REPORT SUMMARY

FTA Report No. 0257
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FTA RESEARCH
FEDERAL TRANSIT ADMINISTRATION

FOIL FERRY PRELIMINARY DESIGN REPORT

Background

In 2020, Kitsap County Public Transportation Benefit Area Authority, doing business as Kitsap Transit, received a Federal Transit Administration (FTA) research award to advance a robust, replicable business model for a zero-emission, electric transit concept for a high-speed hydrofoil passenger ferry using lightweight carbon fiber hull construction. The vision is to relaunch the "Mosquito Fleet" in Washington State's Puget Sound region to provide increased mobility options while reducing emissions and vehicle traffic.

Objectives

The objectives of the Foil Ferry Preliminary Design, for which this report serves as the primary deliverable to FTA, were to advance the Foil Ferry from a concept to preliminary design, reduce technical risks, develop emissions and performance predictions, and develop operating and capital cost estimates. These objectives support the Accelerated Innovative Mobility (AIM) project goal to create a replicable business model for the pathway to a first-of-its-kind Fast Foil Ferry (FFF) demonstration in Puget Sound.

Findings and Conclusions

The Preliminary Design validates the Foil Ferry concept for the route identified in AIM cooperative agreement Task 4 of the Route Economic Viability Study*, showing Foil Ferry to have dramatic environmental benefits and reduced operating costs compared to conventional diesel-powered fast ferries.*

Glosten, Inc., and Bieker Boats, LLC, doing business as Foil Ferry, LLC, have completed the preliminary design of Foil Ferry, a 150-passenger all-electric fast ferry. This effort was funded through the Federal Transit Administration's Accelerated Innovative Mobility (AIM) initiative. The design is targeted to the Bremerton–Seattle route in Washington currently served by diesel-powered fast ferries.

Construction of Foil Ferry is estimated to cost $14.1 million, plus $1.0 million for owner construction management and oversight. The first hull will also require the design to be advanced from the preliminary level to the functional level ($2.3 million), a prototype program ($0.8 million), and shoreside infrastructure design and construction ($3.2 million). All-in operating costs are estimated to be $1.3 million per year including energy, crew, and maintenance costs (including battery replacement every eight years), which is 35% less than conventional fast ferries.

The next steps to progress the Foil Ferry program include:

1. Build a scaled prototype vessel to mitigate design and schedule risks prior to construction of first-production Foil Ferry.
2. Develop a functional design package with sufficient detail for fabricators to bid on construction.

Benefits

There are numerous benefits Foil Ferry provides, including safety, environmental sustainability, efficiency, and economic competitiveness. Foil Ferry requires less than one-third the energy of conventional fast ferries. Its lightweight composite design and hydrofoil technology deliver efficiency gains that allow the vessel to be battery powered for commercially viable distances.

The Foil Ferry design described in this report is adapted to the Bremerton–Seattle fast ferry route. The vessel can complete each crossing in 32 minutes and a round trip on a single battery charge. As an all-electric vessel, Foil Ferry emits no greenhouse gases or pollutants. Foil Ferry generates significantly less noise than an internal combustion powered craft and offers reduced motions relative to non-foiling hulls, providing passengers with a more comfortable ride.

Foil Ferry produces negligible waves as the hulls fly above the water's surface. This wake reduction compared to traditional vessels is important for protecting sensitive shorelines such as those along Rich Passage, Washington, which makes up a significant portion of the Bremerton–Seattle route.

Foil Ferry incorporates systems to ensure it is at least as safe and reliable as conventional fast ferries. The pilothouse is optimized for situational awareness, including a novel automated object detection system borrowed from the autonomous vessel market that improves outcomes and reduces the risk of collisions. In the event of a strike with an object such as a log while foilborne, a collision absorption system ensures that the vessel comes to a safe and controlled stop.

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Project Information

This research project was conducted by Glosten, Inc., and Bieker Boats, LLC, doing business as Foil Ferry, LLC. For more information, contact FTA Project Manager Justin John at 202-366-2823, justin.john@dot.gov.

All FTA research reports can be found at https://www.transit.dot.gov/about/research-innovation.