Undersea Cables

In the 21st century, digital communications across international boundaries, continents, and global seas are, for many, a basic and even critical component of daily life. Once, these trans-oceanic communications, ranging from personal emails to money transfers, relied on satellite. Now, undersea cables carry nearly 99% of the world's trans-oceanic data,[1] offering data transfers that are higher quality, faster, greater in capacity, and more reliable than those attainable through satellites.

Undersea cables have an extensive history as a mode and method of communication, with their use stretching back to the 1840s. The early days of the undersea cable saw Britain (an initial leader in the technology) deploying them to enhance communication with its scattered and immense empire, and trading companies utilizing them to communicate with and disseminate instructions to their vessels. Nations also found them to be effective means by which to receive communications from and transmit directions to their militaries and diplomats. While these early cables traversed only short distances, crossing harbours, rivers, or, for instance, the English Channel, their success soon inspired efforts to expand their reach. Indeed, in the 1840s, investors quickly backed a proposal to lay an undersea cable across the Atlantic Ocean, stretching from Ireland to Newfoundland and onwards to the mainland. Though a promising prospect, laying an undersea cable stretching between continents was a complex and formidable task. US Navy Lieutenant Matthew Maury, who had performed survey work off the eastern coast of the US, mused in 1853 that laying an undersea cable across the Atlantic Ocean would certainly be possible in the undersea conditions in question. However, "I [do not] pretend to consider the question as to the possibility of finding *a time calm enough*, *the sea smooth enough, a wire long enough, a ship big enough*, to lay a coil of wire sixteen hundred miles in length."[2]

Indeed, the technical and logistical considerations surrounding such a groundbreaking undertaking were numerous. Often, questions regarding how to lay the cables, how to insulate them, and how to maintain a strong signal over such a distance required trial and error to resolve. Though initial attempts at installing trans-oceanic cables failed, the 1850s saw the first cables successfully crossing the Atlantic, and further cables connected Britain and India by the 1880s and crossed the Pacific Ocean in the early 1900s. Initially, these cables transmitted telegraph messages. As technology evolved, they began to convey telephone traffic, and now they are responsible for the transmission of a variety of communications and data, including telephone communications, money transfers, and internet data. While their initial speed of transfer for a telegraph was around 10 to 12 words per minute (a substantial increase in speed over the weeks-long process of sending a letter), technological improvements have enabled the transfer of sizeable amounts of data at nearly the speed of light. Such improvements (particularly the development of the fibre-optic cable) and the rise of the internet age with its constant push for more information created a new race to lay cables in the 1980s and 1990s. This, in turn, saw the investment of billions of dollars, the expansion of the cable system, and the replacement of existing lines. Since the early 2000s, the focus with respect to undersea cables has transitioned from the Atlantic Ocean to the Pacific.

Laying undersea cables is an expensive undertaking. As such, private consortia of operators have historically been – and continue to be – responsible for their construction, with private telecommunications firms like Microsoft and Google owning the majority of cables today. In the 21st century, these cables underpin much of modern society's systems and functions. Socially, these cables are now the basis of peoples' ability to communicate with each other across international boundaries and oceans. Economically, the international financial system relies on the undersea cable infrastructure to transmit information. For instance, the Society for Worldwide Interbank Financial Telecommunication (SWIFT) transmits, on a daily basis, "some 20 million messages to more than 8,000 banking organizations, security institutions, and corporate customers in nearly 200 countries, reconciling trillions of dollars' worth of assets across global financial markets."[3]

Given the extent of the world's dependency on these cables, their security has been and continues to be a cause for concern. Operators began to bury undersea cables in the 1980s to reduce their vulnerabilities. Still, however, certain risks remain. Anchors, fishing nets, offshore oil exploitation, dredging operations, ocean currents, and natural events like earthquakes can all inadvertently and unexpectedly cause injury to the cables. For instance, unmanned US surveillance flights over and in Iraq shuddered to a halt in 2008 when an anchor snagged on and severed an undersea cable several hundred miles away, interrupting the connection between the unmanned aircraft and their controllers, based in the continental US.[4] Similarly, the 2011 earthquake off Japan severely damaged undersea cables in that region.

In addition to these accidental or unforeseen damages, the intentional damaging of undersea cables has occurred, albeit rarely. Early in the technology's history, Britain realized that the cables, given their status as an integral communication means, were vulnerable to disruption during military conflicts and could be either compromised for information or cut to disrupt communications. While the 1884 Convention for the Protection of Submarine Telegraph Cables thus sought to prevent states from deliberately damaging cables, this has not entirely prevented malicious efforts to disrupt the communications they carry. The First and Second World Wars both saw the Germans and British attacking cables to disrupt the opposing side's communications. Soviet "fishing" trawlers "inadvertently" dragged and severed US cables in the Cold War, while the US tapped into Soviet cables. Within the past decade, in 2015 and 2018, there has been concern in the West about Russian submarines and vessels either conducting operations near or hovering over subsea cables.[5] These concerns prompted the US's 2018 defence budget to approve the construction of a second cable-repair/laying vessel for the US Armed Forces. Furthermore, while no confirmed terrorist attack has targeted submarine cables to this point, pirates did seize an 11-kilometre stretch of cable connecting Hong Kong, Vietnam, and Thailand in 2007 and tried to sell the cable as scrap. Piracy off the African coast has moreover delayed the laying of cables into Africa. Since the cable-repair and cable-laying vessels are slow and large, and transit a predetermined and specific route, they can be particularly susceptible to attack. Security experts also caution that the availability online of maps of the cable routes could aid hostile actors seeking to target undersea cables. While recent history has not seen an outright malicious attack on the world's undersea cable systems, such an attack is not inconceivable nor impossible.

Indeed, the extent of the world's dependency on these cables demands their redundancy, so that the loss of one cable would not take the entirety of the system offline. Building such total

redundancy is, of course, exorbitantly expensive. Historically, operators laying new cables tended to do so in approximately the same locations, all opting to utilize the optimal routes between destinations across the ocean floor. Since this, too, creates risks, in that an attack or accident in the region could damage multiple cables and disrupt several lines, undersea cable systems today generally prioritize redundancy in their arrangement and organization, implementing features like "mesh networks" and dual landing points to enable the transfer of services amongst networks in the event that one path is no longer operational. Modern technology is also capable of determining the precise location of damage in a cable to enable rapid repair, therefore increasing reliability.

Undersea cables are thus a strategic communications asset, spanning the world and proving integral for states' militaries, economies, and citizens. Their military importance in conveying information would make the disruption of cable networks detrimental for military exercises and operations, which could elevate the value of such cables as targets for hostile state-based and non-state-based attacks. Though buried in the seabed, and thus out of sight, undersea cables remain vulnerable assets due to their significance as strategic, economic, and communication links between Canada and the rest of the world. Their protection, then, is a task that falls to the world's navies, including the Royal Canadian Navy.

References

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[3] Robert Martinage, "Under the Sea: The Vulnerability of the Commons," *Foreign Affairs* 94, no. 1 (January/February 2015): 119.
[4] "Concern Over Russian Ships Lurking Around Vital Undersea Cables," CBS News, March 30, 2018, www.cbsnews.com/news/russian-ships-undersea-cables-concern-vladimir-putin-yantar-ship/.
[5] For instance, see "Concern Over Russian Ships Lurking Around Vital Undersea Cables;" "Fears Over Russian Submarine and Spy Ship Patrols Near Vital Undersea Internet Cables," *Daily Mail*, October 25, 2015, https://www.dailymail.co.uk/news/article-3289303/U-S-concerned-Russian-operations-near-undersea-cables-NY-Times.html; and Sebastien Roblin, "Russian Spy Submarines Are Tampering with Undersea Cables That Make the Internet Work. Should We Be Worried?" *National Interest*, August 19, 2018, https://nationalinterest.org/blog/buzz/russian-spy-submarines-are-tampering-undersea-cables-make-internet-work-should-we-be.