



THE GLOSTEN ASSOCIATES

Consulting Engineers Serving the Marine Community

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File No. 14015.01

Mr. Rick Gifford, Borough Administrator, and
Mr. Gary Hennigh, King Cove Administrator
Aleutians East Borough
3380 C Street Suite 205
Anchorage, AK 99503-3952

Subject: Operability and Suitability of Landing Craft for Regular Service across Cold Bay

- References:
1. *Technical Memo: King Cove – Cold Bay Transportation Improvement Assessment, Available Marine Technologies*, prepared for Parsons Brinckerhoff by The Glostén Associates, File No. 97077-C, April 1998.
 2. *Technical Memo Regarding King Cove – Cold Bay Transportation Improvement Assessment*, File No. 97077, The Glostén Associates, 29 May 1998.
 3. *Cold Bay Ferry Study*, prepared for Aleutians East Borough by The Glostén Associates, Glostén File No. 99035, Rev. 1, June 1999.
 4. *Characteristics of the Wind Speed Distribution Over Cold Bay and Lenard Harbor*, Johns Hopkins University, Applied Physics Laboratory, April 2001.

Dear Mr. Gifford and Mr. Hennigh:

In response to a request from Aleutians East Borough, we are writing to discuss the history of investigations regarding marine transportation alternatives to cross Cold Bay, with the purpose of connecting King Cove with the Cold Bay airport, and our current opinion on the possibility of achieving that marine connection with a landing craft.

Founded in 1958, The Glostén Associates is a full service consulting firm of naval architects and marine and ocean engineers. It is nationally and internationally recognized for its engineering analysis capabilities, and for innovative design, especially for unique and complex missions. Its practice has always maintained a focus on the Pacific Northwest, including Alaska. Throughout its history, it has been engaged in engineering, including operability assessments, supporting field operations and remote location marine logistics in the Arctic and subarctic regions of Alaska, Canada, and the Russian Far East.

Since 1997, The Glostén Associates has been periodically involved with the question of marine transportation alternatives to cross Cold Bay, in order to connect the community of King Cove with the airport at Cold Bay. The author of this letter was the project manager and principal investigator for the first three studies referenced above. He has experience operating vessels in Alaska in his own youth. In 2008, The Society of Naval Architects and Marine Engineers awarded him the prestigious David Taylor Medal for “*notable achievement in naval architecture and marine engineering*,” citing in particular his contributions to seakeeping analysis (the analysis of vessel behavior in waves) and operability assessment.

As subconsultants to Parsons Brinckerhoff for the periodic update of the SW Alaska transportation master plan for the Alaska Department of Transportation & Public Facilities (AKDOT&PF), The Glostén Associates was given the task of identifying the two most promising marine transportation alternatives for connecting King Cove with the Cold Bay airport. Reference 1 documents a broad consideration of all classes of marine transportation and concludes that the two most promising marine options were:

1. An ice-capable conventional monohull.
2. A hovercraft.

Reference 2 reports on a follow-up study to Reference 1 that explored in greater detail the potential of an ice-capable conventional monohull and a hovercraft. In studying the ice-capable conventional monohull, Reference 2 specifically considered a landing craft as such a solution; which, were it feasible, would have low cost for port termini and associated vessel-to-shore improvements.

Reference 3, issued roughly a year following Reference 2, is a more substantive, in-depth report developing only the concept of an ice-capable conventional monohull. The concept of a landing craft is abandoned in Reference 2, in favor of a deeper draft design vessel that would operate between termini requiring substantial capital improvements, including dredging and breakwaters at the Cold Bay terminus.

Reference 4 is a detailed analysis of the spatial distribution of wind speed. The final engineering assessments of operability for the hovercraft were subject to wind and wave climatologies derived using Reference 4 and related data from supporting sources. Any conventional marine vessel, landing craft or otherwise, proposed for regular service across Cold Bay should be subjected to a similar engineering operability assessment.

The rationale for abandoning the landing craft alternative is not documented in Reference 3, but it involved a growing appreciation of:

- The severity of the operating wave environment throughout the year,
- The occasional severity of the winter ice environment, and
- The absence of beaches with natural protection from wave action.

Landing craft can deliver high operability in operating theaters protected from waves, particularly at the beaches where landings are to take place. However, they are severely restricted in their ability to operate safely to beaches subject to wave action. At considerable peril to vessel integrity, landing craft can operate to a beach subject to wave action in a military operation such as the D-Day landing. This is because the craft will have fulfilled its mission if it succeeds in making even one trip to the beach, and disembarking its cargo and beach-bound personnel.

Landing crafts are ill-suited to frequent service to beaches subject to wave action if that frequent service requires landing on the beach without regard for the wave conditions. Landing crafts can succeed in operations to beaches subject to frequent wave action if they are able to postpone their landings until the wave action is below the threshold for safe operations. This can be the case for logistic operations such as landing construction equipment at remote locations. However, the wave climatology of Cold Bay is such that, in every month of the year, days may pass between periods when landings on exposed beaches would be regarded as safe.

There is some ability to strengthen landing craft to be more robust against the pounding action against the beach in waves, but this can only be accomplished at the expense of the landing craft becoming heavier and hence of deeper draft. Consequently, a strengthened landing craft will beach further offshore and make it more difficult and challenging for cargo and personnel to be moved to and from the shore safe and dry. It may be appropriate to recall images of infantry wading ashore from their landing craft on D-Day.

In order to ground as close to shore as possible, it is important for landing craft to be shallow draft vessels. Shallow draft vessels, however, have poor seakeeping performance. In particular, shallow draft hulls are prone to severe "slamming" in waves. In an environment such as Cold Bay, the slamming behavior will also result in spray icing problems. These traits will hamper the ability of a shallow draft landing craft to operate successfully across Cold Bay with willing passengers.

Even if one were to assume that the technical, environmental, and capital cost challenges associated with providing protected landings at each terminus could be overcome, the concerns regarding poor seakeeping performance in transit would remain.

Those poor seakeeping problems may be overcome by increasing the draft of the vessel and making it into a more sea-kindly form, but then it will ground too far offshore. The solution to that problem would be to provide piers and transfer spans. By this point, however, the original 'landing' craft solution has been completely transformed into a conventional ferry vessel design, with all of the expenses and environmental impacts associated with terminus harbor and shore improvements that were identified for the ice-capable conventional monohull ferry in the 1999 study (Reference 3).

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It is worthy of note that, subsequent to the studies referenced in this letter, a hovercraft service was in fact implemented across Cold Bay. That service was ultimately discontinued as Aleutians East Borough determined that the necessary operating subsidy was too burdensome and the community of King Cove determined that the service was not meeting their expectations regarding reliability and operability. The fact, however, that a solution expected to be substantially more successful than a landing craft failed reduces even further any anticipation of success for a landing craft.

Yours very truly,
The Glostén Associates, Inc.



Digitally Signed
24-Mar-2014

for Bruce L. Hutchison, PE
Senior Marine Consultant
BLH:amt