



# Icebreakers: Essential Assets for a Changing Arctic

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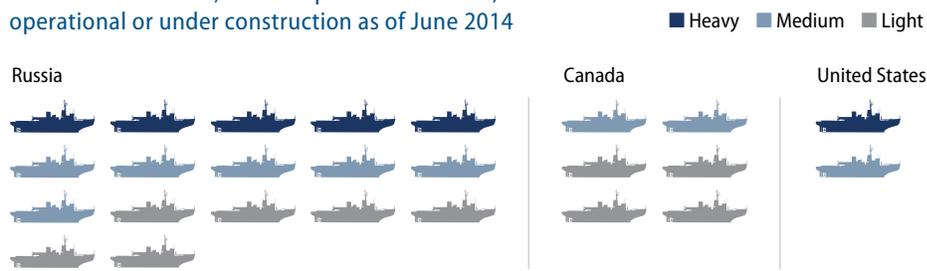
For most of U.S. history, the Arctic Ocean's frozen surface and hostile climate excluded most human activity from the region, outside of intrepid explorers trekking over the ice and stealthy naval submarines prowling beneath it. This extensive, year-round shield of ice protected the ocean and its ecosystems from commercial extraction of the region's living and mineral resources, and precluded any need for regular U.S. Coast Guard patrols beyond scientific research.

But times—and the Arctic's climate—have changed. Carbon pollution has resulted in the warming of the Alaskan Arctic at a rate twice as fast as the rest of the United States,<sup>1</sup> thinning the polar ice cap and shrinking the extent of the Arctic Ocean's perennial sea ice by 13 percent per decade since 1978.<sup>2</sup> In other words, the gates to the Arctic are opening to shippers eager to shorten traditional intercontinental trade routes; oil corporations keen to tap one of the planet's last great fossil fuel reservoirs;<sup>3</sup> and international fishing interests, which have demonstrated aptitude for both legal<sup>4</sup> and illegal<sup>5</sup> harvests, even in high-latitude seas. According to Coast Guard personnel, traffic of all vessels navigating into and through the Arctic via the Bering Strait has doubled since 1998.<sup>6</sup>

Managing this expanding maritime activity—and ensuring that the Arctic's mariners and marine environment are protected—will require a greater presence in the polar ocean than the Coast Guard has ever before had to deliver. Because of the extreme conditions and lack of coastal infrastructure, this oversight will require specialized vessels—specifically, Arctic-ready icebreakers. Yet while other Arctic nations—including Russia, Sweden, and Canada—operate many of these powerful, armored ships,<sup>7</sup> the United States currently has just one functional heavy icebreaker, the U.S. Coast Guard Cutter Polar Star, capable of navigating throughout the Arctic year round.<sup>8</sup> Built in 1976, and already past its originally planned service life, this ship is only expected to function for a few more years.<sup>9</sup> The Coast Guard's other polar-capable vessel, the medium icebreaker Healy, has less icebreaking capacity, and is designed primarily for scientific research.<sup>10</sup>

**FIGURE 1**  
**Whose Arctic?**

Government-owned, Arctic-capable icebreakers, operational or under construction as of June 2014



Note: Icebreaker rating is based on engine power. Heavy ships feature greater than 45,000 brake horse power, or BHP; medium ships feature 20,000–45,000 BHP; and light ships feature 10,000–20,000 BHP.

Source: United States Coast Guard Office of Waterways and Ocean Policy, *Major Icebreakers of the World* (U.S. Department of Homeland Security, 2014), available at <http://www.uscg.mil/hq/cg552/images/20140626%20Major%20Icebreaker%20Chart.pdf>.

Unless Congress and President Barack Obama act decisively to authorize and fund construction of new, modern icebreakers for the Coast Guard, the United States risks losing its capability to patrol the Arctic at the moment when such a capability is more important than ever. As Rep. Don Young (R-AK) explained, “Without access to heavy icebreakers, we will be unable to adapt to historic changes in the Arctic.”<sup>11</sup>

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## Why a warming Arctic needs U.S. icebreakers

According to a congressionally ordered independent analysis,<sup>12</sup> 9 of the Coast Guard’s 11 statutorily mandated missions<sup>13</sup> are now relevant to the rapidly thawing Arctic. These essential duties include enforcing fishing and maritime safety laws, maintaining defense readiness, and conducting search and rescue for mariners in distress.<sup>14</sup> The Coast Guard is also responsible for emergency response to offshore oil spills,<sup>15</sup> a particularly crucial function as the U.S. Department of the Interior prepares for new Arctic oil lease sales in 2020 and 2022<sup>16</sup> and as Royal Dutch Shell continues its pursuit of year-round, offshore oil and gas production in the Beaufort and Chukchi seas.<sup>17</sup> In other words, the Coast Guard must be able to conduct operations in Arctic waters in order to uphold its duties as both a military service and the foremost maritime law enforcement entity.

The paradox of the global warming-driven thaw of the Arctic is that the retreat of permanent sea ice is actually making Arctic navigation riskier, even as overall accessibility increases.<sup>18</sup> Before perennial sea ice began its steady retreat in the early 1980s,<sup>19</sup> it shielded Arctic waters from wind and reduced the volatility of seasonal ice formation.<sup>20</sup> Today, winter sea ice now forms and recedes over a much larger proportion of the Arctic Ocean. In addition, loose icebergs and pack ice can be quickly transported long distances and jam into thick ridges and treacherous, hull-crushing floes by wind and currents, especially in the spring and fall.<sup>21</sup>

To safely and effectively carry out its diverse missions in the Arctic year round, the Coast Guard must be properly equipped with specialized ships built with the powerful engines, structural reinforcement, and nearly two-inch thick steel hulls needed to withstand and break through even the thickest sea ice during the heart of the polar winter. Such ships, known as heavy icebreakers, are also large enough to accommodate aircraft, large crews of sailors, scientists and other personnel, as well as the storage of adequate fuel, supplies, and equipment required for self-supported polar missions and unaided journeys to and from the polar regions.<sup>22</sup>

Today, however, the United States only has one functional heavy icebreaker remaining—the U.S. Coast Guard Cutter Polar Star—and it's on its last legs. Commissioned in 1976 and originally slated for a 30-year service life, Congress provided about \$57 million in fiscal years 2009 and 2010 for major repairs to the ship, which facilitated a successful re-launch in 2012.<sup>23</sup> The Coast Guard now expects the ship to function until around 2020, after which the United States will not have heavy icebreaking capability.<sup>24</sup>

Polar Star's sister ship, Polar Sea—commissioned in 1977—currently sits disabled and docked in the Port of Seattle, inoperable since a major engine failure in 2010.<sup>25</sup> Legislation signed by President Obama in December 2014 requires that the Coast Guard evaluate options for Polar Sea and decide to either decommission or attempt to rehabilitate the vessel.<sup>26</sup> However, should the latter option even prove to be feasible, a short extension of its service life similar to that of Polar Star seems like the best potential outcome. After this extension, the U.S. government would again not possess the capability for year-round operations in the Arctic.

According to the Congressional Research Service, the U.S. Department of Homeland Security, or DHS, made this predicament perfectly clear in its 2013 Mission Need Statement, in which it explained:

*[C]urrent requirements and future projections... indicate the Coast Guard will need to expand its icebreaking capacity, potentially requiring a fleet of up to six icebreakers (3 heavy and 3 medium) to adequately meet mission demands in the high latitudes.<sup>27</sup>*

Two current issues—environmental security and national security—underscore this strategic outlook and are discussed in the following sections.

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## Oil spills on ice: Preparing for the risks of year-round Arctic oil production

“We are minded to drill this year in the Chukchi,” Shell CEO Ben van Beurden told reporters on a January 29, 2015 earnings call.<sup>28</sup> He reinforced his point with a commitment to spend \$1 billion on the effort this year, on top of the \$6 billion Shell has already spent on its current Arctic campaign. This resoluteness comes despite a disastrous 2012 exploratory drilling campaign that called into question the company’s competence to operate safely in Arctic conditions. That year, Shell’s legally required oil spill containment unit was “crushed like a beer can” during tests in the calm waters of the Puget Sound;<sup>29</sup> its drilling contractor committed eight felony violations of maritime safety and water pollution laws, resulting in \$12.2 million in federal fines;<sup>30</sup> and, at the season’s end, Shell’s 250-foot-tall, customized drill rig Kulluk ended up aground after its contractor attempted to tow it through gale force winds and 25-foot swell<sup>31</sup> in a mad dash across December seas in order to avoid tax liability to the state of Alaska.<sup>32</sup> Coast Guard officers led the coordinated response to the multi-day emergency, and its Alaska-based aviators saved the Kulluk’s 18 crewmembers in a harrowing rescue operation, effectively preventing the crisis from becoming a tragedy.<sup>33</sup>

Hopefully, Shell will be better prepared and more judicious in its next Arctic foray than it was in 2012. But the human error, system failures, and life-threatening emergencies that stymied the oil company—one of the world’s richest and most experienced—demonstrate the critical necessity of sustained Coast Guard presence in a region with truly humbling working conditions. Once the company has located ideal well sites, it will reportedly take 7 to 10 years to build permanent offshore platforms and other infrastructure needed to produce oil year round,<sup>34</sup> at which point both Shell and the Coast Guard must be prepared to conduct emergency and oil spill response year round, including in the ice-bound Arctic winter.

Yet Polar Star, already on an unplanned service-life extension, will likely not last longer than 7 to 10 years, and Polar Sea’s potential reactivation remains uncertain. Meanwhile, the construction of a new heavy icebreaker could take as long as 10 years, as U.S. shipyards have not built such a vessel since launching the two Polar-class vessels nearly 40 years ago.<sup>35</sup>

Coast Guard presence in the Arctic is indispensable in ensuring the safety of offshore Arctic oil and gas production and to mitigate the worst impacts of any potential accident. Recall that in 2010, 60 Coast Guard vessels and 22 of its aircraft were deployed in the response to BP’s Deepwater Horizon oil spill in the Gulf of Mexico.<sup>36</sup> Yet the U.S. government and the Coast Guard are fast approaching a major gap in Arctic capability, one that would force the mariners, ocean-dependent communities, and ecosystems of the Alaskan Arctic to simply wait until summer for help should they face an oil spill in winter.

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## Heavy icebreakers are crucial for national security

Heavy icebreakers are also essential assets for national security in the Arctic and to uphold U.S. sovereignty in our polar seas. In its “Naval Operations Concept” report—which coordinates the U.S. military’s maritime assets with national security imperatives—the U.S. Navy makes clear that it depends exclusively on the Coast Guard for icebreaking capability should it need to move warships through ice.<sup>37</sup> Additionally, the report echoes calls from the DHS and independent analysts for sustained Coast Guard presence in the polar sea, stating, “Increased international activity, new transoceanic shipping routes and competition for resources in the Polar Regions will require icebreakers for the foreseeable future.”<sup>38</sup>

While the possibility of an armed standoff in the Arctic seems remote, Russia—which has a fleet of 14 government-owned, Arctic-capable icebreakers with 3 more under construction as of June, 2014<sup>39</sup>—has recently carried out repeated incursions into the sovereign territories of several nations, including Finland<sup>40</sup> and the Baltic states, in addition to its occupation and annexation of Ukrainian territory.<sup>41</sup> Russia is also suspected of recent, mysterious submarine incursions into Swedish<sup>42</sup> and British<sup>43</sup> waters. As surprise contraventions of the international norms that enshrine territorial borders, these incidents left each country scrambling to marshal its defenses. Given the United States’ looming inability to sustain a year-round military presence in the Arctic, those same international norms will represent much of its defense of Arctic maritime territory.

Today, defense experts in Sweden<sup>44</sup> and the United Kingdom<sup>45</sup> are bemoaning their respective countries’ underinvestment in maritime security assets as a key factor in the vulnerability that these incursions have revealed. Other nations with a stake in the Arctic appear to recognize the importance of investment in polar-capable icebreakers: Canada has six government-owned vessels of the class, and Sweden, Germany, and Japan each have one.<sup>46</sup> Even China, a country with no polar territory of its own, has a modern icebreaker and a second one due to launch in 2016.<sup>47</sup>

The U.S. Navy is the most powerful the world has ever known.<sup>48</sup> Should it need to defend American interests in the Arctic Ocean, however, it will depend on the Coast Guard for safe passage through the ice. Yet without decisive action from appropriators, both branches of the military may soon be confined to warmer waters.

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## Finding the funding

While the necessity for additional U.S. icebreaking capacity is clear, the source of funding for it is not. According to independent analysis conducted for the Coast Guard, each new heavy icebreaker will cost almost \$1 billion.<sup>49</sup> This is almost equivalent to the Coast Guard’s entire 2016 budget request for acquisition, \$1.01 billion, which must cover everything from modernizing its aged fleet of cutters and aircraft to maintaining bases and navigational aids.<sup>50</sup> This funding is already stretched too thin:

Decades-old vessels are still in operation, despite dire reliability issues that directly impinge on the fulfillment of essential duties such as search and rescue and drug interdiction throughout U.S. waters.<sup>51</sup> The Coast Guard cannot further shortchange missions in one region to pay for others elsewhere.

Over the long term, the major components of solving this challenge include boosting the Coast Guard's annual appropriations so that it can procure and deploy the vessels it needs and relocating its budget in a unified federal defense budget, as the Center for American Progress has advocated for several years.<sup>52</sup> This move would allow the costs and benefits associated with funding this underappreciated, hardworking branch of the armed services to be properly evaluated within the context of the overall defense budget—a much bigger pool of resources and an arena in which the necessary budgetary tradeoffs can be much more fairly considered.

The Coast Guard's entire FY 2014 budget of \$10.4 billion<sup>53</sup> consumed a sizable 17 percent<sup>54</sup> of the DHS budget, but the same amount would comprise just 2.1 percent of the U.S. Defense Department's enacted FY 2014 budget<sup>55</sup> of \$496 billion. Indeed, a single billion-dollar icebreaker would represent less than 5 percent of the \$21 billion the Navy has proposed to spend on shipbuilding annually for the next thirty years.<sup>56</sup> Put in even starker contrast, the Coast Guard's entire 2014 budget was nearly matched by the \$8.4 billion spent in 2014<sup>57</sup> for continued development of just one weapon under U.S. Department of Defense's stewardship—the years-delayed and budget-busting F-35 fighter jet.<sup>58</sup> The jet still has not been deemed ready for military operations despite a price tag that is now approaching \$400 billion.<sup>59</sup>

Yet with the DHS's budget currently a partisan battlefield<sup>60</sup> for the 114th Congress due to the debate on immigration policy, legislation for these important structural reforms is probably not forthcoming. Meanwhile, the long lead time needed to procure Arctic-ready ships combined with the Arctic Ocean's continued thaw necessitates a more immediate and pragmatic approach.

The procurement process for the Coast Guard's research-oriented medium icebreaker—the USCGC Healy, commissioned in 1999<sup>61</sup>—provides a potential model for appropriators to consider today. In 1989, the 101st Congress allocated \$329 million for procurement of the ship via a line item in the U.S. Navy's funding in the 1990 Defense Appropriations Act.<sup>62</sup> The Navy's shipbuilding command oversaw construction of the vessel, which was turned over to the Coast Guard upon completion.<sup>63</sup> A bipartisan group of senators that included Sens. Maria Cantwell (D-WA) and Lisa Murkowski (R-AK) attempted to replicate this accomplishment during the 113th Congress, introducing an amendment to the defense appropriations bill that would have funded the Navy to oversee the construction of four new icebreakers for the Coast Guard.<sup>64</sup> However, the amendment never advanced for a vote.

Today, the plurality and urgency of needs for the Coast Guard to sustain presence in the Arctic should unite a broad coalition of members of Congress, including advocates for the environment, scientific research, and offshore oil and gas production, as well as security hawks, and representatives of coastal states with an interest in upholding law and order along their seaboard and in their ports.

Pulling together funding from within the defense budget won't be easy, especially in the context of the discretionary defense spending caps established by the Budget Control Act of 2011. However, as discussed above, the cost of one to three heavy icebreakers is modest in comparison with other major weapons systems. Unlike the F-35's complex technological development process, the many decades of effective service provided by both Polar Star and Polar Sea, built on 1970s-era technology, suggests that new heavy icebreakers need not feature novel design elements that sometimes lead to budget overruns.

Nevertheless, the window of opportunity for action to ensure continuity in the U.S. military's Arctic capability is rapidly closing. Should icebreaker advocates not muster full congressional support in the upcoming Defense Department appropriations bill, a low-cost preliminary step should still be pursued. For example, Congress could authorize and fund the Coast Guard or the U.S. Navy's shipbuilding command to formulate a request for detailed design proposals for a heavy-icebreaker program from American shipbuilders that includes an option for procurement from the proposal evaluated to be the most competitive. Such processes are a normal feature of Navy acquisitions.<sup>65</sup> Furthermore, it would provide precise and concrete information to lawmakers and the shipyards interested in icebreaker construction on the costs involved.

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## Ensuring the Coast Guard is "Always Ready"

Just as the security and peace of any city depends on having police officers on the beat, Coast Guard presence is essential in carrying out vital missions in U.S. waters. What happens when nations fail to police and defend their exclusive economic zones? Indonesia—a country with a smaller naval budget than that of Singapore despite having around 55,000 km of coastline<sup>66</sup>—is estimated to lose as much as \$3 billion per year worth of seafood to foreign pirate fishermen illegally plundering its waters.<sup>67</sup>

The U.S. government needs to start designing and building new heavy icebreakers to ensure that the Coast Guard retains capability to access the Arctic and fulfill its missions in this region after Polar Star is decommissioned and before year-round Arctic oil and gas production begins. Should the needed appropriations be deferred yet again, President Obama and Congress risk undermining American credibility as an Arctic nation, and further eroding the identity of the stalwart maritime service that prides itself on being "Always Ready."<sup>68</sup>

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## Endnotes

- 1 F. Stuart Chapin III and others, "Alaska." In U.S. Global Change Research Program, "U.S. National Climate Assessment" (2014), available at <http://nca2014.globalchange.gov/report/regions/alaska#narrative-page-17116>.
- 2 NASA, "Arctic Sea Ice Shrinks to New Low in Satellite Era," available at <http://www.nasa.gov/topics/earth/features/arctic-seaice-2012.html> (last accessed February 2015).
- 3 Kiley Kroh and Howard Marano, "Adding Fuel to the Fire: The Climate Consequences of Arctic Ocean Drilling" (Washington: Center for American Progress, 2013), available at <https://www.americanprogress.org/issues/green/report/2013/03/21/57674/adding-fuel-to-the-fire-the-climate-consequences-of-arctic-ocean-drilling/>.
- 4 Susan Moran, "Team Tracks a Food Supply at the End of the World," *The New York Times*, March 12, 2012, available at <http://www.nytimes.com/2012/03/13/science/tracking-antarctic-krill-as-more-is-harvested-for-omega-3-pills.html?pagewanted=all>.
- 5 CCAMLR, "Illegal, unreported, and unregulated (IUU) fishing," available at <https://www.ccamlr.org/en/compliance/illegal-unreported-and-unregulated-iuu-fishing> (last accessed February 2015).
- 6 Matt Miller, "Coast Guard maps out marine traffic lanes to the Arctic," KTOO News, January 27, 2015, available at <http://www.ktoo.org/2015/01/27/coast-guard-maps-marine-traffic-lanes-arctic/>.
- 7 United States Coast Guard Office of Waterways and Ocean Policy, *Major Icebreakers of the World* (U.S. Department of Homeland Security, 2014), available at <http://www.uscg.mil/hq/cg5/cg552/images/20140626%20Major%20Icebreaker%20Chart.pdf>.
- 8 Associated Press, "Nation's Last Big Icebreaker Endures Despite Age," *The New York Times*, November 11, 2014, available at <http://www.nytimes.com/online/2014/11/11/us/ap-us-last-polar-icebreaker.html>.
- 9 United States Coast Guard, "USCGC Polar Star (WAGB-10): Seattle WA," available at <http://www.uscg.mil/pacarea/cgcpolarstar/> (last accessed February 2015).
- 10 United States Coast Guard, "USCGC Healy (WAGB-20): Seattle, WA," available at <http://www.uscg.mil/pacarea/cg-cHealy/>.
- 11 Alex DeMarban, "Should Alaska take the lead in financing new icebreakers?" Alaska Dispatch News, April 11, 2012, available at <http://www.adn.com/article/should-alaska-take-lead-financing-new-icebreakers>.
- 12 Ronald O'Rourke, "Coast Guard Polar Icebreaker Modernization: Background and Issues for Congress" (Washington: Congressional Research Service, 2015), available at <https://www.fas.org/sgp/crs/weapons/RL34391.pdf>.
- 13 United States Coast Guard, "Missions: Ready for Today... Preparing For Tomorrow," available at <http://www.uscg.mil/top/missions/> (last accessed February 2015).
- 14 O'Rourke, "Coast Guard Polar Icebreaker Modernization."
- 15 U.S. Environmental Protection Agency, "Oil Spills," available at <http://www.epa.gov/oilspill/> (last accessed February 2015).
- 16 Bureau of Ocean Energy Management, "2017–2022 Lease Sale Schedule," available at <http://www.boem.gov/2017-2022-Lease-Sale-Schedule/> (last accessed February 2015).
- 17 Karolin Schaps and Ron Bousso, "UPDATE 1-Shell wants to resume drilling in Arctic this summer," Reuters, January 29, 2015, available at <http://www.reuters.com/article/2015/01/29/shell-arctic-idUSL6N0V846B20150129>.
- 18 ABS Consulting, "United States Coast Guard High Latitude Region Mission Analysis Capstone Strategy" (2010), available at <http://assets.fiercemarkets.com/public/sites/govit/hlsummarycapstone.pdf>.
- 19 Maria-José Viñas, "Four Decades of Sea Ice from Space: The Decline," NASA, available at <http://www.nasa.gov/content/goddard/four-decades-of-sea-ice-from-space-the-decline/#.VOZMry-IJN8>.
- 20 ABS Consulting, "United States Coast Guard High Latitude Region Mission Analysis Capstone Strategy."
- 21 Ibid.
- 22 Jeff Foss, "The Last U.S. Heavy Icebreaker Ships Out," *Outside*, December 15, 2014, available at <http://www.outsideonline.com/outdoor-gear/gear-shed/edge/The-Last-US-Heavy-Icebreaker-Ships-Out.html>.
- 23 O'Rourke, "Coast Guard Polar Icebreaker Modernization."
- 24 Yereth Rosen, "U.S. icebreaker fleet will need makeover by about 2020, Coast Guard says," Alaska Dispatch News, September 16, 2014, available at <http://www.adn.com/article/20140916/us-icebreaker-fleet-will-need-makeover-about-2020-coast-guard-says>.
- 25 O'Rourke, "Coast Guard Polar Icebreaker Modernization."
- 26 U.S. House of Representatives Committee on Transportation and Infrastructure, *The Howard Coble Coast Guard & Maritime Transportation Act of 2014* (2014), available at <http://transportation.house.gov/uploadedfiles/coastguardreauth-senateagreement.pdf>.
- 27 O'Rourke, "Coast Guard Polar Icebreaker Modernization."
- 28 Jennifer A. Dlouhy, "Shell Planning to Restart Arctic Drilling This Year," FuelFix, January 29, 2015, available at <http://fuelfix.com/blog/2015/01/29/shell-planning-to-restart-arctic-drilling-this-year/>.
- 29 John Ryan, "Sea Trial Leaves Shell's Arctic Oil-Spill Gear 'Crushed Like a Beer Can,'" KUOW.ORG, November 30, 2012, available at <http://kuow.org/post/sea-trial-leaves-shells-arctic-oil-spill-gear-crushed-beer-can>.
- 30 Yereth Rosen, "Shell drilling contractor's sentence includes \$12.2 million fine," Alaska Dispatch News, December 19, 2014, available at <http://www.adn.com/article/20141219/shell-drilling-contractors-sentence-includes-122-million-fine>.
- 31 McKenzie Funk, "The Wreck of the Kulluk," *The New York Times Magazine*, December 30, 2014, available at <http://www.nytimes.com/2015/01/04/magazine/the-wreck-of-the-kulluk.html>.
- 32 Lisa Demer, "Kulluk left Dutch Harbor to avoid taxes, Shell official testifies," Alaska Dispatch News, May 25, 2013, available at <http://www.adn.com/article/20130525/kulluk-left-dutch-harbor-avoid-taxes-shell-official-testifies>.
- 33 McKenzie Funk, "The Wreck of the Kulluk."
- 34 Jon Birger, "Why Shell is betting billions to drill for oil in Alaska," *Fortune*, May 24, 2012, available at <http://fortune.com/2012/05/24/why-shell-is-betting-billions-to-drill-for-oil-in-alaska/>.
- 35 Carol Wolf and Kasia Klimasinska, "As the Arctic Opens for Oil, the Coast Guard Scrambles," Bloomberg News, July 26, 2012, available at <http://www.bloomberg.com/bw/articles/2012-07-26/as-the-arctic-opens-for-oil-the-coast-guard-scrambles>.
- 36 United States Coast Guard, *BP Deepwater Horizon Oil Spill: Incident Specific Preparedness Review (ISPR)* (U.S. Department of Homeland Security, 2011), available at <https://www.uscg.mil/foia/docs/DWH/BPDWH.pdf>.

- 37 United States Marine Corps, United States Navy, and United States Coast Guard, *Naval Operations Concept 2010: Implementing the Maritime Strategy* (2010), available at <http://www.navy.mil/maritime/noc/NOC2010.pdf>.
- 38 Ibid.
- 39 United States Coast Guard Office of Waterways and Ocean Policy, *Major Icebreakers of the World*.
- 40 Kati Pohjanpalo and Kasper Viita, "Finland's Fighter Jets on Alert As Russia Violates Airspace," *Bloomberg Business*, August 28, 2014, available at <http://www.bloomberg.com/news/articles/2014-08-28/finland-puts-fighter-planes-on-alert-as-russia-violates-airspace>.
- 41 David M. Herszenhorn, "Fears Rise as Russian Military Units Pour Into Ukraine," *The New York Times*, November 12, 2014, available at [http://www.nytimes.com/2014/11/13/world/europe/ukraine-russia-military-border-nato.html?\\_r=1](http://www.nytimes.com/2014/11/13/world/europe/ukraine-russia-military-border-nato.html?_r=1); Kathrin Hille, Richard Milne, and Sam Jones, "Russian Air Incursions Rattle Baltic States," *Financial Times*, September 24, 2014, available at <http://www.ft.com/cms/s/0/9d016276-43c3-11e4-baa7-00144feabd0.html#axzz3QmY4uakU>.
- 42 Elias Groll, "Swedes Find Definitive Evidence of Submarine, Russians Call Them Unmanly," *Foreign Policy*, November 15, 2014, available at <http://foreignpolicy.com/2014/11/15/swedes-find-definitive-evidence-of-submarine-russians-call-them-unmanly/>.
- 43 Victoria Ward, "A Suspected Russian Submarine Is Lurking Off Of the Scottish Coast," *Business Insider*, January 9, 2015, available at <http://www.businessinsider.com/a-suspected-russian-submarine-is-lurking-off-of-the-scottish-coast-2015-1>.
- 44 Ari Shapiro, "Russian Threats Expose Europe's Military Cutbacks" National Public Radio, January 27, 2015, available at <http://www.npr.org/blogs/parallels/2015/01/27/381631684/threats-from-russia-underscores-europes-need-to-boost-military>.
- 45 Ward, "A Suspected Russian Submarine Is Lurking Off Of the Scottish Coast."
- 46 United States Coast Guard Office of Waterways and Ocean Policy, *Major Icebreakers of the World*.
- 47 Ibid.; NDTV, "China to build new icebreaker for polar research expeditions," January 05, 2014, available at <http://www.ndtv.com/world-news/china-to-build-new-icebreaker-for-polar-research-expeditions-546901>.
- 48 GlobalSecurity.org, "World Wide Aircraft Carriers," available at <http://www.globalsecurity.org/military/world/carriers.htm> (last accessed February 2015).
- 49 ABS Consulting, "United States Coast Guard High Latitude Region Mission Analysis Capstone Strategy."
- 50 John C. Marcario, "OPC, C-27 Funding Highlight Coast Guard Fiscal 2016 Budget Proposal," *SEAPOW*, February 2, 2015, available at <http://www.seapowermagazine.org/stories/20150202-uscg-budget.html>.
- 51 Ted Sherman, "Dead in the water? U.S. Coast Guard deals with aging fleet and mounting budget woes," *NJ.com*, September 28, 2014, available at [http://www.nj.com/news/index.ssf/2014/09/dead\\_in\\_the\\_water\\_us\\_coast\\_guard\\_deals\\_with\\_aging\\_fleet\\_and\\_mounting\\_budget\\_woes.html](http://www.nj.com/news/index.ssf/2014/09/dead_in_the_water_us_coast_guard_deals_with_aging_fleet_and_mounting_budget_woes.html).
- 52 Lawrence J. Korb, Sean Duggan, and Laura Conley, "Building a U.S. Coast Guard for the 21st Century" (Washington: Center for American Progress, 2010), available at <https://www.americanprogress.org/issues/security/report/2010/06/09/7943/building-a-u-s-coast-guard-for-the-21st-century/>.
- 53 United States Coast Guard, *Always Ready: United States Coast Guard 2013 Performance Highlights and 2015 Budget in Brief* (U.S. Department of Homeland Security, 2014), available at [http://www.uscg.mil/budget/docs/2015\\_Budget\\_in\\_Brief.pdf](http://www.uscg.mil/budget/docs/2015_Budget_in_Brief.pdf).
- 54 U.S. Department of Homeland Security, *Budget-in-Brief Fiscal Year 2015* (2014), available at <http://www.dhs.gov/sites/default/files/publications/FY15BIB.pdf>.
- 55 Office of the Under Secretary of Defense, *United States Department of Defense Fiscal Year 2015 Budget Request Overview* (U.S. Department of Defense, 2014), available at [http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2015/fy2015\\_Budget\\_Request\\_Overview\\_Book.pdf](http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2015/fy2015_Budget_Request_Overview_Book.pdf).
- 56 Congressional Budget Office, "An Analysis of the Navy's Fiscal Year 2015 Shipbuilding Plan" (2014), <http://www.cbo.gov/sites/default/files/cbofiles/attachments/49818-Shipbuilding.pdf>.
- 57 U.S. Department of Defense, *Summary of the DOD Fiscal Year 2014 Budget Proposal* (2013), available at <http://www.defense.gov/news/2014budget.pdf>.
- 58 Mark Thompson, "The Costly F-35: The Saga of America's Next Fighter Jet," *Time*, March 25, 2010, available at <http://content.time.com/time/nation/article/0,8599,1975139,00.html>.
- 59 Government Accountability Office, "F-35 Join Strike Fighter: Slower Than Expected Progress in Software Testing May Limit Initial Warfighting Capabilities," GAO-14-468T, Testimony Before the Subcommittee on Tactical Air and Land Forces, Committee on Armed Services, House of Representatives, March 2014, available at <http://www.gao.gov/assets/670/661957.pdf>.
- 60 Marshall Fitz, "An Extreme Agenda of Mass Deportations" *U.S. News & World Report*, February 5, 2015, available at <http://www.usnews.com/debate-club/do-house-republicans-have-the-right-approach-on-dhs-funding/an-extreme-agenda-of-mass-deportations>.
- 61 United States Coast Guard, "CGC Healy History," available at <http://www.uscg.mil/pacarea/cgchealy/history.asp> (last accessed February 2015).
- 62 *Department of Defense Appropriations Act, 1990*, Public Law 101-501, 101st Cong. 1st sess. (November 21, 1989), 1122, available at <http://www.gpo.gov/fdsys/pkg/STATUTE-103/pdf/STATUTE-103-Pg1112.pdf>.
- 63 Jonathan Berkson and George DuPree, "USCGC Healy: The United States' New Polar Research Icebreaking Vessel" (Washington: United States Coast Guard, 1998), available at <https://www.uscg.mil/history/webcutters/HealyNarrative.pdf>.
- 64 Maria Cantwell, United States Senator for Washington, "Cantwell, Begich Introduce Bipartisan Amendment that Would Pave the Way for New Icebreakers," Press release, November 25, 2013, available at <http://www.cantwell.senate.gov/public/index.cfm/2013/11/cantwell-begich-introduce-bipartisan-amendment-that-would-pave-the-way-for-new-icebreakers>.
- 65 Christopher P. Cavas, "Bidding for New Oiler, Amphibs to be Bundled," *Defense News*, January 30, 2015, available at <http://www.defensenews.com/story/defense/naval/ships/2015/01/30/navy-oiler-amphibious-ships-ship-building-construction-taox-lha-lhd-assault-ingalls-nass-co/22606093/>.
- 66 World by Map, "Coastline Lengths," available at <http://world.bymap.org/Coastlines.html> (last accessed February 2015).
- 67 *The Economist*, "Indonesia's Maritime Policy: Fishing Trips," January 3, 2015, available at <http://www.economist.com/news/asia/21637451-new-administration-path-prosperity-watery-one-fishing-trips>.
- 68 United States Coast Guard, "Semper Paratus' (Always Ready): The Official Coast Guard Marching Song," available at [http://www.uscg.mil/history/faqs/semper\\_paratus.asp](http://www.uscg.mil/history/faqs/semper_paratus.asp) (last accessed February 2015).