Arctic Shuttle Container Link from Alaska, US to Europe

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1. Project / publication	Niini, M, Arpiainen, M., Kiili, R. (2006): *Arctic shuttle container link from Alaska US to Europe*. AARC Report K63. Helsinki: Aker Arctic Technology Inc., 40 pages. http://www.marad.dot.gov/documents/Arctic_Analysis_November_08.pdf
2.Initiator	The study was funded by the Institute of the North and executed by Finnish-based Aker Arctic Technology Incorporated.
3. Objectives	The task was to perform a prefeasibility study to examine and evaluate the techno-logical and economical aspects of establishing a container traffic link between Aleutian Islands and Europe using the Northern Sea Route (NSR).
4. Geographical delimitation	The Arctic Ocean, particularly the Northern Sea Route/North East Passage.
5. Time horizon	No particular time horizon is given. The ice information provided seems to be historical data, not modeling of changes in the ice conditions. Discussions of cost elements also seem to reflect current prices.
6. Thematic focus	This is a feasibility study of establishing year-round container traffic along the Northern Sea Route. The concept is based on establishing ports in both ends for loading containers onto ships specialized for ice operations.
7. Images for the future	Assuming twin trans-shipment ports in Alaska and Iceland, the study evaluated vessels that were 750 TEU and 5,000 TEU. The simulations were based on two different kinds of years, average winter ice conditions and severe winter ice conditions. The evaluation used the double-acting operation design which allows the vessel to travel the traditional bow ahead in open water and, by using a propeller system that turns 180 degrees, to go stern ahead in ice-covered waters. The 750 TEU Arctic container vessel for the study was a modified version of the Norilsk Nickel's Arctic Express, which moves nickel plate year-round and without icebreaker assistance between the ports of Dudinka and Murmansk in Russia. The theoretical study vessel was modified from carrying nickel plate to container storage both below and above deck. The design also doubled the size of the fuel storage due to the longer sailing required. The ship could ply the shallow waters near the coastline of northern Russia, but simulation runs indicated it would need some traditional icebreaker assistance in severe winter conditions. The 5,000 TEU vessel used the same icebreaking design, just on a larger scale. While the larger vessel would accommodate more containers, the size and especially the draft of 13.5 meters would prohibit it for use along the traditionally shallow-draft route of the NSR. As noted, it is anticipated that the smaller study vessel would need icebreaker support some of the year, while the larger vessel would not. However, if the 5,000 TEU ship needed assistance, it would require two icebreakers due to the width of the vessel. Another issue the larger study vessel poses is the ability to travel outside the traditional NSR routes. Using only economic input related to the cost of the vessel, the operational costs, the amount of cargo that could be delivered and other related issues, the transport cost from the Aleutian Islands in Alaska to a port in Iceland via the NSR for the larger study vessel would be between 354 and 526 $US/TEU, and between 1244 and 1887 $US/TEU for the smaller container ship. When comparing to the order of magnitude for costs between Japan and Europe via

	the Suez Canal (ap 1500 $US/TEU), the conclusion was that the results suggest that the Trans-Arctic commercial cargo traffic has been brought in a feasible situation with the most recent developments in ice-breaking ship technologies. Several additional factors were still acknowledged, see under "uncertainties" below.
8. Key driving forces	Driving forces are not particularly discussed. The study is more a test of "what if", making several assumptions about vessels, ice, costs etc.
9. Uncertainties/ wildcards	The study identifies several factors that are important both for the practical operations of a transit route, and for its economic performance. "All of these factors are unclear, uncertain and difficult to estimate," the study concluded. In this order of significance, the most important ones were: • The fairway fees for operating the Northern Sea route with icebreaker assistance. An estimate of $US900 to $US1,000 TEU was given for traffic in 2005. Changes in Russian tariff policies can change these costs. The report criticized the fee structure along the NSR at the time written , which was based on the paradigm of using icebreakers and "paying potential." Therefore, the movement of natural resources along the NSR paid high fees whether using icebreaker assistance or not. This type of fee policy is not suitable for cargo vessels that are capable of independent operations, as the fee should be paid if the icebreaker assistance is needed, according to the study. • Costs of building and running terminals in both ends of the Arctic Ocean, including port infrastructure costs, terminal and harbor costs and the cost to offload cargo onto the shuttle vessel, as well as transferring it back to an open-ocean vessel after reaching the twin port. These could be in the same category as the cost of the vessels. Of course, the terminals for the large and effective 5,000 TEU vessel are much more expensive than those for the 750 TEU vessel, but cost per container may be lower for the larger traffic volume. • "Feeder link costs". These costs are associated with moving the containers between the Arctic Shuttle Container Link terminals and the areas of origin or destination for the container. This is not discussed in the report, but identified as a major cost factor. Other uncertain factors discussed in the report include drafts of vessels versus depth of routes and harbors, ice conditions, the ship's ability to operate fully independent of icebreakers (the bigger ship assumed more independent than the smaller), use of routes outside the territorial waters of Russia and Russian policies on fees in such circumstances and ice conditions,
10. Accomplishment and collaboration	Expert based.
11. Method	The study used an ice operation simulation programme developed by AARC. This calculated the vessels capability of maintaining speed in specific routes under changing ice conditions. "Ice profiles" imitating the true ice conditions were prepared based on ice charts and an ice database. The ships average speed through different types of ice was calculated, and results were presented for different legs of the route and different months. This was combined to give total sailing times from Alaska to Iceland over the year.
12. Sources of information	Ice information and apparently various internal data.
13. Strengths	The strength of the study is the quantitative technical-economical analysis. This is a basis for going deeper into the feasibility of container shipping. It was based on a ship technology that had been proven to be well functioning in ice.

14. Weaknesses	The study is narrow in scope in focusing on technical design of one type of vessels adapted for one specific mode of trans-Arctic shipments. The other main alternative, ice-strengthened ships designed as a compromise for open water and ice, sailing with ice breaker support, is hardly mentioned. It is also narrow in calculating only the costs associated with operating the vessel itself on the Arctic Ocean section of a wider transport system, not the economic feasibility of the whole system. This makes comparisons with costs for alternative routes like via the Suez canal difficult (though a comparison is presented in the conclusion). Such economic analysis is needed before a trans-Arctic shuttle operation can be considered as a serious alternative to today's route via the Panama Canal. These limitations are stated in the report and referred under "uncertainties" above. As long as the reader is aware of it and does not draw wider conclusions, these are not particular weaknesses. The report is unclear about future conditions and how they will change. Several other factors than the technical-economic ones will determine the future of Arctic shipping. These are hardly mentioned .
15. Attention and significance	Aker has been actively engaged in discussions about future prospects for shipping in the Arctic on many occasions. Examples are the "Breaking the Ice" conference organized by the Islandic government in 2007, in a working group under the Arctic Transform project for US-EU dialogue, and PAME during their work on Arctic Marine Shipping Assessment. References to this project can also be found in a 2011 statement by the governor of Alaska on US needs for maritime initiatives in the north. Aker's views on technological and operational challenges for ship operations in the Arctic, in particular their solution with double-acting vessels, therefore have received much attention over the years.
16. Relevance for the Fram Centre	The project is useful for more detailed work on shipping in the Arctic Ocean flagship.