

High-Speed Commuter Ferry Service: The Boston Experience

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High-speed over-the-water passenger transportation is a relatively untested concept in the United States, although it has enjoyed wider application in other parts of the world. Therefore, it is useful to observe the limited use of this mode in the United States as one way of understanding the problems and opportunities that might be associated with expanded use of this transportation mode at other U.S. sites. A Boston demonstration with a high-speed hovercraft vessel is particularly instructive in this respect because the vessel was put in service for the urban commuter market in combination with conventional ferry service. The demonstration showed that high-speed waterborne commuter services may have great potential. However, some specific local problems kept the Boston service from realizing its full potential. A key difficulty was the limited scope of the project, including limited availability of suitable high-speed craft, which rendered it difficult to make adequate provisions for maintenance and backup service. These constraints resulted in problems of service reliability that diminished public acceptance of the service and led to its ultimate termination.

Although there have been ferries in one form or another operating in Boston harbor since the 1600s, the present move to provide commuter service between downtown Boston and the South Shore began around 1973. Over the next two years, several studies were conducted, largely at the instigation of South Shore residents. As a result, service was finally provided on a steady basis in 1977. The service consisted of one morning and afternoon trip each weekday with a conventional boat. Ridership was about 125 round trips/day.

In 1978, the Massachusetts Executive Office of Transportation and Construction (EOTC) and the Department of Public Works (DPW) bought a 60-passenger Hovermarine HM-2 Mark III for \$450 000 and named it the "Yankee Skimmer". The hovercraft and conventional vessel service operated on route A shown in Figure 1, a distance of approximately 10 miles. The conventional ferry service between Hingham and Boston was provided by a 15-knot conventional-hull vessel named the "Freedom". The principal communities served are Hingham, Weymouth, Cohasset, and Quincy; the nearby communities of Marshfield, Hull, and Norwell contribute marginally to ridership. Additional over-the-water service with another conventional boat was provided by a private, unsubsidized operator on route B.

The South Shore terminal is located at Hingham Shipyard, 0.5 mile off MA-3a (Figure 1). It is convenient to Hingham and Weymouth residents, who can generally reach the site within 10 min. The terminal has approximately 250 parking spaces. There is one bus route that can provide feeder service.

Central Wharf is used as the docking site in Boston. The Aquarium stop on the Massachusetts Bay Transportation Authority (MBTA) Blue Line subway is adjacent to Central Wharf. This heavy rail line has rush-hour headways of 5 min. Bus service is provided at Central Wharf but does not offer any downtown distribution. Much of the Boston central business district is within a 10- to 12-min walk of Central Wharf.

Both the Hingham Shipyard terminal and Central Wharf in Boston lack adequate covered waiting areas, information and ticket booths, and restrooms.

In late January 1979, the Yankee Skimmer service was discontinued due to a freeze-up in the lower harbor and mechanical problems with the boat. Service was not resumed until late spring, in part be-

cause of concern over the budget available to cover operating deficits of both the hovercraft and the conventional vessel.

From May through late October 1979, hovercraft service was resumed and experienced better ridership and fewer breakdowns. The increased ridership during the summer can be attributed to the combined effects of better weather, better service reliability, and the gasoline shortage. At its peak, the commuter service was operating at capacity on two hovercraft runs each rush hour. An extra stop in East Boston was added on one of the hovercraft runs each way to service Bethlehem Steel, which bought 25 seats for that trip. In July 1979, Sunday service was offered to the Boston Harbor islands on four successive weekends and was also heavily patronized.

In the fall of 1979, there was concern at EOTC about the Yankee Skimmer's ability to perform satisfactorily throughout the winter. Service was therefore discontinued that winter and did not begin again until late in the summer of 1980. EOTC operated the vessel briefly in the fall of 1980 before selling it back to Hovermarine in December 1980. This paper is based only on the service provided through the winter lay-up in October 1979.

MARKETING AND FARE POLICY

There was little advance marketing of the hovercraft service and no paid advertising. However, because of the unique aspects of the demonstration, there were a number of news articles in Boston and South Shore newspapers when service began. In addition, since much of the ridership came from a dedicated group of "boat buffs", word-of-mouth communication was expected to be effective. In any case, since the HM-2 could only carry 180-240 passengers/peak, little advertising was considered necessary to get adequate ridership response.

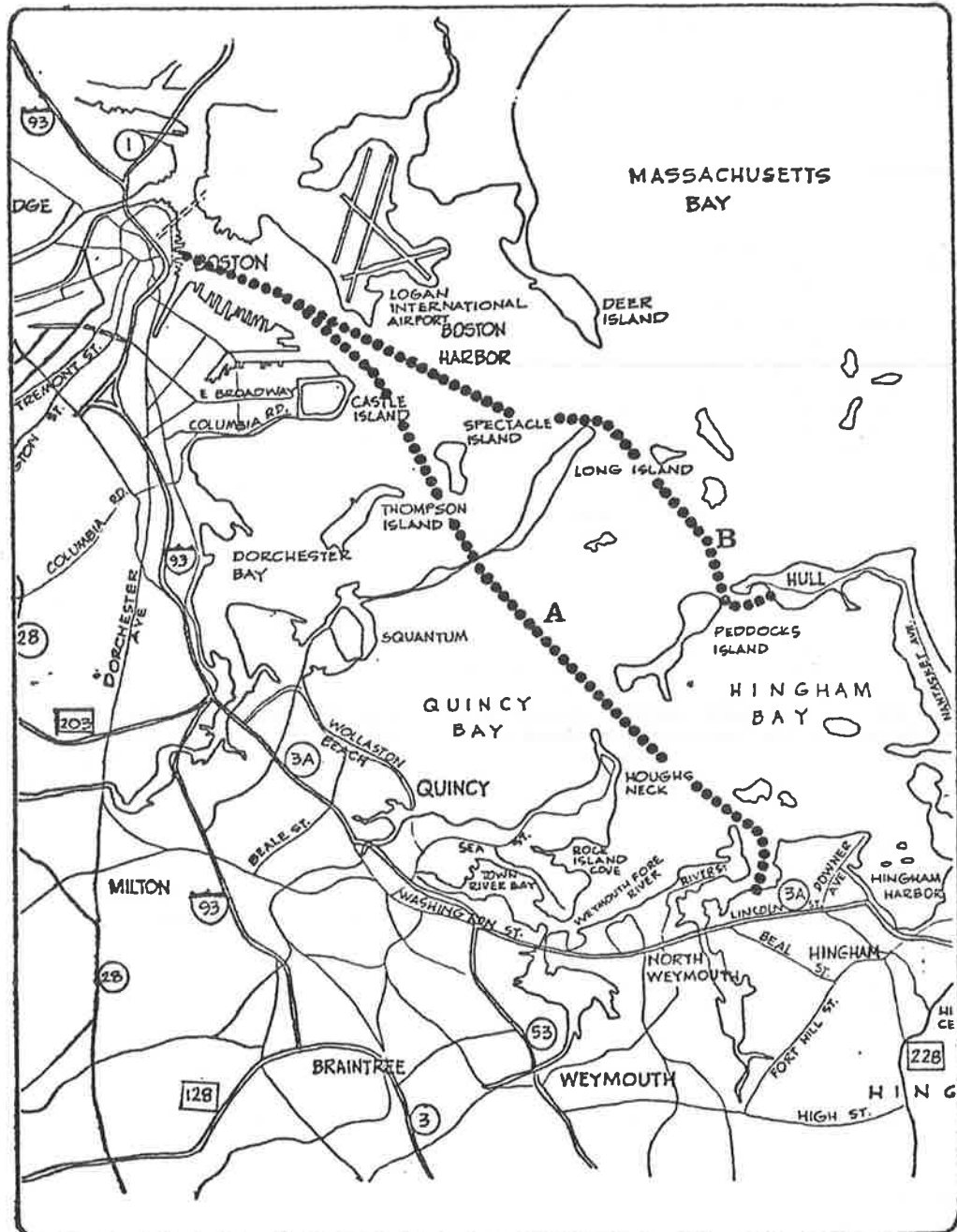
After service began, information on service cancellations was broadcast on a local South Shore radio station and a major Boston station. Decisions on cancellations due to weather were usually made at about 4:00 a.m. to permit adequate notice. Commuters could also call the boat operator or EOTC for information on service status.

The tight core of regular riders lent itself to two other forms of unusual information dissemination. For several months a monthly newsletter was handed out on the boat. In addition, EOTC held periodic meetings (roughly one per month) with commuters to promote a dialogue on how the service was responding to passenger needs. These meetings were held downtown during weekday lunch hours and typically attracted about 20 riders.

The fare on the Yankee Skimmer and the Freedom was set at the same price. Initially, the one-way fare was \$1.50; during the course of the project it was raised to \$1.75.

Because the Yankee Skimmer was limited to a seating capacity of 60 passengers, a specific ticket-sales policy had to be developed. This is not necessary for the Freedom, which has a rated capacity of 399 persons (on the Freedom, the seats are not built in and, unlike on the HM-2, standing is permitted). Tickets were sold on a preannounced day at

Figure 1. Project area.



the Hingham dock. Tickets were sold for specific individual trips to permit riders to select the most appropriate combination of morning and afternoon runs (or to choose to use the hovercraft in only one direction). The number of reserved-seat tickets sold varied during the project from 45 to 50 out of the 60 seats available on each run. Commuters appeared to prefer sale of as many reserved-seat passes as possible, since few of them were willing to stand in line daily. Waiting in line was not only a nuisance but was also very risky, since there were at most 15 open seats.

SERVICE RELIABILITY

Perhaps the most significant level-of-service impact in this project relates to the reliability of the hovercraft and, in turn, the reliability of the ser-

vice itself. Reliability relates to the ability of the vessel both to stay in service and to maintain its published schedule. Based on a survey of passengers conducted in August 1979, reliability was considered by South Shore passengers to be one of the three most important service issues, the others being speed and frequency of service.

Mechanical and Hull Reliability

During the six weeks between the scheduled start of service on December 18, 1978, and the formal withdrawal of the hovercraft from service at the end of the week of January 22, 1979, 30 runs (three days of service) were missed because of repairs resulting from damage caused by hitting debris. This represents 16.4 percent of the 183 scheduled runs during the period.

Although it is generally believed that impacts by objects took place several times a week, the vessel's deflection system prevented damage in most cases. The operator observed that strikes were most likely on the first run in the morning before full light. Ironically, the lack of traffic in the harbor at that hour compounds the problem of darkness. When objects are observed by vessels, they are often reported on the radio, which allows other operators to be alert for them and to track them during the day. On the hovercraft's first trip of the morning, however, debris had usually not yet been reported.

Striking objects caused major damage to the hull itself on only one occasion, when it was holed in the first month of service. A more frequent result was damage to the rudders or propellers. Damage or loss of rudders was accelerated by electrolysis to the rudder bolts and posts. This problem has been diminished by installing anodes on the hulls of newer Hovermarine models.

Most mechanical problems did not result in significant downtime, partly because the HM-2 is powered by three diesel engines of proven reliability. However, there are two factors that affect the service reliability of this equipment. First, the engines are run at a higher number of revolutions per minute than is apparently normal for diesel engines, even though the operator usually ran the vessel at 27-28 knots instead of the 31-32 possible. This increased average run times accordingly.

The second mechanical reliability factor involves the principle of redundancy. Although the Freedom has four engines, it often runs on only two (to save fuel) and is still able to operate on schedule. The Yankee Skimmer can operate on one engine if necessary but does not steer well on "cushion". With drive from only one propeller, the rudders must resist a great deal of turning moment, which makes operation at normal cruise speed hazardous.

Subfreezing temperatures reduced the reliability of the hovercraft for two reasons. First, spray thrown up by the bow tended to land on the stern and freeze. This increased the weight of the vessel, imbalanced it so that air escaped from the cushion at the bow, and forced slower operating speeds. Second, problems with the cooling system developed on several occasions. On particularly cold days, a thin film of ice would develop on the surface of the water. This ice would be scooped up into the raw-water cooling system, where it would clog the filters and stop the flow of raw water through the cooling system. This caused the engine to overheat. Hovermarine engineers felt that the only solution would be to convert to an air-cooled engine, since modifications to the water-cooled systems have been judged infeasible (a deeper intake would be too vulnerable to damage and no amount of heat at the filter could melt incoming ice fast enough). Hovermarine indicated that this problem is unique to Boston among the 70 or so sites where Hovermarine vessels are in service (Rotterdam is the site closest to Boston in climate among other locations where Hovermarines operate; however, the protected waters and freshwater rivers along the Yankee Skimmer's route increase the ability of ice to form on the surface).

Schedule Reliability

The impact of weather on the hovercraft service was profound. In addition to the mechanical problems caused by darkness and subfreezing temperatures, fog occasionally reduced visibility severely enough to force slower operation. The major weather problem, however, was high winds and seas, particularly in winter. Based on a limited period of six weeks from

the planned start of service to formal withdrawal of the hovercraft for the remainder of the winter season, 32 trips were canceled due to bad weather, or 17.5 percent of all trips. In contrast, between May and October only four trips, or about 0.5 percent of all trips, were canceled due to weather.

The trip cancellations due to weather are the result of U.S. Coast Guard safety regulations that were incorporated into a Letter of Stability issued for the Skimmer. These regulations prohibit service under any of the following conditions:

1. Sustained winds in excess of 30 knots,
2. Gusts in excess of 35 knots, or
3. Seas in excess of 4.5 ft.

For seas approaching 4.5 ft, the Coast Guard established a sliding scale of maximum speed guidelines. However, it was the wind restrictions rather than the wave restrictions that forced several cancellations of service. The wind restrictions were apparently imposed because of concern that in a strong crosswind the Skimmer's bow would be blown downwind due to the boat's limited water resistance while on cushion (water resistance at the stern is provided by the rudders). The Coast Guard's concern was that, with a hard offsetting rudder correction to maintain a straight course under such conditions, altering course to windward would be impossible.

By contrast, the Freedom is capable of operating in winds up to 60 knots. The Freedom did not have to cancel service due to weather during the course of the project, although a substitute boat was occasionally used.

The schedule allowed a 30-min period for each one-way trip by the hovercraft. This was based on an expectation of 20 min for the trip itself from cast-off to tie-up, 2-3 min for loading and unloading, and a layover cushion of 7-8 min. In actual practice, EOTC determined that trips departed 3.2 min late on average and arrived 28.4 min after the scheduled departure time. This implies that a slightly longer layover between trips would have prevented marginal delays on individual runs from affecting schedule adherence on subsequent trips.

Reliability Summary and Comparison

During the six-week start-up period of winter operation (December 18, 1979, to January 26, 1980), EOTC reported operating a total of 113 runs out of 183 that were scheduled, or 61.7 percent. Overall, EOTC accounted for the scheduled runs as follows (1, p. 20):

<u>Category</u>	<u>Percentage</u>
Run	61.7
Missed	
Weather	17.5
Hull damage	16.4
Mechanical problems	4.4

During the period from May 1 to October 12, 1979, service reliability improved somewhat. At its best, the hovercraft was available for scheduled service 97.8 percent of the time between June 4 and July 27. However, as a result of wear and tear this declined to 78 percent between August 6 and October 12 (1, p. 21). Overall, the Yankee Skimmer failed to operate at least some of its scheduled service in 14 out of 24 weeks of service between May and October.

SERVICE QUALITY

Four major attributes of service quality are germane to the South Shore hovercraft vessel. These include

(a) speed, (b) frequency of service, (c) ride quality, and (d) on-board amenities. Of these, speed and frequency of service were judged by riders to be the most important.

Speed

The Yankee Skimmer has a maximum speed of 31-32 knots, but it is normally operated at only about 80 percent of power to ease the strain on the engines and reduce fuel consumption. The cruising speed is therefore only 27-28 knots under normal circumstances.

Speeds may also be affected by the need to slow down for (a) harbor speed limits, (b) navigating tight turns in channels or congested harbor traffic, (c) reducing the wake in the presence of small craft, and (d) navigating in reduced visibility. There is a 6-mph speed limit in the approaches to the docks at Boston and Hingham. This restriction, as well as the problems of harbor traffic and reduced visibility, affects all craft, although the impact is more substantial on higher-speed craft. The problem of wake, however, is less significant for a hovercraft because the vessel produces a very small wake when on cushion regardless of speed, which is an advantage over conventional hull craft.

The EOTC on-board survey polled passengers on their attitudes regarding speed. Some 68 percent of Yankee Skimmer passengers rated speed as very important; only 39 percent of Freedom passengers felt the same way. All Yankee Skimmer passengers rated the hovercraft's speed as satisfactory. In fact, the EOTC report concluded that hovercraft passengers would be willing to accept a slightly longer travel time in exchange for improved reliability. Thus, it appears that a number of passengers felt that the loss of reliability offset some of the benefits of reduced travel time.

Frequency of Service

The South Shore service operated only one round trip each peak period before the Yankee Skimmer was introduced into service. Because of its higher speed, the hovercraft could just about maintain a round-trip schedule every hour. By providing three additional trips each peak period, the Yankee Skimmer substantially improved the frequency of service available with a single vessel as well as that of the overall (combined) service.

Seventy-nine percent of EOTC on-board respondents felt that frequency of service was very important and that the schedule of four trips over a 3-h peak period was satisfactory.

An important benefit of frequent transit service in general is to reduce the penalty of missing a particular trip. Unfortunately, the 1-h hovercraft headways are not helpful in this respect. Moreover, during July and August the demand for service was so heavy that, even if a commuter was willing to wait for the next run, there was no guarantee that a seat would be available.

Ride Quality

No detailed analysis of ride quality was possible as part of this evaluation. However, among hovercraft riders, the EOTC survey found that 91 percent of the passengers considered ride comfort satisfactory. This compared with 93 percent satisfaction among riders on the conventional boat. Unfortunately, no study could be conducted of those who ceased using the service. In addition, the survey was conducted in late August, which was a month without much bad weather.

On-Board Amenities

The EOTC survey asked passengers on both the Yankee Skimmer and the Freedom how important they thought it was to have coffee, snacks, or cocktails available. The Yankee Skimmer does not have these amenities but the Freedom does. Therefore, it is not surprising that three out of four Freedom passengers viewed coffee, snacks, or cocktails as important whereas only one in three Yankee Skimmer riders felt this way. Passengers may view amenities as less important on the hovercraft because the trip takes less time.

A related indication of the significance of on-board amenities is that many persons who took the Yankee Skimmer to Boston in the morning apparently took the Freedom home in the afternoon, particularly during the summer. This suggests that, whereas speed and schedule convenience may be the most desirable service-quality attributes in the morning, riders may be less concerned with these issues in the afternoon than they are with the ability to stand on deck and relax with a drink.

RIDERSHIP

Ridership on the hovercraft during the winter was moderate at the beginning of service and deteriorated, probably due to the extensive difficulties encountered in keeping the vessel in service. After service resumed in the spring of 1979, ridership was about the same as it had been at the termination of service in January, but it grew quickly. Three factors probably combined to bring this about:

1. The better weather may have made the service seem more attractive.
2. Service reliability improved markedly.
3. This was the period during which the gasoline shortage developed to crisis proportions.

Although exact figures are not readily available, EOTC indicated that ridership declined somewhat in the autumn of 1979 from the summer peak. Presumably this deterioration was due to a combination of factors, including reduced reliability, poorer weather, and the increased availability of gasoline. Reliability problems tended to develop due to the lack of time for preventive maintenance. The decreased availability of gasoline caused a marked upswing in ridership for all types of public transit (including the Freedom, which was serving 150-200 passengers/day, or about 50 more than normal), and a subsequent slippage in patronage would be expected. In addition, some riders were attracted to the service because of its novelty, which may have begun to wear off. Finally, regular riders knew the boat was going out of service for the winter and probably began to resort to other modes in anticipation.

The total average morning ridership was 175 compared with only 140 afternoon daily riders during the same period. Assuming the difference is picked up by the Freedom, this supports the hypothesis that afternoon riders are less concerned with speed and more concerned with amenities. Twice as many riders surveyed (22) reported using the Yankee Skimmer in the morning and the Freedom in the afternoon as reported the reverse.

Before the introduction of the Yankee Skimmer, service was available on one run each way per day, with a boat similar to the Freedom. Ridership on that service averaged roughly 125 passengers/day each way and remained relatively constant on the Freedom despite the added hovercraft runs. Therefore, the 150 or so daily passengers served each way

Table 1. Hovercraft project costs.

Item	Per Week (\$)	Per Year (\$)
Capital/start-up costs		
Depreciation		108 000
Central wharf		
Dock ^a		0
Renovation ^b		13 500
Hingham dock ^b		7 500
Crew training and boat preparation		19 500
Total		148 500
Fixed annual costs		
EOTC administration		15 000
Mass Bay Lines fee	216	11 232
Insurance		32 000
Hingham pier rental ^c		4 800
Total		63 032
Operating costs		
Crew	852	44 304
Fuel	695	36 140
Maintenance	547	28 444
Extraordinary maintenance		12 000
Miscellaneous ^d	97	5 044
Total		125 932
Total		337 464

^a Owned by EOTC; no depreciation estimate.
^b Paid as annual rental for two years.
^c Excludes \$4800 attributed to Freedom.
^d Security guard and trash pickup at Hingham.

by the Yankee Skimmer appear to represent 100 percent induced ridership.

Most hovercraft riders came from one of four communities bordering the location of the South Shore terminal. This was also true before the Yankee Skimmer entered service. The greatest gains in ridership on the new service were from the communities closest to the wharf. This is logical, since benefits of reduced line-haul time are most significant for those with the shortest access time.

The principal alternative modes available to potential hovercraft passengers are the private automobile, the Red Line subway, and a private bus line. In the 1979 survey, more than 90 percent of both conventional and hovercraft passengers indicated one of these options. Since the survey did not ask any information regarding former mode, it must be assumed that responses to the question about the mode used "if boat service were not available" are representative of users' former modal choices.

Only 3 percent of the respondents to the 1979 survey (combined hovercraft and regular-service passengers) indicated that they would not have traveled if the boat service were not available. Thus, the commuter boat service did not generate significant additional travel.

Door-to-door travel times by alternative modes depend on each individual's origin and destination, so it is difficult to estimate the precise impact of the hovercraft's shorter dock-to-dock trip time. However, the table below gives some indication of how the Yankee Skimmer and the Freedom probably compare with alternative modes for passengers in the Hingham area:

Mode	One-Way Travel Time (min)	Round-Trip Out-of-Pocket Costs (\$)
Drive alone	45	5.50
Drive to subway	50	2.00
Bus to subway	60	2.00
Bus	55	3.00
Carpool (two occupants)	55	2.75
Yankee Skimmer	55	3.25
Freedom	85	3.25

(The \$2.00 cost for drive to subway and bus to sub-

way is for 1978-1979; subway fares have increased since then.) Although these figures are approximate, they clearly point to the significance of the Yankee Skimmer's faster travel time. This makes the hovercraft service competitive with most other modes with respect to travel time. The conventional boat, on the other hand, simply cannot offer travel times comparable to those of other modes for the majority of commuters even in the Hingham area.

The price of the hovercraft service is generally competitive with the price of bus and carpool, but the subway offers a cheaper alternative. For those who rely on kiss-and-ride, the subway is also more reliable, runs much more frequently, and offers several convenient stops throughout the downtown area instead of only one.

Two of these three advantages over the hovercraft (reliability and frequency of service) are primarily due to the fact that it has no sister ship(s) for backup. In the long run, a more difficult issue in designing a commuter boat service is the location of docking terminals with convenient access to a substantial ridership market.

COST AND REVENUE

The projected annual cost of keeping the Yankee Skimmer in service, excluding start-up costs and depreciation, is approximately \$189 000. Start-up costs were an additional \$61 500 and capital depreciation of the Yankee Skimmer would have been \$108 000 if the boat had been returned at the end of April. These costs are summarized in Table 1.

At its best, the Yankee Skimmer was handling approximately 322 trips/day. Average ridership is unlikely to match this primarily because of seasonal variations. With 60 percent of seats sold in the peak direction, one rider per run on the backhaul, and a 95 percent in-service record, the hovercraft would serve about 62 000 passengers annually. This would yield a total revenue of \$94 000. The total deficit for the year in this instance would be \$95 000, or \$1.53/passenger, excluding depreciation and start-up costs. This compares with a deficit of \$0.97/passenger on the MBTA bus and rapid transit service and \$2.96 on their commuter rail service during the same period (1, p. 8).

It is unrealistic to absorb all depreciation and start-up costs over only two years. Assuming instead an amortization period of five years yields an estimated total annualized deficit of \$166 300, or \$2.68/passenger. It must be remembered, however, that other noncommuter uses of the boat might reduce the relative impact of depreciation.

REGULATORY ISSUES

Two sources of regulation significantly affected the project. The Coast Guard operating rules concerning suspension of operations in bad weather have already been mentioned; the other important regulation is the Jones Act.

The Jones Act is essentially a "buy American" law. Because it requires that a vessel used in intra-U.S. commercial service be built in the United States, it severely limits the number of hovercraft available for such use. Specifically, EOTC would have been unable to purchase a sister ship for the Yankee Skimmer even if it could have afforded to.

ENERGY CONSUMPTION

The HM-2 is claimed by its manufacturers to be fuel efficient because of its reduced drag when on cushion. On the other hand, the lift engine itself consumes energy, and the higher operating speeds also

require more energy. The Freedom consumes on the order of 80 gal/h in commuter service compared with about 33 gal/h for the hovercraft (both at normal operating speeds). Because the hovercraft has a higher operating speed, this translates to 0.19 mile/gal for the Freedom and 0.85 mile/gal for the Yankee Skimmer.

Although the Freedom carries a larger payload, it appears to be marginally less efficient than the Yankee Skimmer on the basis of passenger miles per gallon. Based on the above numbers and prime direction loads of 125 on the Freedom and 36 on the Yankee Skimmer, the Freedom operates at 11.7 passenger miles/gal and the Skimmer at 15.3 passenger miles/gal. It should be noted, however, that the Freedom consumes substantially less fuel per mile at the lower speeds (6-8 knots) at which it runs in excursion service.

CONCLUSIONS

Analysis of the South Shore commuter boat service before and after the introduction of the HM-2 hovercraft indicates that over-the-water service must have certain attributes in order to compete with land-based modes. These attributes include speed, frequency, reliability, and convenient access. In some respects, the hovercraft improved the attributes of the South Shore service; in other respects, it did not or could not. Although it did provide trip times competitive with other transit modes while performing within the normal range of transit operating deficits, it was more constrained in the choice of terminals and hence in the number of commuters for whom access was convenient. The reliability of service was hampered by a combination of Boston weather and sea conditions and a lack of adequate maintenance.

In retrospect, many of the difficulties experienced in the Boston project are avoidable and it is to be hoped that future projects can be considerably more successful by the simple expedient of not replicating certain problems. These problems and approaches to solving them are reviewed below.

Wind Conditions

The HM-2 Mark III labors under a wind-velocity restriction imposed because of the potential impact on steering control when the craft is on cushion in a high crosswind. This restriction may be questioned in light of the obvious ability of the boat to alleviate the problem by dropping off cushion. Furthermore, other hovercraft designs or other high-speed technology craft may be less susceptible to this problem.

Sea Conditions

Because of Boston's northern latitude and the fact that the hovercraft was operating in protected estuarial waters, ice and slush scooped into the cooling system from the surface water was a chronic problem. These sea conditions are not duplicated anywhere else that the Hovermarine craft is in service, nor is it likely to be experienced in any other major port city in the United States. However, intake filtering systems or other engineering solutions could presumably be developed if necessary.

Mechanical Design

The HM-2 Mark III is an old model that does not incorporate the latest design features. For example, the lack of adequate anode plates probably contributed to several rudder failures. This design deficiency has been corrected on later Hovermarine models.

Engineering and Maintenance Resources

Tight budget restrictions forced EOTC to forgo corrective engineering and maintenance actions that could probably have overcome situations such as the intake of frozen raw-water coolant. Thus, even correctable problems sometimes went unchecked. Again, the conclusion is that there must be adequate budgeting for maintenance to ensure service reliability.

Boat Capacity

Because the HM-2 seats only 60 passengers, no strong marketing effort was possible. In fact, the ridership levels achieved (even without substantial marketing) during the summer of 1979, when the boat was running at its best, constituted a problem because those without reserved seats were being turned away. Thus, the South Shore service does not offer an accurate measure of what the ultimate market potential of this type of service might be. Larger boats with more seating, combined with an active marketing program, should be considered in future programs.

Number of Boats Available

Perhaps the single most perplexing problem in the Boston demonstration stemmed from the lack of additional hovercraft. Short of buying five new boats, which would have been prohibitively expensive for EOTC/DPW, the Yankee Skimmer was the only boat available to the state at the time. Without any comparable sister ship, the hovercraft could not offer attractive headways nor could it be withdrawn for essential preventive maintenance. This situation caused unfortunate repercussions throughout the demonstration. Clearly, future programs must give serious consideration to having an appropriate number of high-speed vessels to ensure continuity of service.

In view of the constraints imposed by reliance on a single high-speed craft, EOTC staff feel that the HM-2 has performed as well as can be expected. Despite the resulting limitations of the Boston-South Shore demonstration, high-speed over-the-water technology offers the promise of significantly more successful results in subsequent commuter service applications.

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REFERENCE

1. Evaluation Report. Massachusetts Executive Office of Transportation and Construction, Boston, Dec. 1979.

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