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EVALUATING POTENTIAL RAIL CONNECTION BETWEEN RUSSIA AND THE UNITED STATES ALONG THE BERING STRAIT

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ABSTRACT

The Bering Strait is a narrow waterway that separates the Asian and North American continents forming a major corridor between northern and southern transportation routes. The strait is distinctive, from a supply chain perspective, because it is international, bordered by the United States on one side and Russia on the other. This thesis explores the possibility of closing the gap between the two countries through construction of an interhemispheric railroad connected by a tunnel under the Bering Strait.

Although this global intercontinental railway project could be profitable for transportation purposes to and from Russia and the United States, it faces many difficulties. Not only would the construction period be lengthy and costly for all nations involved, the inability of past Russian and U.S. leaders to sign a joint treaty poses a problem as well. Finding investors who will be willing to pay up to $100 billion to lay 2,400 miles of rail through Siberia, plus 3,000 miles in the U.S. and Canada, in addition to digging a tunnel under the Bering Strait, is also a challenge. This thesis will discuss the current plans set forth by Russia and the United States regarding the feasibility of this project as well as foreseeable benefits and complexities related to its development.

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Introduction

When looking at a globe of the earth, one may find it hard to see the geographic separation between the United States and Russia. The small gap between the most northeastern part of Asia and the extreme northwestern region of North America is known as the Bering Strait. In fact, the official boundary between the United States and Russia lies in the exact middle of the strait, where two islands sit – Big and Little Diomede. The International Date Line, which separates two consecutive calendar days, further divides these islands. Measuring 58 miles (85 km) wide, this narrow passage receives its fair share of attention mainly due to the fact that at one time, land used to connect Alaska, Northwestern North America, and Siberia, Northeastern Asia (*World Atlas*, 2013).

The Bering Strait is not only notable for its extreme land-to-water transformation, but also for its extremely dangerous waters and nearly impossible transportation protocol. Although it is legal to cross the Bering Strait, one must depart and arrive in an official port of call. A port of call, as defined by Merriam-Webster, is an intermediate port where ships customarily stop for supplies, repairs, or transshipment of cargo (*Merriam-Webster*, 2013). The closest official port to the Bering Strait is in Providenia, which is located in Far East Russia and less than 200 miles from the closest Alaskan port of call located in Nome (Webmasters, 2012). In addition, one must also receive formal permission to arrive in Providenia from the Russian government – a process that takes about a year (*Angus Adventures*). It is because of these extreme measures that it is so difficult to cross the Bering Strait and part of what makes it so unique.

In response to the lack of travel along the Bering Strait, there have been discussions regarding construction over the strait. In the last few decades, the idea of building a bridge to once again join Russia and the United States was discussed. However, financial and weather concerns have recurrently delayed the project. Most recently, discussion of a tunnel under the strait has emerged as a central proposition by both Russian and United States officials (*World Atlas*, 2013).

> "The Bering Strait rail and tunnel project can help enhance and expand prosperity for the 21st Century by linking the world's greatest industrial nations with the vast untapped mineral resources of the Arctic. To the south of Alaska and Canada, stands the continental United States, with the greatest economy on Earth, and it too badly needs resources. Building a corridor, linked across the Bering Strait, will provide access to our Arctic resources of oil, gas, precious minerals of all kinds, and freshwater. This vital link will greatly enhance the prosperity of the world" (Wally Hickel, *International Bering Strait Tunnel and Railroad Integration Portal*, 2013).

In 1849, then-Colorado governor, William Gilpin, first proposed the idea of a Bering Strait crossing by rail link (Barry, 2011). More than a century later, economists believe that an interhemispheric railroad will be economically feasible. With that said, many government officials reason that an Alaska-Canada Rail Link (ACRL), connecting existing Canadian rail lines with the Alaska railroad, should be the first phase of this global intercontinental railway project. Once an Alaska-Canada rail link is built, officials feel that it will facilitate the construction of a tunnel to connect this rail line to Russia for both the public and private sectors (Barry, 2011).

According to the 2007 study, *Rails to Resources to Ports*, published by the state of Alaska and Canadian territory of the Yukon, the ACRLwould result in benefits. However, the revenue generated by the freight moved along this new rail may not cover the projected construction cost, which is a steep $10.5 billion. The belief is that building the 1,600-mile line(s) would encourage mining development and create a new trade route to Asia. The completion of the ACRL would not only initiate the Bering Strait project, but also serve as the longest stretch of infrastructure toward the tunnel. In turn, the construction of the rest of the required track would be much less daunting. Additionally, early use of the ACRL would demonstrate the difference between a land route to Asia in comparison to a sea route from off-loaded rail freight. "Such a project would also serve to solidify U.S.-Russian relations over the long-term and expand bilateral cooperation" (Barry, 2011).

In order for such an idea to be executed, support must be generated by North America, Canada, and Russia. The idea must also be of interest to potential users of the tunnel, such as China. Furthermore, it is imperative for all parties involved to realize the benefits and challenges associated with such connectivity prior to construction.

This thesis will begin by exploring the current ocean shipping industry as well as the rail industry in the United States and in Russia. Then, the construction of an interhemispheric railroad in the form of an Alaska-Canada Rail Link (ACRL) will be assessed as well as the proposed plans for an undersea tunnel, including the potential gains and difficulties associated with such a project. Additionally, this thesis will evaluate how the implementation of a Bering Strait tunnel linking Russia and North America will impact Russian-American political relations, their respective countries, and transportation from a supply chain perspective.

Chapter 1

The Ocean Shipping Industry

"World trade has grown at an astonishing rate in recent decades and is in large part dependent upon the ocean shipping industry" (Bruyninckx, 2012). Although it may not be the fastest or most accessible mode of transportation, ocean shipping is a viable option when moving cargo internationally. Maritime traffic practically doubled between 2003 and 2007 and now ocean transport accounts for ninety percent of world trade, by volume. In other terms, roughly five percent of world trade, which is an estimated $380 billion, was generated by the operation of merchant ships (*Organisation for Economic Co-operation and Development*, 2013).

This is an attractive means of transportation for numerous reasons, but most notably for its publicly owned right-of-way, low fixed costs, and low barriers to entry. What this essentially means it that anyone can utilize the water. Certain segments of the ocean shipping industry entail low fixed costs relative to most, if not all, other modes of transportation, and are relatively easy to enter (Novack, 2012). From a global standpoint, this industry is comprised of carriers from all over the world. Given its multi-national business structure, an international organization to regulate ocean transportation has yet to be established. Instead, many countries that engage in foreign trade have created their own legislation, regulation, and policies (Thomchick, 2000).

Ocean Shipping Transportation

There are multitudes of ways in which goods can be transported using ocean shipping. Some of these methods include, but are not limited to, container ships, bulk ships, tankers, general cargo ships, and RORO, or roll on roll off, ships (Novack, 2012). International ocean shipping can be divided into two general markets – dry cargo and liquid cargo. Iron ore, grain, coal, phosphates, and bauxite make up the five main dry bulk cargo categories, while oil and petroleum products serve as the major liquid bulk cargo (Bruyninckx, 2012). In addition, many manufactured products are transported by ocean in containers or in breakbulk form.

These markets can be further subdivided into the bulk, or tramp, sector and the liner sector. The main difference between the two is that the tramp sector carries large shipments of raw materials and does not operate on a fixed schedule or route while the liner sector transports small parcels of general cargo, such as manufactured goods and smaller quantities of bulk commodities, on a regular schedule with standard routes (Parameswaran, 2004).

Tramp Sector

"The purpose of tramp ships is to provide a convenient and economical means to transport goods that require cross-ocean movement" (Lun, Lai, Cheng, 2010, p. 4). A tramp ship can be any vessel as long as it does not have a fixed itinerary. These ships travel from port to port, carrying cargo when it's available, on an as-needed basis on the basis of a short or long-term contract. This cargo mostly consists of a single commodity belonging to one owner. Ships in this sector are typically purpose-built for particular cargo types and are generally unsuitable for other commodities. Dry bulk and liquid bulk cargo are transported in separate vessels within the tramp market. Tramp shipping carriers typically transport dry cargo in bulk whereas tankers are used to transport liquid bulk. The design and construction of these ships are very different due to the fact that they carry different types of cargo. For example, pumps and pipes are used in tankers for loading and discharging purposes, but tramp ships for dry bulk cargoes do not possess these elements. Furthermore, tankers are characteristically larger than dry cargo tramp vessels.

Liner Sector

The liner sector differs from the tramp sector in that its main function is to satisfy the demand for routine cargo transport through customary routes with regular schedules. Liners typically carry manufactured or partly manufactured goods and adhere to a set schedule of ports of loading and ports of discharge. There are often published timetables with set conditions of carriage for liners to follow, as well. Most of the liner cargo is carried in containers and on a variety of vessels that can usually accommodate larger shipments and have more facilities. Additionally, the cargo transported by liners belongs to multiple shippers rather than just one single owner so the administrative processes are far more complex than those of the tramp sector. As a result, liner carriers tend to be more expensive than tramp ships due to higher building and operational costs.

Ocean Shipping Rates

As in any other industry that provides a service to a customer, there is a cost associated with the goods transported in the ocean shipping industry. The prices charged for these services are known as ocean freight rates. These rates consist of the cost of owning and operating a vessel as well as the cost of the specific service provided. In addition to these expenses, the price should also reflect an apposite profit margin (Thomchick, 2000). Freight rates are dependent upon both the demand for and supply of shipping services in the market and shipping demand is contingent on the need for shippers to transport their cargo. The "going price" is an equilibrium value between the supply and demand. This is illustrated in Figure 1-1. When demand exceeds supply, the freight rate increases as a result. The amount of which the rate changes is subject to the sector of the ocean shipping industry in which the transportation occurs.

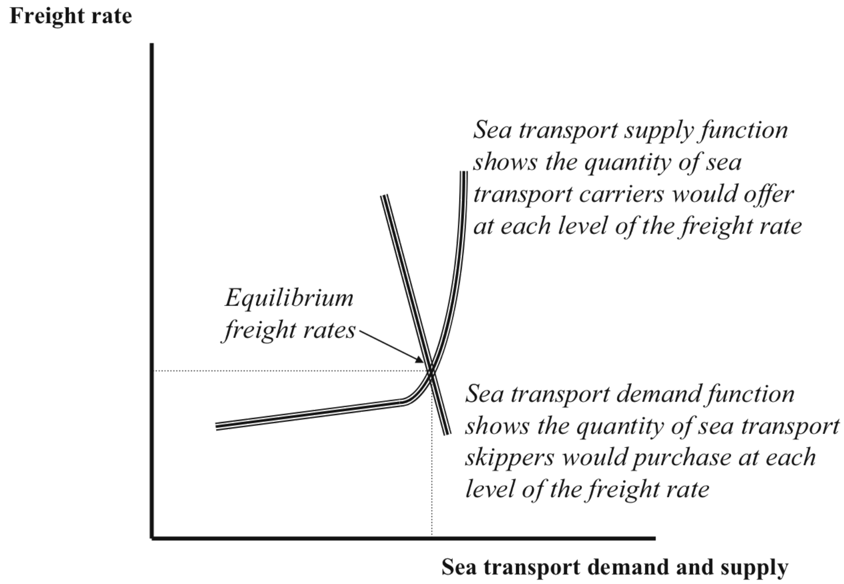

Figure 1-1. The Freight Rate Mechanism (Lun, Lai, Cheng, 2010)

Tramp Rates

As previously discussed, the tramp sector carries dry cargo in bulk and can be transported in any vessel that does not have a fixed itinerary. Accordingly, rates are determined independently for each expedition as well as the specific commodity transported. "All the costs of running the ship, handling the cargo, and paying port fees and harbor dues must be added to the capital charges of ownership and the expenses of administration and overhead" (Kendall, 1986, p. 269). In addition, a shipowner may add margin for profit if conditions are competitive.

Tramp operators have no stake in the long-term goodwill of those who may repeatedly send the same type of cargo over the same stretches of ocean. Rather, the owner accepts offers that seem profitable at the moment. Mindful of the existence of competition, tramp rates demonstrate the workings of the law of supply and demand. When business conditions are favorable, the owner selects whichever cargo assures the largest profit. When adversity threatens, however, operators accept charters, which is the carrying of an entire shipload of cargo from one port to another, that will minimize the anticipated losses (McDonnell; Kendall, 1986).

When there are few cargoes being offered and many ships are competing for the business, a charterers' position is strong and rates tend to be low. Conversely, when there are too many cargoes and a small number of vessels, the shipowners' position is strong and rates are high (Kendall, 1986). Ideally, the tramp owner strives to offer a rate that is low enough to attract the shipper, but high enough to pay the cost of service and allows a reasonable profit. The tramp sector is unique because operators have the privilege of retiring their vessels when they find it economically impractical to continue operating. Owners have the flexibility of doing so until they find it financially advantageous to carry on with operation.

Liner Rates

Contrary to the unpredictable nature of the tramp sector, the liner industry operates on regularly scheduled voyages and conventional routes. Therefore, liner rates are predetermined and based on the individual commodities that are being transported. These rates vary according to their designated stowage factor. A stowage factor is calculated as the ratio of weight to stowage space. This number determines how many cubic meters one metric ton of a certain type of cargo occupies in a vessel's hold (*Transport Information Service*).

The capacity of a liner has two constraints – weight and volume. The stowage factor helps establish how the cargo should be dictated, which is either by volume or deadweight trade. Rates are based on the rule that one long ton equals 40 cubic feet[1]. If one long ton occupies more than 40 cubic feet then it is described by measure and charged by volume while cargo that stows in less than 40 cubic feet is identified as deadweight cargo and charged according to weight.

[1] Or one metric ton with a stowage factor of one cubic meter

Typically, the carrier is given the opportunity to decide whether to charge by weight or measure. This is because any cargo with a stowage factor lower or higher than 40 is considered to be underutilizing the vessel. Cargo with a stowage factor lower than 40 underutilizes the liner's weight capacity, while cargo with a stowage factor higher than 40 underutilizes the vessel's volume capacity. Consequently, the carrier may charge according to the maximum revenue realized by the shipment (*Transport Information Service*; Thomchick, 2000).

Factors Affecting Ocean Freight Rates

While moving cargo through oceanic transportation, one can argue that ocean freight rates play the largest role. However, there are a number of other factors to consider that affect ocean freight rates. Technology, destination, currency, fines and fees, as well as fuel prices are among some of the many factors. Innovative technology, for example, is changing the way vessels are built, specifically with regard to size. Larger ships result in economies of scale, which lead to lower operating costs and should ultimately bring about lower freight rates (Thomchick, 2000). Similar to the effect of larger ships, the distance in which cargo is transported is a significant factor affecting freight rates. Simply put, the longer the voyage, the greater the ocean shipping rates and vice versa. Additionally, freight rates vary with the direction of the voyage, which means that rates may be different on the headhaul and backhaul. This is due to varying demands for cargo on the two trade lanes. This is true for the liner industry, as the tramp industry, with vessels not having set itineraries, are free to go with the lanes that offer the highest revenues. Currently fluctuations are also a factor because shipments cross international borders (Thomchick, 2013).

In the ocean shipping industry today, the common denomination used for international transaction purposes is the dollar, which means that freight rates are dependent upon fluctuating exchange rates (*Marine Insight*, 2011). See Figure 1-2 for an example of how currency rates can fluctuate. Ocean freight rates are also dictated by fines and fees obtained in transit to the final destination port. For example, a charge could be administered for a delay in vessel arrival due to an overcrowded port and a ship's inability to dock in a timely manner. When these delays occur, they cause the ships to spend more time at sea, which results in more fuel being used. As fuel prices change, freight rates are adjusted accordingly.

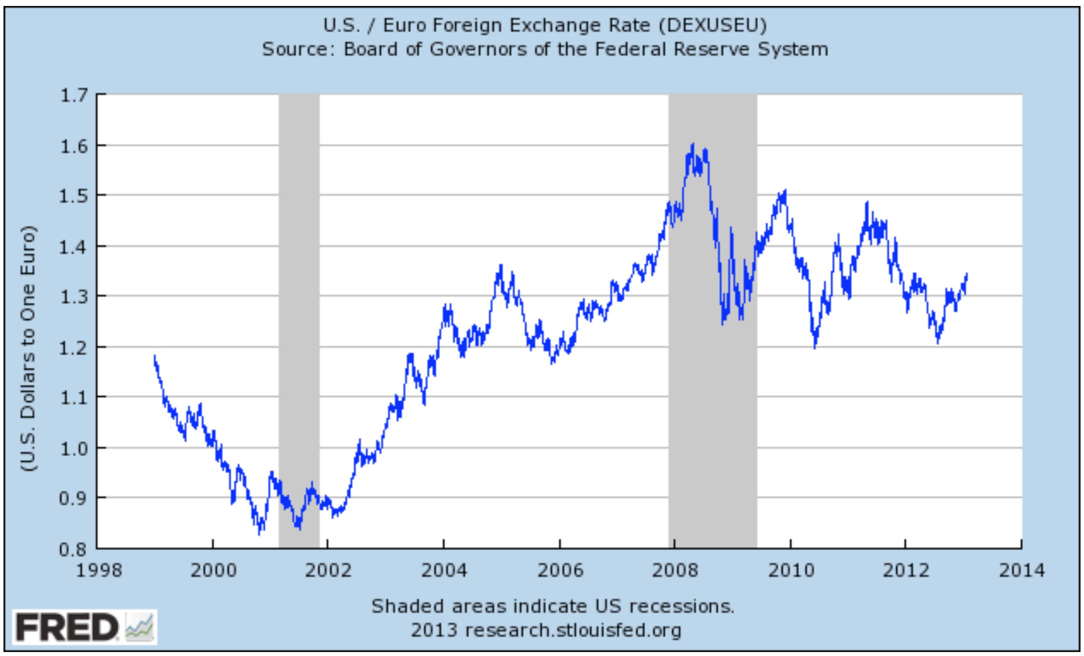

Figure 1-2. U.S. / Euro Foreign Exchange Rate (Board of Governors of the Federal Reserve System, 2013)

If the proposed construction of the Bering Strait tunnel is pursued in its current form, economists are concerned that it will have a negative impact on the ocean shipping industry, thus causing the reduced use of the mode. With that said, building such a tunnel with lengthy connecting railways will significantly increase railway traffic. In order to better understand the rail shipping industry and its cost, a discussion of the rail system is critical.

Chapter 2

The Rail Shipping Industry in the United States

Freight train shipments make up the majority of rail transportation in the United States today. When compared to the transportation patterns of other countries, passenger service, which was once a large and vital part of the nation's transportation network, now plays a limited role. There have been repeated fluctuations in the U.S. rail industry because of changing U.S. economic needs in addition to the rise of automobile, bus, and air transport. Despite these fluctuations, the industry generated $59.6 billion in revenue in 2010 (*Palley*, 2012). According to the Association of American Railroads (AAR), in 2009, railroads moved approximately 43 percent of U.S. freight by ton-miles (*Highbeam Business*).

The United States is connected by a safe, cost-effective, and reliable freight rail system. As of 2010, this multi-billion dollar industry consists of nearly 140,000 rail miles operated by seven Class I railroads, 21 regional railroads, and 537 local railroads (*Palley*, 2012). Not only does the near-140,000-mile system move more freight than any other freight rail system in the world, totaling 1,695 millions of tons in 2011, it also provides jobs across the country and numerous public benefits (*Freight Facts and Figures*, 2012).

The U.S. freight railroads are almost entirely privately owned and operated and are responsible for their own maintenance and improvement projects. Compared to other major industries, they invest one of the highest percentages of revenues to maintain and add capacity to their system. The majority of this investment is for upkeep to ensure a state of good repair while a much smaller percentage of capital expenditures, on average, are used to enhance capacity (*National Atlas*, 2013).

Internationally, the U.S. freight rail network connects with Canada and Mexico through several key gateways along the borders. These gateways allow freight railroads to participate in achieving national export goals and facilitating safe and efficient importation of goods.

Economic regulations, dating back to 1980 through the passage of The Staggers Rail Act, have assisted in the success of the freight railroad industry. These regulations supported the interests of both the railroads and its customers through the following: (i) lowering costs for shippers; (ii) encouraging railroad capital investment (i.e., $480 billion since 1980); and (iii) enabling freight railroads to support a large number of high-paying rail jobs (*Association of American Railroads*). As of 2009, U.S. freight railroads operated 139,118 route-miles (223,888 km) of standard gauge in the United States **(***Freight Facts and Figures***,** 2012). Although they constitute as little as one percent of the number of freight railroads in the world, they account for 67 percent of the industry's mileage, 90 percent of its employees, and 93 percent of its freight revenue **(***Highbeam Business*).

Railroad Classes

In the United States, freight railroad companies are generally divided into three categories based upon their annual revenues[2]: Class 1 for freight railroads with annual operating revenues above $398.7 million, Class II for freight railroads with revenues between $40 million and $398.7 million, and Class III for all other freight revenues. These classifications are set by the Surface Transportation Board (*Palley*, 2012).

[2] These classifications are based upon dollars earned in the year 2010.

Types of Rail

In addition to railroad classification by revenue, freight railroads are further defined by type and function. There are four different types of freight railroads: Class I (as described above), regional, local line haul, and switching & terminal.

A. Class I Railroads

As previously stated, Class I freight railroads are defined as those with revenue of at least $398.7 million. Although there were as many as 132 Class I railroads in the 1900s, as a result of mergers, bankruptcies, and changes in the regulatory definition of "Class I," there are currently only seven railroads operating in the United States that meet the Class I criteria (*Palley*, 2012).

B. Regional Railroads

A regional railroad is a line haul railroad with no less than 350 miles (560 km) and/or revenue between $40 million and the Class I threshold. In 2010, research shows that there were 21 regional railroads, which employed 5,334 people (*Palley*, 2012).

C. Local Line Haul Railroads

Local line haul railroads are generally known for performing point-to-point services over short distances. This type of freight railroad generally operates less than 350 miles (560 km) and generates annual revenues of less than $40 million per year. In 2010, there were 537 local line haul railroads (*Palley*, 2012).

D. Switching and Terminal Carriers

The final category, switching and terminal (S&T) carriers, are railroads that are either: (i) jointly owned by two railroads for the purpose of transferring cars between railroads; or (ii) operate solely within a facility or group of facilities. This type of freight railroad performs pick-up and delivery services regardless of revenue (*American Short Line & Regional Railroad Association*).

	Class I RRs		Regional RRs		Local RRs	
	1990	2010	1990	2010	1990	2010
number	14	7	30	21	486	537
employment	209,708	151,854	11,578	5,334	14,257	12,092

Figure 2-1. Railroad Class Statistics (*Palley*, 2012)

Competition and Benefits

The freight railroad business, like most businesses in the United States, is highly competitive. In order to compete effectively against each other as well as other transportation providers, these railroads must offer high quality services at competitive rates.

As previously indicated, railroads account for approximately forty percent of freight ton-miles in the United States. Although this is more than any other mode of transportation, railroads' revenue share has been falling for decades. This is a true reflection of both the intense competition that railroads face and the large rate reductions railroads have passed on to their customers over the years (*National Atlas*, 2013).

Railroads carry numerous bulk commodities, coal being the single most important commodity to the rail industry as it accounts for approximately half of the U.S. electricity generation. “According to figures compiled by the Association of American Railroads (AAR), coal accounted for 47 percent of tons originated by railroads in 2009 and 25 percent of railroads’ 2009 gross revenues” (*Envision Freight*, 2011). Chemicals, grain, non-metallic minerals, lumber, cars, and waste materials make up the other major commodities carried by rail (*National Atlas*, 2013).

Currently, the fastest growing method of rail traffic is intermodal. Intermodal is the transport of shipping containers or truck trailers by rail and at least one other mode of transportation, generally trucks or ocean-going vessels. One of the principal benefits of intermodal transport is that it "combines the door-to-door convenience of trucks with the long-haul economy of railroads". As illustrated in Figure 2-2, during the last twenty years, utilization of rail intermodal has tripled and plays a critical role in making logistics more efficient. "In 2003, for the first time ever, intermodal surpassed coal in terms of revenue for U.S. Class I railroads" (*National Atlas*, 2013). In the global economy, the efficiency of intermodal has provided the U.S. with a significant competitive advantage.

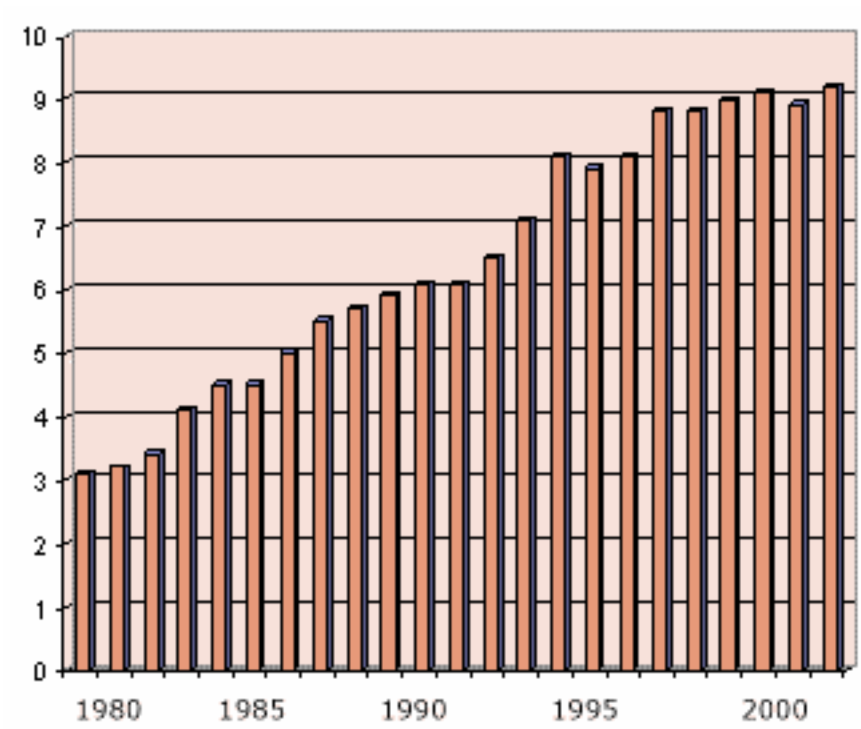

Figure 2-2. Intermodal Growth: TOFC/COFC Loading in Millions of Units (*National Atlas*, 2013)

Passenger Rail and Means to Meeting Future Railroad Challenges

Prior to the introduction of Amtrak in 1970, the same companies in the United States that offered freight service provided passenger rail service. To simplify the transition process when Amtrak first began providing services, the U.S. government allowed freight railroad companies to donate passenger equipment to Amtrak in consideration for its consent to allow them to exit the passenger rail business. The financial benefits to Amtrak as a result of the "donation" process by freight railroads reached almost $200 million.

Although the track mileage over which Amtrak operates exceeds 22,000, all of those tracks are owned by freight railroads. By law, freight railroads are required to grant Amtrak access to utilization of their tracks. In consideration for use of the tracks and to cover related costs, Amtrak pays significant fees to the freight railroads. For these reasons, Amtrak is currently the only intercity U.S. passenger rail carrier in the continental United States (*National Atlas*, 2013).

In order for the U.S. to be competitive in the global market, the country must make effective investments in transportation infrastructure. Creating public-private partnerships is one way to accomplish this. In these partnerships, private companies and governments cooperate to maintain, improve, and expand transportation infrastructure. The investments provided by public-private partnerships act as an effective means to meet future transportation challenges while also providing public benefits. These benefits include reductions in road congestion, highway fatalities, highway fuel consumption and greenhouse gasses, logistics costs, and public infrastructure maintenance costs (*Federal Railroad Administration*).

The U.S. freight railroads are set to meet these future challenges by offering multiple transportation solutions, such as intermodal transportation. As previously discussed, intermodal transportation allows for containers of goods to be placed on rail, moved across the country, and then transferred to other forms of transportation in order to reach their final destination. Intermodal transportation is even more efficient with the use of double-stacked containers on railcars. “With improvements in service and facilities, rail intermodal will become more competitive and absorb the projected increases in freight movement caused by population growth and the growth of the intermodal movement of goods into the future” (*Federal Railroad Administration*).

Chapter 3

The Rail Shipping Industry in Russia

Transportation has always been an issue for Russia's people and government because of its large land areas and harsh conditions. Prior to the construction of roads and railways, waterways were used as the primary mode of transportation. Although roads were built, they were only usable at certain times of the year because of the weather. As a result, railroads proved to be the most efficient means of transportation in Russia (*Fink*, 1991).

The Soviets greatly modernized the train system through electrification, building new lines, installation of automatic couplers, brakes and signaling, and establishing Railway Universities. These improvements enabled the country's rail industry to establish itself as a leader, superior to most other railroad systems in the world (Voronin & McKey, 2010).

Currently, Russian Railways, the government-owned national rail carrier of the Russian Federation, is an industry leader and one of the largest railway companies in the world. Created in 1992, it operates over 85,000 kilometers (53,000 miles) of common carrier routes and several hundred kilometers of industrial routes, resulting in it being the second largest railway operation in the world, exceeded only by the United States (*Globaltrans*, 2011).[3] Russian Railways, a monopoly within Russia and formed to take over existing rail lines within Russia from the Soviet Union, employs almost one million people (*Federal State Statistics Service*, 2009).

[3] With the collapse of the Soviet Union, the Ministry of Russian Railways was formed in January 1992 to operate railways within the Russian Federation.

History of Freight Traffic

Freight traffic in the Russian Empire was weak at the start of World War I (before 1917) in comparison to the size of the country, but it grew significantly under the Soviet Union, only to decrease after the Soviet Union separated into its satellite countries. By 1941, the Soviet Union rebuilt its rail system and industrialized through five-year plans. When World War II began, however, railroad traffic decreased to almost one-half of its prewar value. The Soviet Union started construction of railroads during the course of the war so that by the end of World War II, a significant portion of the lost traffic was recovered; however, it took years after the war ended to regain the pre-war level of traffic (*Russian Railways*, 2013).

Determined to succeed, the Soviet Union rebuilt its rail system as well as implemented a series of additional five-year plans for industrialization and rail traffic increased significantly. By 1954, the Soviet Union hauled more freight than any country in the world, even surpassing the United States (*United Nations Statistics Division,* 1958, pp. 297, 300). Rail freight continued to increase in the Soviet Union to the point that in 1960, the Soviet Union was moving half of all railroad freight in the world (*United Nations Statistics Division*, 1985/86, p.55). This statistic continued for almost thirty years. Shortly thereafter (1991), the Soviet Union collapsed and its largest republic, the Russian Federation, which at that time hauled two-thirds of the traffic of the former Soviet Union, became an independent country. As of 1993, Russia was no longer the leader in rail freight with the United States assuming that position. Russia's position as a leader in rail freight continued to decline, with China surpassing Russia in 1994 (*United Nations Statistics Division*, 2002, pp. 538, 543, 545).

Fleet Overview

As of 2011, the Russian railcar fleet totaled 1.1 million units. In Russia, rolling freight cars primarily consist of two types: (i) general purpose rolling stock commonly known as gondolas or open top cars; and (ii) specialized rolling stock. The gondola is the most common type of rail car as it can be used to carry a variety of items, including ferrous metals, scrap metals, crushed stone, coal and timber. Rail tank cars, the second most common type of railcar in Russia, are predominantly used for the transport of liquid and gaseous commodities, including the movement of oil and oil products. As a result of the demand for these types of commodities over the past few years, there has been significant growth in the use of freight rail services in Russia (*Globaltrans*, 2011).

Pricing in the Freight Car Sector

With the exception of Russian Railways, pricing for railcar services in Russia is unregulated. Russian Railways operates many of its own railcars (mostly noncommercial) and railcars leased from its subsidiaries, Freight One and Freight Two. Freight One is Russia's largest rail transport operator and owns over 200,000 units of rolling stock of different types (*Globaltrans*, 2011). It has implemented noteworthy tariffs and standardized freight contracts.[4] In August 2011, Russian Railways divested itself of Freight One, selling seventy-five percent of its shares to a group controlled by Vladimir Lisin, one of Russia's wealthiest individuals. The same group acquired the remaining twenty-five percent in October 2012 (*Railway Gazette*, 2012).

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[4] The railcar tariff charged and regulated by Russian Railways was an effective standard for the market prior to the creation of Freight One. However, the effectiveness of this benchmark has decreased dramatically since the majority of the Russian commercial railcar fleet is no longer owned by Russian Railways.

Although the rail industries of the United States and Russia differ in many ways, an interhemispheric railroad could bridge the gap between these discrepancies. Despite considerable costs and intricate engineering, the ACRL could be the ultimate connection between two very dissimilar and distant countries. The physical association may foster better relations between the U.S. and Russia, which have been slighted since the Cold War times. With that said, however, it is important to evaluate the current status of the Bering Strait tunnel project, including the plans associated with the construction of the Alaska-Canada rail link, to measure the true feasibility of such a challenge.

Chapter 4

Bering Strait Transportation Plans

In order to pursue the construction of a Bering Strait tunnel, political and financial support will need be generated from the countries whose territory the project will occupy – the United States, Canada, and Russia. Due to the fact that the U.S. and Canada are democracies, a multifaceted approach will be required. This will ensure that effective and sustained education is being utilized as well as lobbying in the public and private sectors to build support and obtain financing and governmental approvals in order for this project to be successful. The construction of a Bering Strait tunnel would directly affect the U.S., Canada, and Russia, while indirectly influencing their neighboring countries China, Mongolia, North and South Korea, Japan, and even Mexico/Central America. Additionally, the creation of such a tunnel would have a profound impact on economic development in eastern Siberia, Alaska and the Canadian northwest (Barry, 2011).

Interhemispheric Railroad

In 2000, the U.S. Congress authorized $6 million to conduct a feasibility study for the construction of an Alaska-Canada rail link. "The 2007 ACRL study examined building a line from a terminus of the Canadian National Railway in northern British Columbia, running through Yukon to the state-owned Alaska Railway, as well as a branch line to the White Pass & Yukon Route Railway" (Barry, 2011). This is illustrated in Figure 3-1. Currently, rail cars voyaging to and from Alaska travel by barge. Researchers claim that the construction of the ACRL would improve Alaska's economic security through the addition of transportation options. The bulk of the line's traffic would be made up of exports of British Columbia coal and iron ore from Yukon because building mines in the region would be more economically feasible with access to rail service.

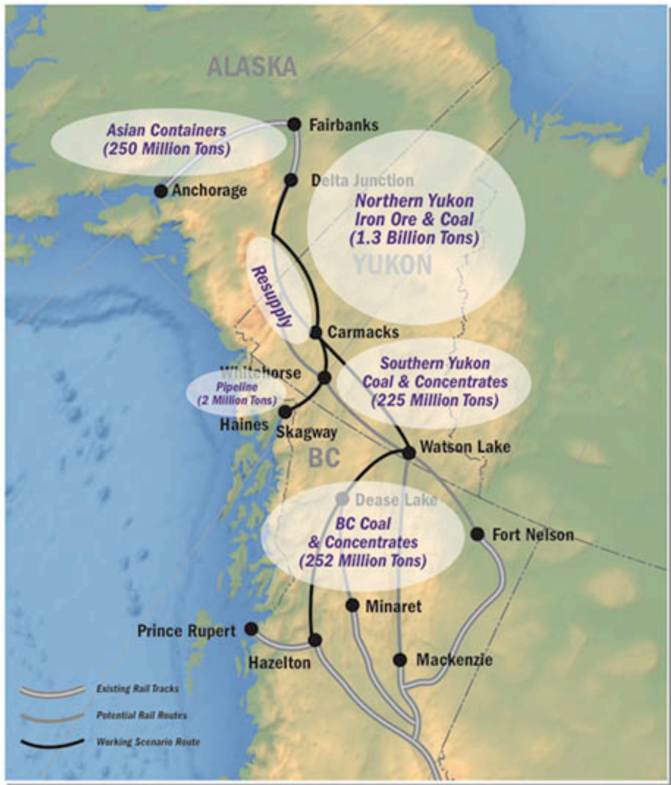

Figure 3-1. A map of 50-year life-cycle sourcing for route options connecting the Alaska Railroad to the Canadian National Railway in northern British Columbia (Barry, 2011)

"Support for a Canada-Alaska railroad, however, grows along with each new rise in the price of oil, the growing demand in Asia for new oil sources, and the simple fact that Canadian natural resources - especially in the Western Provinces of British Columbia, Alberta and Saskatchewan as well as the Yukon Territory - have difficult access to Pacific ports" (Soloview, 2012). The current plan consists of constructing a 1,632 mile purpose-built, double-track railway from Canada to Delta Junction, Alaska by the Canadian company Generating for Seven Generations, Ltd. (G7G). Then, a Canadian railroad would connect to a single-track Alaska railroad that is currently under construction near Delta Junction.

Generating for Seven Generations, Ltd. is seeking $4.5 million to get this project underway. If the necessary funding is generated within the next year, G7G anticipates a Canada-Alaska railroad will be built by 2018. If this connection follows the given timeline, it is expected that the American continent of international track (a 1,300-mile bit between Fairbanks and the Bering Strait) can be completed by 2024, which is six or more years earlier than the projected Russian railroad to the coast of the Bering Strait from Yakutsk. This could give the U.S. an opportunity to dig the entire 64-mile tunnel using its own financing and labor force, which could potentially give the country more control over key aspects. Some of these aspects include, but are not limited to, tunnel maintenance, security, customs and operation schedules, as well as land on the Russian side to house its workers (Soloview, 2012).

The Bering Strait Tunnel Project

The Channel Tunnel, also known as the English "Chunnel", which connects Britain to the European continent, lends to the feasibility of an interhemispheric rail joining North America and Russia across the Bering Strait. The Chunnel highlights global challenges as well as the potential of creating a new and secure avenue for trade and communication. In order for such a major development to progress, there must be significant preparation and dedication by those who foresee this economic vision.

By way of example, the 31.4-mile undersea Eurotunnel took four years to complete and was preceded by the work of two financial and construction groups from both the British and French sides. Before the Channel Tunnel Group/France-Manche was formed in 1985, local banks and construction interests lobbied for the construction of the tunnel, based on supporting material from a 1975 study (*International Bering Strait Tunnel and Railroad Integration Portal*, 2013).

Unlike Britain and France, who have been partner nations in the European Union since 1957, at the present time there is no indication that the same level of cooperation will be set forth between the United States and Russia. There are often more issues that divide the two countries than unite them. With that said, however, a railroad connecting the two nations could be dually profitable with regard to the speed of moving cargo and passenger traffic as well as the availability of rich mineral deposits. Arguably more important, this connection could put a new perspective on the need for a more harmonious relationship between Russia and the U.S. (*International Bering Strait Tunnel and Railroad Integration Portal*, 2013).

Progress of the Interhemispheric Railroad and Bering Strait Tunnel

On August 12, 2011, at the Intercontinental Magistral Eurasia – North America conference held in the Russian city of Yakutsk, Dr. Victor Razbegin, acting head of a joint organization of the Russian Academy of Sciences and the Ministry Economics, said:

> "The only segment that remains before the continents are linked is 4,000 km in Russia and 2,000 km in Alaska and Canada, so this is a key, pivotal project for developing the entire infrastructure of our Northeast. The project is for building an integrated main line, not only a railroad, but a highway and an electric power transmission line, linking the power grids of the continents. After we build this segment, four out of six continents will be interlinked by these systems" (Douglas, 2011).

It was at this conference that Russia agreed to link its existing Baikal-Amur railway to the Bering Strait, a project that will require laying 2,400 miles of rail through undeveloped regions in Siberia to the Chukotka Peninsula by 2030. Then, on November 15, 2011 Russian President, Dmitry Medvedev, attended a ceremony, which initiated the construction of a new rail line that would shorten the trip along the Baikal-Amur railway to Yakutsk. This portion of the track will connect the towns of Berkatit and Nizhny Bestyakh, the latter being roughly 10 miles from Yakutsk (*International Bering Strait Tunnel and Railroad Integration Portal*, 2013).

It is believed that the United States and Canada could build their portion of the railroad to the Bering Strait several times faster than the Russians, due to the previously mentioned undeveloped Siberian lands. This is in large part due to the fact that North American construction can be initiated from different places simultaneously. For example, the existing Alaska Railroad in Fairbanks can be expanded on either side in tandem as well as from Forth Nelson in Canada to the north. Additionally, an 80-mile railway is already underway from North Pole to Delta Junction, with nearly a mile-long bridge over the Tanana River, which will only expedite the process (*International Bering Strait Tunnel and Railroad Integration Portal*, 2013).

Before the tunnel itself can be built, approximately 5,500 miles of new railroads would need to be built between the United States, Russia, and Canada. This construction would result in an estimated total cost of a possible $100 billion. The joint stock company Russian Railways is managing Russian state funds, which will be used to finance the railway project in Russia. The total expenditure of the Bering Strait tunnel will depend on many things, but is estimated to cost Russia up to $50 billion, although the final amount may be more. “The final bill for the tunnel between Britain and France, for instance, was 80% over initial estimates; in current princes that would be $17.5 billion” (*International Bering Strait Tunnel and Railroad Integration Portal*, 2013).

Although the financing of this undersea tunnel project seems to be prearranged in Russia, the weaker U.S. economy could present a tougher case with regard to finding the money to build the North American section. Similar to the way the Eurotunnel was built, researchers feel as though the entire North American portion of the project can be financed through private funding by way of private investors with approval from local territorial governments.

Chapter 5 Conclusion

While the construction of a Bering Strait tunnel could be forty to fifty years off or more, the result could be everlasting; however, because of the effort and costs involved, as well as the international cooperation required, the feasibility of such a project is undetermined. With that said, the construction and completion of an interhemispheric railroad, in the form of an Alaska-Canada rail link, will complete the initial stage of the Bering Strait tunnel project. It is anticipated that this significant initiation of the project will create the necessary momentum for serious consideration of the construction of a Fairbanks to Wales rail link with the ultimate goal being the building of the tunnel (Barry, 2011).

Potential Challenges

Although the implications of an interhemispheric railroad connected by a tunnel under the Bering Strait present many benefits, like any construction project, there are expected challenges and obstacles associated with construction.

Climate and Geographic Limitations

Due to the Bering Strait's close proximity to the Arctic Circle, the severely cold and long winters may present obstacles to building during the construction phase. Further, as a result of the frigid temperatures, the Strait is often faced with very thick ice that lasts for extended periods of time during the year due to its inability to thaw. Finally, the geographic area in which the Strait is located is often the subject of high magnitude earthquakes, thus causing concern that construction could be halted at any time in the event of intervening damage from such an disturbance (*Ricci*, 2012).

Economic Challenges

While the limitations addressed above are practical concerns and of paramount importance to the tunnel, the challenge that may be most problematic is the excessive cost associated with its construction. First and foremost, the location of the Strait is in a deserted area. Because the closest town on either side of the Strait is approximately one hundred miles away, roads and railways will need to be built to transport workers to the site, the cost of which may be excessive. Second, the design and construction of the tunnel will require sophisticated engineering by numerous specialists in the field. In light of the fact that each phase of the design and construction of the tunnel will differ, extraordinary costs will, in all likelihood, accompany the same (*Ricci*, 2012).

Finally, because the tunnel will be below surface, significant time and expense will be devoted to considering the most practical method of its construction. In this regard, certain engineering models have contemplated an approach where sections of the tunnel are built above ground during the coldest winter months and then submerged during the warmer summer months. While this methodology appears logical, engineers have explained that building a submerged tunnel requires a soft water floor as a base and the Bearing Sea's floor is quite the opposite, making this design difficult to implement. Other proposals contemplate building the tunnel under the ocean floor. Although this, too, appears practical, construction will require workers to drill through miles of rock to create a tunnel that can withstand the impact of the tremors associated with the aforementioned earthquakes. Once again, this will be a difficult task in light of the conditions of the ocean floor surrounding the Strait. Regardless of the method that is ultimately chosen, each brings with it enormous costs (*Ricci*, 2012).

Understanding the practical and economic challenges presented by a project of this magnitude, proponents believe the impacts on transportation, Russian-American relations, and benefits that could be realized by the related countries, still overshadow the challenging aspects.

Impact on Transportation

With the emergence of a railroad via a Bering Strait tunnel, the ocean shipping industry would see significant changes. For one, the creation of a railway would eliminate two land-to-water transfers. Containers are currently moved from their city of origin to Vladivostok, Russia by rail. Then the freight is moved from Vladivostok to a Pacific port by ship. Finally, the goods are transported by rail again to their final destination. These land-to-water transfers are not only time-consuming, but can be expensive as well. With the creation of a railroad, one train can move freight from the city of origin to its final destination in a single, continuous trip. In order for this to be made possible, the track gauge, or distance between two rails of one track, must be uniform between Russia and the United States (Cerny, 2011).

An all-rail route provides a considerably shorter travel path compared to the rail-water-rail route previously discussed. Less distance will be traveled because of the more direct route used by the railroad. Additionally, an all-rail route will be significantly faster. With this railroad, it would be possible to achieve a three-day travel schedule from Northeast Russia to Canada using average speeds of 56-59 miles per hour (90-95 kilometers per hour). The line could even provide a four-day service from Canada to China, where high capacity lines exist. These times are drastically shorter than those achieved by the fastest ocean container ships. Furthermore, if the eventual purpose of the railroad is to have passenger trains for regional or tourist purposes, these cars will be able to move at the same speed as freight (Cerny, 2011).

The proposed railroad through the Bering Strait tunnel can serve many functions at one time. Some of these functions include international transportation for Northeast Russia as well as transport connections with the rest of Russia, the Middle East, and Europe. In addition to Russia and the United States, the railroad would also directly benefit Canada, China, Korea, Mexico, and Vietnam by way of existing railroads (Cerny, 2011).

Impact on Related Countries

It is expected that up to one hundred million tons of freight traffic will be generated every year between Europe, Russia, China, Japan, South Korea, Canada, and the U.S (*International Bering Strait Tunnel and Railroad Integration Portal*, 2013). As a result, it is expected that significant social benefits will emerge within these countries. "New towns, hospitals, schools and other community services will have to be developed in areas where little exists today, and high-value jobs will be created by the thousands in areas where subsistence has long been the primary means of human survival" (Burroughs, 2009). The connecting railroad will also have considerable employment creation potential, as well. It is expected that the construction of the railroad will generate between 3,000 and 7,500 jobs over a four to five year period. These jobs anticipate estimated annual payrolls of $200 to $500 million. Once built, maintaining the operation of the railroad should create 1,000 to 1,500 permanent jobs over a thirty to fifty year span. These jobs are expected to see estimated annual payrolls of $75 to $125 million per year (Cooper, 2007).

The Alaska-Canada railroad has potential to create an estimated 10,500 to 26,250 jobs during the construction phase, with an additional 3,500 to 5,250 jobs during operation. Arguably more important than potential jobs are the economic expansion opportunities through the creation of improved transportation infrastructure. An estimated 175,000 to 300,000 new jobs are expected to surface in northwestern North America as a result of the increased business activity stemming from the Alaska-Canada railroad. Furthermore, between 100,000 and 155,000 new jobs are expected to be created in Alaska, in addition to 25,000 to 50,000 jobs in the Yukon Territory, and 50,000 to 100,000 new jobs in British Columbia. These jobs will be created to support the new industrial, mining, and trade and transportation-related businesses that will develop in response to the Alaska-Canada railroad (Cooper, 2007).

Impact on Russia-American Relations

As a result of the Bering Strait tunnel project, economic growth would be realized by Russia and the United States alike. For example, Russia could sell its abundance of gas and oil to North America, adding new and convenient resources to the marketplace (*International Bering Strait Tunnel and Railroad Integration Portal*). Similarly, the railroad could transport crude oil and petroleum products to the lower 48 states from Russia, Alaska, or northern Canada (Cooper, 2007).

There could also be substantial benefits in the way of international relations between Russia and the United States as a result of this project. The Bering Strait rail link will inevitably bring the U.S., Russia, and Canada closer together and combat rivalry as a result of their close trading relationship. On a global scale, it is also plausible to add Japan, Korea, Mongolia, Southeast Asia, India, the Middle East and Mexico into the sphere of influence. This new railway system could ultimately connect even Europe, Africa and South America. “Creating more trade, more jobs, and more real wealth will be the major benefits to the world of the Bering Strait rail link, and in the process there will be fewer reasons to consider armed conflict as a solution to real or perceived international injustices” (Burroughs, 2009).

> "As one of the greatest civil engineering projects in history, this Interhemispheric North America-Eurasia railroad could also usher in a new era of American and Russian cooperation. The moment at which American and Russian workers drive in the final spike will be as significant to the world as that World War II moment 68 years ago when our armies linked up across the river Elba in Germany to end a war" (*International Bering Strait Tunnel and Railroad Integration Portal*).

Although the construction of the Bering Strait tunnel could provide a faster, safer and less expensive way to move freight, it also poses serious challenges with regard to climate, geographic limitations, and economic factors. While ocean shipments may decrease, construction of the tunnel would create access routes from isolated areas of North America and Russia. In addition, railway travels through the tunnel would be a passage point between multiple continents. Many argue that the Bering Strait project is not only about economics, but a global investment in peace and security that would bring other benefits, which can be viewed as equally important to the betterment of relations among countries that often have conflicts.

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ACTIVITIES/ MEMBERSHIP

Beta Gamma Sigma Honors Society — University Park, PA
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- Selected to society based upon ranking in top 10% of class

Sapphire Leadership Program — University Park, PA
Active Member — 2009-PRESENT
- Recruited for and accepted into 80-member organization comprised of top 8% of incoming Smeal College of Business students
- Attended professional and leadership development, fundraising and community service events each semester

Penn State IFC/Panhellenic Dance Marathon — University Park, PA
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- Actively involved in fundraising efforts where chapter exceeded initial goal by raising over $200,000

WORK EXPERIENCE:

Limited Brands: Henri Bendel — Columbus, OH
Distribution Center Operations Intern — SUMMER 2012
- Managed the flow and efficiency of the newly implemented e-commerce system
- Learned and utilized the latest software and return/exchange process
- Created a database to measure e-commerce productivity

Supper Restaurant and The Global Dish Catering Company — Philadelphia, PA
Business Management Intern — SUMMER 2011
- Conducted weekly inventory evaluation of food, liquor and supplies
- Managed daily financial activity of each business, including revenue and expense
- Integrally involved in all facets of planning for private catered events

LEADERSHIP:

Alpha Sigma Alpha Sorority — University Park, PA
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- Supervised all meetings of chapter and the executive board to assist members in better understanding chapter's goals and requirements
- Communicated with national headquarters regarding chapter standards to ensure chapter's compliance with rules and regulations
- Acted and served as a role model to chapter members

Panhellenic Delegate of Gamma Eta Chapter — 2009-2010
- Expressed opinions of chapter by voting in panhellenic meetings
- Served as liaison between chapter and College Panhellenic Association through attendance at biweekly meetings
- Participated in workshops and forums to better understand panhellenic organization