

# Broadband Satellite Communications for Future US Military and Coast Guard Operations in an Ice-Free Arctic

Patrick L. Smith<sup>1</sup>, Leslie A. Wickman<sup>2</sup>, and Inki A. Min<sup>3</sup>,  
*The Aerospace Corporation, El Segundo, California 90245*

The U.S. Navy, Coast Guard and other military services have begun planning for increased operations in the Arctic, which may start becoming essentially ice-free in summers as early as about 2015. Commercial ship traffic and resource exploitation activities in the region have already started to increase. The Arctic is a very different arena for space system operations compared to lower latitudes. Weather, navigation and surveillance satellites cover the Arctic, but passive imagery (for ice monitoring and other types of surveillance) is hampered by persistent cloud cover and seasonal darkness and satellite communications are quite limited. Canada and Russia have started new satellite programs for the Arctic and future U.S. military and Coast Guard needs for space-based support capabilities are certainly well within the planning horizon for National Security Space programs. This article focuses primarily on requirements and procurement options for satellite broadband service.

## I. Introduction and Background

In 2007 we received internal corporate funding to study the impacts of climate change on future National Security Space (NSS) requirements, manufacturing and launch operations. One of the first areas we focused on was the need for broadband satellite communications in the Arctic for support to increased U.S. fleet and Coast Guard operations. During the past 23 years, 41 percent of the perennial Arctic ice has melted. Between 2004 and 2005 alone, 14 percent was lost.<sup>i</sup> The volume of ice in the Arctic at the peak of 2009's annual freeze was the lowest on record, and of that only 30 percent was thick, slower melting multiyear ice.<sup>ii</sup> Up until a few years ago, climate models were predicting that the Arctic would not become ice-free during summers until the end of the century. But revised model predictions presented at the 2007 meeting of the American Geophysical Union now indicate that ice-free Arctic summers might start occurring as early as 2015.<sup>iii</sup>

The Northwest Passage (Figure 3) briefly opened for the first time in human memory in 2007. The Northeast and Northwest Passages could soon become busy navigation routes, cutting about 7,000 km from the current shipping routes between Asia and Europe. Canada currently claims the Northwest Passage as internal waters, whereas the United States asserts the route is through international waters where free passage is permitted. The Northeast Passage will likely see the fastest buildup in traffic because floating ice is less of a problem and Russia has a string of sea ports along the northern coast and offers ice-breaking services to assist ships transiting the passage.

A US Geological Survey (USGS) suggests that the Arctic seabed may hold as much as 25 percent of the world's undiscovered oil and natural gas reserves. Sovereign rights to energy resources in the Arctic seabed remain largely undetermined under international law. Recent articles in *Jane's Defense Weekly* (16 January 2008)<sup>iv</sup> and *Foreign Affairs* (March 2008)<sup>v</sup> describe the on-going competition among nations to claim parts of the Arctic seabed. The UN Convention of the Law of the Sea (UNCLOS) provides a general legal framework to govern uses of the world's oceans and resources and the major players in the region are scrambling for evidence to bolster their claims under the treaty, which has not yet been ratified by the U.S. Russia grabbed headlines in 2007 by claiming the North Pole and the resources underlying it.<sup>vi</sup> These issues are not likely to be resolved soon.

We presented a paper on our initial analysis of broadband communication options for U.S. military and Coast Guard operations in the Arctic at the 2009 AIAA Space Conference held in Pasadena, California.<sup>vii</sup> This paper is an overview and summary of the technical trades plus an update of current foreign and commercial satellite development programs for the Arctic region.

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<sup>1</sup> Member Technical Staff, Systems Engineering Division, The Aerospace Corporation.

<sup>2</sup> Sr. Engineering Specialist, Space Architecture Department, The Aerospace Corporation.

<sup>3</sup> Principal Engineering Specialist, Architecture & Design Subdivision, The Aerospace Corporation.

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<sup>i</sup> “Photo in the News: Arctic Ice Melting Rapidly, Study Shows,” *National Geographic News*, September 14, 2006. Accessed on July 23, 2009, at <http://news.nationalgeographic.com/news/2006/09/060914-arctic-ice.html>.

<sup>ii</sup> Shipley, D., “Arctic Sea Ice Extent Trending Below Record 2007 Melt,” *The Daily Green*, June 12, 2009. Accessed on July 13, 2009, at <http://www.thedailygreen.com/environmental-news/latest/arctic-sea-ice-47061201>.

<sup>iii</sup> Amos, J., “Arctic summers ice-free ‘by 2013’,” *BBC News*, December 12, 2007. Accessed on July 13, 2009, at <http://news.bbc.co.uk/2/hi/science/nature/7139797.stm>.

<sup>iv</sup> “Global Warming Speeds Up Race for North Pole,” *Jane’s Defense Weekly*, January 16, 2008.

<sup>v</sup> Borgerson, S., “Arctic Meltdown: The Economic and Security Implications of Global Warming,” *Foreign Affairs*, March/April 2008.

<sup>vi</sup> Goldberg, M., “About that Russian Arctic ‘Claim’,” *UN Dispatch: Posts on the UN*, August 20, 2007. Accessed on July 24, 2009 at [http://www.undispatch.com/archives/2007/08/about\\_that\\_russ.php](http://www.undispatch.com/archives/2007/08/about_that_russ.php).

<sup>vii</sup> Smith, P., Wickman, L. and Min, I., “Future Space System Support to U.S. Military Operations in an Ice-Free Arctic: Broadband Satellite Communications Considerations,” paper presented at AIAA Space 2009 conference, Pasadena, CA, September 14, 2009.