Kobe-Tokushima

Hardanger Sunnhordlandske Dampskibsselskap
Norway

Rodriquez PT.50 1970

Hongkong Macao Hydrofoil Company
Hongkong
Four Rodriquez PT.20s and a single PT.50 entered service with HMH on the Hongkong-Macau route in 1964. Three more PT.50s were subsequently introduced and the PT.20s were replaced by five RHS 140s in 1971-74. Another increase in capacity occurred when four Marinteknik JC3000 catamarans were introduced in 1982-83. One of these was sold to a PRC operator in 1986 and one is operated on a route from Kowloon to Zhuhai, People's Republic of China, on behalf of an associate company, the Hongkong China Hydrofoil Company.

Flying Albatross	Rodriquez PT.50	1964
Flying Skimmer	Rodriquez PT.50	1965
Flying Condor	Rodriquez PT.50	1965
Flying Dragon	Rodriquez RHS 140	1971
Flying Egret	Rodriquez RHS 140	1972
Flying Sandpiper	Rodriquez RHS 140	1972
Flying Swift	Rodriquez RHS 140	1973
Flying Ibis	Rodriquez RHS 140	1974

Hongkong-Macau
Kowloon-Macau
Hongkong-Zhuhai

Ishizaki Kisen
Japan
Ishizaki Kisen operates a fleet of Hitachi PT.20s and PT.50s on routes between Honshu and Shikoku in southern Japan.

Kinsei	Hitachi PT.20	
Kosei	Hitachi PT.50	1969
Saisei	Hitachi PT.50	1974

Jugoslavenska Oour Turisthotel
Yugoslavia
This tourist organisation based in Zadar has operated two Kometa hydrofoils since 1978 on tourist excursions.

Zman	Sormovo Kometa	1978
Zverinac	Sormovo Kometa	1978

Kansai Kisen/Kato Kisen
Japan
Kansai Kisen and Kato Kisen purchased two Jetfoil 929-115s, previously operated by a Canadian company, at the beginning of 1987 for a joint service in Japan. No other details are known.

Jetfoil 929-115	1980-1987
Jetfoil 929-115	1986-1987

Köln Dusseldorfer Shipping Company
West Germany
Since 1972, the Köln Dusseldorfer Shipping Company, or KD German Rhine Line, has operated a Raketa hydrofoil each summer as a high-speed alternative to its ships on part of the River Rhine.

Rheinpfeil	Sormovo Raketa	1972

Cologne-Mainz (April-October)

Kompas
Yugoslavia
Kompas has introduced a fleet of seven Kometa hydrofoils since 1977. They are operated on tourist excurions in northern Yugoslavia.

Krila Slovenije	Sormovo Kometa	1977
Krila Kvarnera	Sormovo Kometa	1978
Krila Pirana	Sormovo Kometa	1979
Krila Kornata	Sormovo Kometa	1980
Krila Primorske	Sormovo Kometa	1980
Krila Briona	Sormovo Kometa	1983
Krila Portoroza	Sormovo Kometa	1983

Kvarner Express
Yugoslavia
Kvarner Express took delivery of a pair of Kolkhida hydrofoils in 1985 and another two in 1986. Based in Opatija, they are operated on tourist routes in the northern Adriatic.

Magnolija	Ordzhonikidze Kolkhida	1985
Kameija	Ordzhonikidze Kolkhida	1985
Mirta	Ordzhonikidze Kolkhida	1986
Mimoza	Ordzhonikidze Kolkhida	1986

Mahart Magyar Hajozs Si Rt
Hungary
Mahart has operated a fleet of Raketa, Meteor and Voschod hydrofoils on the River Danube between Hungary and Austria since the early 1960s. Recently, the last of the three Raketas has been withdrawn and three more Voschods added to the fleet.

Sólyom	Sormovo Meteor	1975
Vöcsök I	Sormovo Voschod	1977
Vöcsök II	Sormovo Voschod	1986
Vöcsök III	Sormovo Voschod	1987
Vöcsök IV	Sormovo Voschod	1987

Budapest-Vienna (March-October)

Navigation Maritime Bulgare
Bulgaria
The commercial fleet of Navigation Maritime Bulgare includes ten Kometa hydrofoils operating on Bulgaria's Black Sea coast.

Kometa-1	Sormovo Kometa	1965
Kometa-2	Sormovo Kometa	1966
Kometa-3	Sormovo Kometa	1966
Kometa-6	Sormovo Kometa	1973
Kometa-7	Sormovo Kometa	1974
Kometa-8	Sormovo Kometa	1974
Kometa-9	Sormovo Kometa	1975
Kometa-10	Sormovo Kometa	1975
Kometa-11	Sormovo Kometa	1976
Kometa-12	Sormovo Kometa	1977

Varna-Michurin

Navigazione Lago di Como
Italy
Like the companies operating hydrofoils across Lake Garda and Lake Maggiore in northern Italy, Navigazione Lago di Como is a subsidiary of Italy's Ministry of Transport and operates its craft alongside conventional ferries. The first PT. 20, since withdrawn, was introduced on Lake Garda as long ago as 1958. Another was transferred from Garda to Como in 1982. Currently, the Ministry has three more RHS 150 SLs on order.

Freccia del Lario	Rodriquez PT.20	1964
Freccia delle Azelee	Rodriquez PT.20	1967
Freccia de Betulle	Rodriquez RHS 70	1974
Freccia delle Gardenie	Rodriquez RHS 70	1976
Freccia delle Valli	Rodriquez RHS 150SL	1981
Guglielmo Marconi	Rodriquez RHS 150SL	1983
Freccia degli Ulivi	Rodriquez PT.20	1965-1982

Como-Piona

Navigazione Lago di Garda
Italy

Freccia del Benaco	Rodriquez RHS 70	1974
Freccia del Gerani	Rodriquez RHS 70	1977
Freccia della Riviere	Rodriquez RHS 150SL	1981
Galileo Galilei	Rodriquez RHS 150SL	1982

Navigazione Lago Maggiore
Italy

Freccia del Verbano	Rodriquez PT.20	1964
Freccia del Ticino	Rodriquez PT.20	1967
Freccia delle Camelie	Rodriquez RHS 70	1974
Freccia delle Magnolie	Rodriquez RHS 70	1975
Freccia dei Giardini	Rodriquez RHS 150SL	1980
Freccia Enrico Fermi	Rodriquez RHS 150SL	1984

Arona-Locano

Nearchos Maritime Company
Greece
Since 1981 the Nearchos Maritime Company has operated two Kometa hydrofoils on services linking islands in the Greek Dodecanese.

Marilena	Sormovo Kometa	1981
Tzina	Sormovo Kometa	1981

Cos-Leros
Cos-Patmos
Cos-Samos
Rodos-Cos
Rodos-Simi

Pelayaran Nasional Indonesia
Indonesia
PENLI, Indonesia's state-owned shipping company, put a Boeing Jetfoil 929-115 into service in 1982 on a Jakarta-Sumatra service. On Sundays, it is transferred to a route between Jakarta and Putri, a resort in the Thousand Island group.

Bima Samudera I	Jetfoil 929-115	1981-1982

Jakarta-Tanjung Karang
Jakarta-Putri

Red Funnel Group
United Kingdom
Hydrofoils appeared on Red Funnel's established Southampton-West Cowes passenger/vehicle route across the Solent in 1969 when the first of two Seaflight H.57s was introduced. These were superseded three years later by the Rodriquez RHS 70. The company also operated a pair of Hovermarine 216 surface effect ships in 1981-82.

Shearwater 3	Rodriquez RHS 70	1972
Shearwater 4	Rodriquez RHS 70	1973
Shearwater 5	Rodriquez RHS 70	1980
Shearwater 6	Rodriquez RHS 70	1982

Southampton-West Cowes

Regie des Transports Maritimes
Belgium
RTM, Belgium's state-owned ferry-company, took delivery of two Boeing Jetfoil 929-115s in 1981. They are operated across the English Channel as part of the Townsend Thoresen fleet.

Princesse Clementine	Jetfoil 929-115	1981
Prinses Stephanie	Jetfoil 929-115	1981

Ostende-Dover

Sado Kisen Kaisha
Japan
A Boeing Jetfoil 929-100 was introduced by Sado Kisen Kaisha, which also operates a fleet of passenger/vehicle ships, in 1977 between Honshu and Sado islands on a high-speed connecting service with the bullet trains on the Tokyo-Niigata route. The first of the Jetfoil 929-115s joined it two years later and another 929-115 was acquired in 1986.

Okesa	Jetfoil 929-100	1977
Mikado	Jetfoil 929-115	1978-1979
Ginga	Jetfoil 929-115	1980-1986

Niigata-Ryotsu

Setonaikai Kisen
Japan
Setonaikai Kisen introduced its first fast ferry in 1968 and now operates a fleet of ships, hydrofoils and a catamaran on routes across the Seto Inland Sea between Honshu and Shikoku. Tourist excursions are also run during the summer. Earlier this year, the company took delivery of the first CP10 catamaran built by MES.

Hibiki	Hitachi PT.20	1966-1969
Hibiki No 3	Hitachi PT.20	1968
Otori	Hitachi PT.50	1968
Otori No 2	Hitachi PT.50	1970
Condor	Hitachi PT.50	1972
Otori No 3	Hitachi PT.50	1972
Otori No 5	Hitachi PT.50	1973
Condor No 2	Hitachi PT.50	1974
Condor No 3	Hitachi PT.50	1974
Hikari No 2	Hitachi PT.50	1975

Mihara-Matsuyama
Hiroshima-Miyajima
Hiroshima-Kure-Matsuyama
Onomichi-Setoda-Omishima-Imabari
Kure-Etajima
Mihara-Imabari

Showa Kaiun
Japan
Already a ferry operator between Honshu and Shikoku islands, Showa Kaiun introduced a Hitachi PT.20 hydrofoil in 1962 and the first MES Super-westamaran CP20 in 1975 on routes from Shikohu to Honshu.

Hayate No 1	Hitachi PT.20	1962

Mihara-Imabari
Mihara-Matsuyama

Sicilia Regionale Marittima
Italy
SIREMAR operates passenger/vehicle ferries and hydrofoils on a series of routes between Sicily and the islands lying off its northern coast. An RHS 140 has recently been transferred from TOREMAR and the company also has two RHS 160Fs on order for delivery in 1988 and 1989. CAREMAR in Naples and TOREMAR in northwest Italy are both associate companies.

Pisanello	Rodriquez PT.50	1961-1967
Pinturiochio	Rodriquez PT.20	1968
Botticelli	Rodriquez RHS 160	1980
Donatello	Rodriquez RHS 160	1980
Duccio	Rodriquez RHS 140	1977-1987

Lipari-Alicudi
Lipari-Stromboli
Milazzo-Lipari
Trapani-Marettimo
Ustica-Palermo

Toscana Regionale Marittima
Italy
TOREMAR added a Rodriquez RHS 140 to its fleet of passenger/vehicle ferries in 1977 on two routes between the islands of Elba and the north-west Italian mainland. Earlier this year, it was replaced by an RHS 160F. CAREMAR and SIREMAR in southern Italy are associate companies.

Fabrica	Rodriquez RHS 160F	1987

Portoferraio-Piombino
Cavo-Piombino

Transports Touristiques Intercontinentaux (Transtour)
Morocco
Transtour has operated hydrofoils from Morocco to Spain and Gibraltar since the mid-1960s. The monopoly of Kometas was broken in 1980 when a PT.50 was acquired.

Sinibad	Sormovo Kometa	1965
Aladin	Sormovo Kometa	1969
Sheherazade	Sormovo Kometa	1972
Queenfoil	Rodriquez PT.50	1961-1980

Urban Transit Authority of New South Wales
Australia
The first fast service across Sydney Harbour opened in 1965 when a Hitachi PT.20 was introduced by the Port Jackson and Manly Steamship Company. The operator was restructured as Port Jackson Hydrofoils five years later and became part of the Urban Transit Authority of New South Wales in the early 1980s.

A Rodriquez PT.50 was delivered in 1966, another in 1970 and an RHS 140 in 1972. The fleet was further increased by the purchase of PT.50s previously operated in Hongkong and Italy and the PT.20 was finally sold in 1979.

Two RHS 160Fs entered service in 1984-85, replacing two PT.50s, and a third may be built under license in Australia by Carrington Shipways.

Dee Why	Rodriquez PT.50	1970
Curl Curl	Rodriquez RHS 140	1972
Long Reef	Rodriquez PT.50	1967-1978
Manly	Rodriquez RHS 160F	1984
Sydney	Rodriquez RHS 160F	1985

Sydney-Manly

USSR
Although the exact numbers of craft involved is unclear, what is certain is that the USSR is easily the largest user of fast ferries in the world. The first Raketa ferry was launched in 1957 and hydrofoils now operate on more than 150 routes throughout the USSR and carry over 100 million passengers each navigational season on inland waterways, rivers and in coastal areas.

The actual number of fast ferries in service could be as high as 1,000, estimates indicate that there are over 300 Raketa hydrofoils, 100 Zarnitas and up to 150 Zaryas operating. And to these must be added numerous Meteors and Kometas plus various other designs built in smaller numbers and the Kholkhida hydrofoil which is now in production.

Vedettes Armoricaines
France
The tourist fleet of Vedettes Armoricaines operating from the Brittany coast includes a 37m monohull built by Tecimar and a Kometa. The hydrofoil had been laid up for several years but joined *Jaguar* on the company's Channel Islands route in May.

Jaguar 2	Sormovo Kometa	1970
Jaguar	Tecimar 37m	1979

St. Malo-Jersey

Zegluga Gdanska
Poland
Zegluga Gdanska has a fleet of Kometa hydrofoils operating in north-east Poland.

Poszum	Sormovo Kometa	1973
Poweiw	Sormovo Kometa	1973
Poryw	Sormovo Kometa	1975
Pogwizd	Sormovo Kometa	1977
Polot	Sormovo Kometa	1977

Gdynia-Hel-Wladyslawowo
Gdynia-Jastarnia
Gdynia-Sopot
Sopot-Hel
Gdansk-Hel

Zegluga Szczecinska
Poland
A high-speed service between Szczecin and Swinoujscie in north-west Poland is operated by Zegluga Szczecinska using a mixed fleet of Meteor and Kometa hydrofoils.

Wala	Sormovo Kometa	1966
Lida	Sormovo Kometa	1971
Adriana	Sormovo Meteor	1973
Kalina	Sormovo Kometa	1973
Sylwia	Sormovo Meteor	1973
Daria	Sormovo Kometa	1975
Lena	Sormovo Kometa	1975
Marzena	Sormovo Meteor	1975
Iwona	Sormovo Meteor	1976
Liwa	Sormovo Kometa	1978
Wera	Sormovo Kometa	1978

Szczecin-Swinoujscie

CRILLON TOURS; LTDA:
La Paz, Bolivia

Sun Arrow, Seaflight		197
Bolivia Arrow, H. Kock		197
Inca Arrow	"	196
Titicaca Arrow	"	196
Copacabana Arrow	"	197
Huatajata Arrow	"	197

Lake Titicaca

ALISCAFOS ITAIPU
Asuncion, Paraguai

Flecha Guarani, H.Kock		198
Flecha Itaipu	"	198

A-FOIL, INC:
Anchorage, Alaska

Victory I, H. Kock 1964- 8

SEA WORLD
San Diego

3 28 Pax. Sprague 1966
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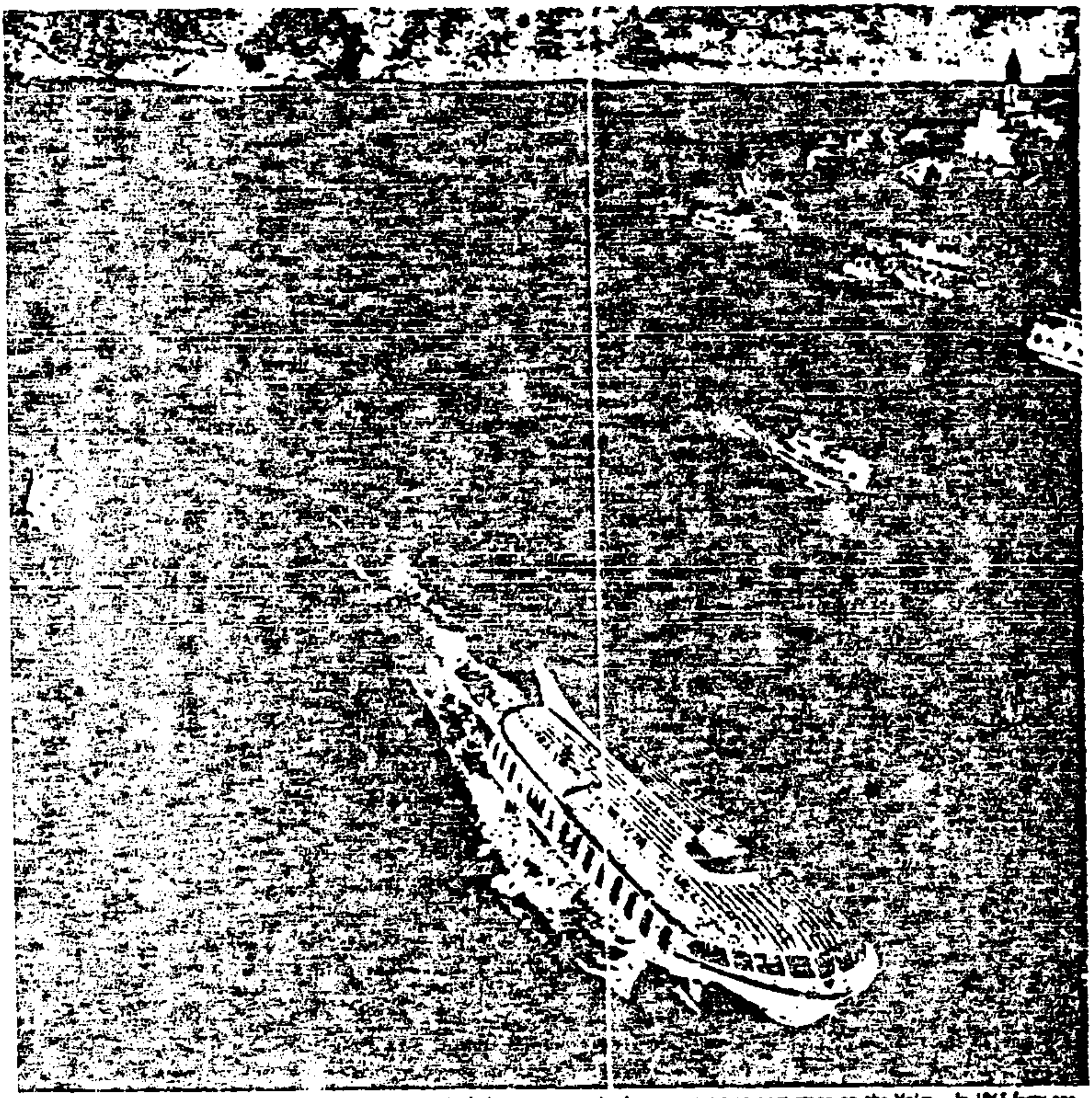
HYDROFOIL OPERATORS



Hydrofoils of the Soviet river fleet are playing an increasingly important part in the passenger transport scene on the Volga. In 1965 forty-one Raketas, Meteors and Sputniks carried over two million passengers on a route network on the river totalling 7,786 km. Above is a 110-ton Sputnik, flanked by two 25-ton Raketas, passing down the Volga at Gorki

III. SELECT BIBLIOGRAPHY OF FERRY TRANSPORTATION MATERIALS IN UNIVERSITY OF CALIFORNIA LIBRARIES

The following bibliography is provided for those who would like to investigate these topics further. It is a partial list of materials held by the University of California and State Library Systems, selected for their pertinence to the subjects discussed at the symposium.

For convenience, call numbers for the library closest to the San Francisco Bay Area are included at the end of each citation. Citations which refer to the U.C. Berkeley libraries are preceded by "UCB," for example, "UCB TRANS" indicates that that item is in the collection of the Institute of Transportation Studies Library, on the 4th floor of McLaughlin Hall. Other libraries which are listed include:

CSL Main	- California State Library (Sacramento)
UCB EnvDesign	- Berkeley Env. Design Library (Wurster Hall)
UCB Bancroft	- Berkeley Bancroft Library (Main Library Bldg.)
UCB Main	- Berkeley Main Library
UCB Documents	- Berkeley Gov't Docs. Room (Main Library Bldg.)
UCB IGS	- Berkeley Inst. of Governmental Studies Library
UCLA	- Various libraries at UCLA
UCSB	- U.C. Santa Barbara Main Library
UCD	- U.C. Davis Main Library

In some cases, the listed item may be found in other libraries besides those identified.

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