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Good afternoon Ladies and Gentlemen, thank you for inviting me here today to share with you my views on Global Logistics, supply chains as I'll refer to them, and the potential implications for Hampton Roads. When people think about the impacts of global supply chains in Hampton roads, the first reaction is to frame the discussion in jobs or business, and although I'll touch on that local aspect a little later, in reality that is only a very small part of the overall impact of the process of globalization and disaggregated global supply chains on citizens of our area, and the military specifically. Global supply chains impact every resident in our area, as they do everyone else everywhere else in America, in hundreds of ways every single day, most invisible until there is a failure. The direct business aspect of globalization is far too narrow a focus, and concentrating on it at the expense of the broader aspects of globalization's impact runs the risk of failing to catch bad policy before it becomes policy. And the only thing more persistent, insidious, and damaging than bad guys planning disruptive attacks are politicians enacting bad policy. The global supply chain is a very large complex system where little is black and white; the distinction between competitor and partner is hard to determine, frequently you are both simultaneously, and from a political/policy perspective the difference between wining and losing is a matter of squishy definition based on hugely subjective cost benefit analysis loaded with unknown unknowns. Policy focus tends to be on very narrow parts of it, even down to the industry level in protectionist discussions. I'm not sure if the true complexity of the global supply chain is understood at the policy level which in and of itself is a threat to the global supply chain, hence our everyday well being, in that policy is being made that effects the functioning of the system without appreciation for what those effects will actually be, some of which will not be good. Our well being depends on the smooth functioning of that system, but it is highly complex, to the point that it's true functioning and the linkages or pathways for propagating effects are well beyond the complete comprehension of most of those making political decisions that affect it. Consequently

we face a risk from bad policy that is every bit as great, or greater than a threat from bad guys. First because bad policy is easier to inflict and hence more likely to happen, and second because once bad policy is in place it is very hard to reverse even when it is a no brainer. Just remember, prohibition was enacted in 1919, and it took 14 years to acknowledge what a stupid idea that was and reverse it.

When we talk about global supply chains the term tends to be taken as some abstract concept and most don't understand it in the personal terms that you should. How does it impact my life every day? So perhaps it would be best to start out by illustrating both how the global supply chain system touches citizens in Hampton Roads in unexpected but critical ways and also how complicated it can be, hence easy to damage, with a very specific example. This example also couples trade with a topic that is generating much heated debated in the US right now – health care.

The US is the worlds leading consumer of diagnostic medical isotope procedures (nuclear medicine) consuming over half of the global total of such services. Millions Americans each year receive nuclear medicine procedures for the detection and tracking of heart disease, cancer, bone injuries, brain and kidney function among other things including many thousands here in Hampton Roads at hospitals like Sentara. 2/3rds all of these, or about 16 million procedures each year in America alone, utilize the medical isotope technetium-99m. Technetium-99m has a half life of about 6 hours and therefore must be used as soon as it is made. That means that a relatively long half-life storage and transport element must be utilized as an intermediary and that element is Molybdenum-99, which decays into technetium-99m. Molybdenum-99 however has a half-life of 66 hours, which means while it is useful for "storage and transport" the supply chains must be very short in terms of time from manufacture to time of use. Molybdenum-99 can not be stockpiled and must be produced in response to real time demand. Consequently it is distributed to users, like Doctors at Sentara, through a very short, rigid supply chain. There are no sources of Molybdenum-99 in the United States. The US imports 100% of this critical element for health care. There are 5 reactors in the world that produce Molybdenum-99. One is in Canada, which produces about half the worlds total and

under normal circumstances about 60% of US consumption. There are also 3 reactors in Europe and one in South Africa. All of these reactors are over 40 years old. All also by the way, produce Molybdenum-99 from highly enriched uranium 235 (HEU), creating a small but important global trade in weapons grade uranium. The Canadian reactor, which is at Chalk River near Ottawa and is over 50 years old, was taken off line in May of 2009 for repairs. Restart has been pushed back several times and is not expected to be operational again until sometime later this year. The result is a global shortage of Molybdenum-99 and subsequent rationing of medical procedures that depend on it. This is not the first time this has happened and in response in July of 2009 the American Medical Isotopes Production Act of 2009 was introduced into Congress. The intent is to establish a domestic source of this critical medical isotope and develop a production process that utilizes low enriched uranium (LEU) rather than weapons grade uranium to reduce proliferation risks. The bill was passed in the house but has not passed in the senate so it is not yet law, and it is estimated that it will take upwards of 6 years to get production going in the US once funding is secured, so even if it does become law, we'll be depending on imports for a long time to come. But let's assume for a moment that the Molybdenum production issue is resolved and we have a domestic production capability. Next comes the low enriched uranium used to make it.

As most people probably do not realize, based on the nuclear power as an alternative to oil rhetoric we here these days, the US is not remotely self sufficient in low enriched uranium, which is primarily used in the electric power generation industry now-and something to remember when the energy independence crowd touts nuclear energy as the solution. For example in May of 2009 the Russian state-owned nuclear power company TENEX signed a 1 billion dollar deal to supply US electric utilities in California, Texas and Missouri with low enriched uranium. The significance of this deal, which got about zero press in the US, is not that Russia is supplying the US with LEU; it has been the biggest supplier to the US of LEU for awhile under the Megatons to Megawatts program. Under this program weapons grade uranium is down blended to LEU in Russia and shipped to the US. Russian LEU accounts for about 40% of all LEU used in US electrical generation nuclear power plants. As a note, the US actually needs

to import well over half of its nuclear fuel for commercial use, and Russia supplies most of it. The real news in the TENEX deal is that it is recognition that the US will most likely face a shortage of LEU in 2013 when the Megaton to Megawatts program expires. Russia has more than 40% of the world uranium enrichment capacity, over 3 times the capacity of the US. The US currently has one enrichment facility in operation by US Energy Corp, and it is an older gas diffusion type facility. The centrifuge enrichment technology, which is about 50 times more efficient than gas diffusion and at the heart of the US / Iranian conflict, is not operational at this time in the US, although a couple such facilities are under construction. Neither will be fully on line before 2015 and that assumes no construction or start-up problems, hence our LEU conundrum and dependence on Russia for nuclear fuel for a significant chunk of domestic electricity production. So for those who receive power from a nuclear power plant including many right here from the plant at Surry, remember to say thanks to the Russians and a global supply chain in LEU the next time you flip the switch and the lights come on. So, assuming we solve the Molybdenum problem we could well just be trading it for an LEU problem. Either way we still depend on foreign suppliers for a critical medical isotope. But lets take another step and assume we solve the LEU problem and develop sufficient enrichment capacity to become self sufficient in LEU production – the next question is where the uranium ore comes from to make LEU. Guess what – we not so good there either.

According to the US Energy Information Administration domestic US mines produced a total of 3.9 million pounds of uranium in 2008. US civilian owners of nuclear reactors bought 53.4 million pounds of uranium. US domestic sources actually supplied 7.7 million lbs, representing a draw on stockpiles as well as current production, something that is actually happening in the global market as well, where globally we are using more uranium than we are producing and drawing on stocks, hinting at possible supply constraints in the future as stocks are depleted and the number of nuclear powers plants increases at the rate planned for the US – there are 18 license applications pending now and some members of congress are pushing for construction of at least 100. Anyway, that means that the US only produces about 14.5% of the uranium ore it needs

at current consumption rates, the other 85.5% comes from foreign suppliers. Clearly if we build 100 plus nuclear power plants we are not decreasing our dependence on foreign suppliers for fuel, just switching who we depend on for what. No matter how far we push, we end up sourcing overseas somewhere. The dominate global players in the uranium business are Russia, Namibia, Niger, Uzbekistan, Kazakhstan, Canada, and Australia. Outside of Canada and Australia not the most stable bunch. It is also worth noting that US uranium ore is not nearly as good a quality as that from foreign suppliers, in particular Kazakhstan. Quality, by the way, is something that must be remember in sourcing discussions and is a reason for example that China imports massive amounts of iron ore, principally from Australia, or they did until the Rio Tinto mess last year, and South America even though they have very large iron ore deposits in China. Anyway, back to uranium and nuclear medicine. As you can see, when you or someone you know heads over to Sentara for a nuclear medicine diagnostic procedure, it is the smooth functioning of a very complex, very short, international supply chain at multiple steps in the production process that allows you to have that procedure done, and the material being used in your procedure will have been created from weapons grade uranium in a foreign reactor just a matter of hours before it is injected into your body.

For an example specific to you in the military, we have rare earths, which lately have captured much attention. The GAO just did a study on US dependence on Rare Earths, the DOD is doing a similar study, and, much like technetium, congress just introduced HR 4866, The Rare Earths Supply – Chain Technology and Resources Transformation Act of 2010, or RESTART Act for short, Congress apparently now in competition with the military for catchy acronyms. The purpose of this act is to make the US self sufficient for rare earths. So What's the big deal here? Rare earths are17 minerals which include 57 thru 71 on the periodic table commonly called the lanthanides, plus two others [scandium and yttrium] thrown in there because they have similar chemical properties. China is virtually the world's sole source of these minerals. In fact the US and EU launched a WTO complaint against China last year because the Chinese were not exporting enough of them – and when's the last time you heard any complaint about China not exporting enough of something. Rare earths impart critical properties to

things like magnets, motors, and alloys. For example, the US military or more accurately their suppliers, can not make much military hardware without rare earths, and therefore depend on china to make handy things like traveling wave tubes and klystrons, essential components in satellite communications equipment, CRT and SVGA computer displays, radars such as the Aegis SPY-1, optical equipment such as NVG's, laser targeters and designators such as that used in the M1A1 Abrams tank, Tomahawk cruise missiles, precision guided munitions such as JDAMS, air-to air missiles such as Phoenix and Sidewinder, and Air-to surface missiles such as the Standoff Land Attack Missile. We also need China to make the DDG51 hybrid-electric propulsion motors and virtually any jet aircraft. When you look at any of that stuff in your inventory there is no doubt you will see a made in America label on it, providing you a sense of security that we are self-sufficient for this critical war fighting stuff, but that's wrong. We depend on China to make all that stuff and that sense of security will lead to dangerous miscalculation, something I'll return to in a moment. Since we need China to make all that stuff I would hope that when we run war games over a conflict with china, we include how we'll deal with the likelihood that China will at some point stop selling us the stuff we use to make the bombs we're dropping on them.

Then we have the holy grail of self sufficiency, energy. The US by the way, is the worlds third largest producer of oil. Something many do not realize. We are behind only Saudi Arabia and Russia. We also happen to be the biggest consumer, meaning we import about half our oil needs. Roughly 30 percent of our domestically produced oil comes from offshore in the Gulf of Mexico. They're having some problems down there right now as you've no doubt seen. The real danger, hooking back to the bad policy bit, is the propensity of congress to react to failures such as deepwater horizon with grand standing and knee jerk legislation resulting in bad policy. Lots of congressional knees are cocked and ready to produce maximum jerkage over the deepwater horizon failure so I'd be a little nervous about our oil supply right now. Anyway, as for self sufficiency, we already talked about the illusion of self-sufficiency by switching to nuclear. One other solution that is being pushed heavily is some form of electric or hybrid car. Here's the catch - electric cars require lithium to make batteries that have both high energy density

and low weight. Most of the world's lithium is in south America, and 50% of the worlds lithium is in Bolivia alone. So we trade dependency on the Middle East with dependency on Bolivia and I'm not sure why anyone thinks they'll be any better. By the way, to get the electric motors light enough to make them practical for a car you also need rare earths, meaning we'd need china too. Once again, like Russia and uranium, we are not making ourselves self-sufficient, just swapping who we're dependent on and for what.

The overall connecting concept here is that efforts to make us self sufficient can be likened to a cartoon with uncle same staring with dismay at the 11th leak in the dike and all his fingers and toes occupied with plugging the first 10. We can not insulate ourselves from the world, even potential advisories such as China. Back during the Cold War we and the Russians quickly came to the joint conclusion that there would be no winner in a nuclear war and the world in total would suffer. Our efforts shifted from trying to figure out ways to win one to ways to ensure we did not fight one to begin with. MAD became our policy and among other things we limited our defenses to ensure there was no miscalculation by either side in thinking winning was possible. We are at that point with China. Any conflict with China will leave no winners and be disastrous for the world. Legislation such as that noted above, and the self-sufficiency movement in general, are the economic equivalent of nuclear defense during the cold war, designed to provide a sense of safety in the event of conflict, but it is an illusion and dangerous in that that false sense of security can lead to the miscalculation that a war with China is winnable. It is not, at least in any practical sense. The economic fall out of a conflict with china would be every bit as bad, and every bit as global, as that from a cold war exchange with the Russians. The dollar would be worthless, wiping out official reserves in most developing countries, bankrupting them and ensuring governmental collapse, the developed world economies, including the US economy would collapse producing widespread social unrest. A collapse in the financial system will lead immediately to a collapse in world trade – the events in 2008 showed us how tightly integrated the financial system is with the trading system when the financial collapse led to the collapse in the letter of credit market used to manage counter party risk causing a disastrous fall in trade even though there were plenty of willing buyers and seller at the early stages. Lest

we forget the US and China together represent about one half of the worlds total manufacturing capacity which would be idled, and the general economic collapse would idle the rest. Economic refugees would lead to large scale people movements, particularly from developing countries; the list goes on and on. So, a war with China is not winnable and must not be fought. We should be working to ensure that outcome rather than legislation such as that noted above, which is nothing more than fingers in a very big dike and likely to lead to a dangerous and false sense of security.

These are just a few examples, and admittedly very strategic examples of a complex supply chain that is invisible to those who depend on it, but it is important to remember that these sorts of complex but invisible supply chains touching your life are replicated thousands of times in all sorts of ways every day in much more mundane but no less critical ways. So, when we think about global logistics and potential impacts on Hampton Roads, resist the first impulse to frame the discussion in terms of jobs and instead consider the far more pervasive and important impacts and pay attention to what politicians are doing, since those supply chains can be easily disrupted.

Which brings us to circumstances well short of conflict – suppose we just want to save a few jobs, not blow up Beijing. The protectionists among us will argue that the legislation noted above is really just about protecting jobs, not preparing for war. The first problem with this approach is, as we saw, more often than not it merely shifts the point in the supply chain at which it is foreign unless the supply chain is traced far enough back. And if it is, then that of course is not a real option either as it will drive up the cost of doing business in the US and the cost of living for US consumers. In the uranium case specifically the impact will be on the cost electricity, making US manufacturers uncompetitive in the global market place and increasing the amount every one of you will pay to vepco every month regardless of whether your electricity comes from coal or uranium. We all remember the steel import quotas put in place to protect the US steel industry in the early 90's. Roughly 8000 steel workers jobs were protected but over 75,000 American manufacturing jobs were lost in US industries that use steel as an input as those manufacturers became uncompetitive due to the high cost of steel. For

every steel worker that kept his or her job, 9 other Americans sacrificed theirs, including places like the Ford plant that was here in Norfolk back then. As far as I know, no one asked those 9 if they thought sacrificing their jobs was worth it to protect the one steel worker they jointly saved. I bet I know what the answer would be if they were asked though.

That's what happens when you mandate the use of high cost inputs. Besides, I doubt anyone can argue that throwing up protectionist walls has led to a competitive, innovative, and efficient shipbuilding industry that serves its customers well. What it has led to is an inefficient, shrunken supplier base and probably the only situation worse than being dependent on a small critical supplier base, and that is a small critical supplier base being dependent on the government. This is a supply chain vulnerability commercial firms would consider an unacceptable risk. The government ends up being politically pressured to buy things they don't really need or to start procurement before a stable design is achieved to maintain employment. One outcome is the much maligned change orders that drive up costs. Change orders are a predictable result of production scheduled to maintain employment at the supplier vice to meet the needs of the customer so no-one should be surprised that there are a large number of them and shipyards using excessive change orders as a reason for their high costs is mind boggling to me. .

The point of all of this is that the US can not make itself independent of the global trading system and efforts to do so will fail, as they already have where we have tried it. We also run the serious risk of generating a backlash from our trading partners that hurt in ways we can not even begin to anticipate. The US, contrary to the popular myth, has not hollowed out and become a country of hamburger flippers. The US remains the world largest manufacturer, with China second. US manufacturing continues to grow in nominal terms and the US has maintained a pretty consistent share of total global manufacturing in the 28% range give or take a couple percent for over 30 years. The US has the world's second most competitive economy, behind only Switzerland – China is down near #30 on that list. The US is the world's third largest exporter behind China and Germany, but we have the largest economy and consume a fairly high level of what we produce, meaning relatively fewer exports. In terms of exports, our largest customer

for containerized exports is China. So we should be careful in applying trade barriers, since we stand much to loose should those on the receiving end choose to retaliate. All discussions related to global supply chains must focus on how to promote and leverage them rather than avoid them.

To give you an example of just how ingrained, invisible, and therefore hard to reverse trade is, take the humble loaf of bread. Specifically I refer to a loaf of Sara Lee Whole Grain White Bread Did you know that each loaf of bread contains ingredients imported from 14 countries – India, the Netherlands, china, Viet Nam, Brazil, Uruguay, Canada, Mexico Argentina, Switzerland, France, Poland, Russia, and Australia. All of those countries contribute to making a loaf of bread baked in the US, a loaf that no doubt has a "made in US" label on it. Trade is much much more than "made in China" labels on cheap sneakers in Wal-Mart.

Speaking of Wal-Mart, which tends to be portrayed as the evil face of globalization and global supply chains, there is a very real economic effect, called unsurprisingly the Wal-Mart effect, on prices in the overall economy. The Wall Mart effect refers to the fact that not only are Wal-Marts prices low, but just the presence of Wal Mart in a market drives down prices at competitor stores with estimates ranging upwards of 13%. Therefore consumers benefit from Wal Mart whether or not they actually shop there. There is no doubt about the presence of the Wal Mart effect and main stream economist's debate in academic journals about its size, not its existence. In fact there is some debate at the NBER level about how to incorporate the Wal Mart effect into estimates of inflation. It is generally accepted that the current method overstates inflation due, among other things, to the failure to incorporate the Wal Mart effect. But even the overstated level of inflation is lower than it otherwise would be, which impacts interest rates, lowering your mortgage payment. Wal Mart achieves this level of price competitiveness by, among other things, being a revolutionary innovator in global supply chain optimization. This is yet another example of effective global logistics positively affecting your life every day without you even realizing it, and also where policy can hurt you in unintended ways. Protectionists measures, for example, that punish Wal Mart for

having been effective at what they do will impact prices not only at Wal Mart but also all other stores in the area, which will respond by raising their prices in kind. That means you will be adversely affected whether or not you shop at Wal Mart. Inflation will go up, meaning interest rates will go up in response, and you will pay more for your house. Wal-Mart, by the way never put a single small mom and pop store out of business. Consumers who switch from shopping at mom and pop to shopping at Wal-Mart are who puts mom and pop out of business

The current age of globalization, even excepting the temporary hiccup we are now emerging from, is driven by a disaggregation of the supply chain and an exploitation of economies of scale and comparative advantage at ever-smaller levels of the production process reaching across a wider swath of the globe. It is a hallmark of this age of globalization, the current economic travails will not reverse it, and in fact may eventually accelerate it, but the risks to the global economic system from bad policy, particularly protectionism, are greater than ever. Therefore when politicians start talking about protectionist measures we need to pay attention since it will impact us here personally and adversely, particularly if foreign countries react with retaliatory measures, something certainly not beyond expectation. Going back to the "made in label" - even when that label says United States there is more often than not a foreign component in there somewhere. Perhaps it is in the raw materials; perhaps it is in component level subassemblies. Remember that over half of all containerized imports into the US contain component level stuff destined for US factories for further assembly. Another impact of a conflict with China, and why our economy would quickly collapse - much of what we import is not stuff for retails shelves, but inputs for that globally dominate manufacturing industry, which would quickly shut down when starved of those imported components. The "made in" label is increasingly becoming a meaningless anachronism representative of a mercantilist mindset that is out of step with reality. Failure to appreciate this, as I have said many times, can lead to very bad policy that at best might benefit a very very narrow segment of society at the expense of a broad swath of the American public and at worst lead to miscalculation in decisions related to conflicts.

In Summary – Complex international supply chains, global logistics, affects every one of you every day in countless, mostly invisible ways. In our area, whether or not you work in the maritime industry, you are the beneficiary of that industry and its contribution to the local and national economy through the port's role as a link in international global logistics chains. This is where of course local business figures in most prominently. We are a major port and a significant chunk of economic activity in many industries is tied to international trade. Shipping, trucking, warehousing, and railroads all for example, benefit directly from port activity. The state estimates that in 2008, a very down year, activity tied to the port generated $12.3 billion in local output, $4.1 billion in wages, and over 100,000 jobs. Add in the multiplier effect through mechanisms such as the real estate market and it is obvious that our local economic well being is very much dependent on international trade. Fortunately the global economy is on the mend, and trade volumes are up substantially, on the order of 20%, both globally and locally. In our area that means import activity of, among other retailers, Wal Mart, Dollar Tree, Lowes, Target, and Home Depot to name but a few. All leverage global supply chains (the dirty word description of this process is outsourcing), and by leveraging global supply chains prices are lower than they would otherwise be, there is a far broader range of goods available than we otherwise would have, and there is a substantial direct positive impact to the economy of our area that benefits every single one of use, whether or not we work in the maritime industry.

One a broad scale, the US is not independent of the world in anything and can not be made so. Arguments about self sufficiency are really about how far down in the supply chain to we want to limit participation to US firms. In the end virtually every supply chain at some point runs through a foreign country. We also need to be mindful that in distorting supply chains for political purposes we impose costs on the economy that are largely born by those who can least afford it. Complex global supply chains will propagate effects throughout the economy in ways that are not understood and the damage from policy that distorts or disrupts these supply chains will not be evident until it is too late and the damage done. Therefore politicians should move in that direction with far more caution than most seem inclined to, and consumers need to be mindful of the harm they can cause themselves when egging their politicians on over emotional

issues such as the unemployment number. Military and political planning need to treat economics and trade issues as integral components of an overall strategy to deal with a complex world where friend or foe, ally or competitor, and the difference between winning and losing are hard to distinguish. Thank you.