Testimony of

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Before the

Committee on Science, Space, and Technology

United States House of Representatives

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"*The U.S. Antarctic Program: Achieving Fiscal and Logistical Efficiency While Supporting Sound Science*."

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Washington, DC

November 15, 2012

Chairman Hall, Ranking Member Johnson and Members of the Committee. It is always a pleasure to appear before you and I appreciate today's invitation to discuss the report of the committee that recently addressed the logistical aspects of U.S. activities in Antarctica and the Southern Ocean.

I would like at the outset of my remarks to acknowledge my colleagues on the committee whose contributions made our report possible: USCG Commandant (Ret.)Thad Allen; RADM (USN, Ret.) Craig Dorman, Dr. Hugh W. Ducklow, Director, Ecosystems Center at the Marine Biological Laboratory; Mr. R. Keith Harrison, retired Global Product Supply Officer, Procter & Gamble; Dr. Don Harthill, Professor of Physics, Cornell University; Dr. Gérard Jugie, Emeritus Research Director of the French research organization CNRS; Dr. Louis J. Lanzerotti, member of the National Science Board; Gen. Duncan J. McNabb, USAF (Ret.), Former Commander, USTRANSCOM; Mr. Robert Spearing, Retired Deputy Associate Administrator for Space Communications, NASA Space Operations Mission Directorate; Dr. Diana Wall, University Distinguished Professor and Director of the School of Global Environmental Sustainability, Colorado State University, and I am particularly pleased that you invited my colleague, General Duncan McNabb to be at the witness table today.

I would like to call to the committee's attention that subsequent to beginning work on this review of Antarctic support activities I learned that the Lockheed Martin Corporation, from which I retired fifteen years ago, was planning to submit a bid to become the operating contractor for the U.S. Antarctic Program. Just prior to our committee's completing its work, the company was in fact selected to fulfill this role. In the spirit of disclosure, I should indicate that I receive a pension and healthcare from Lockheed Martin and own one share of its stock but of course had no contact with the company related to our committee's work. This circumstance has been reviewed without objection by the Counsel's Office at the National Science Foundation.

As you are aware, in 2010/2011, in consultation with the White House Office of Science and Technology Policy, the National Science Foundation tasked the National Research Council (NRC) of the National Academies to conduct a review of likely future science needs in Antarctica and the Southern Ocean. I will not seek to summarize the findings of that review here since the chair of the NRC committee is present at the witness table today. Suffice it to say that significant new opportunities for Antarctic science were identified and that many of these opportunities would best be accomplished using an integrated, international network of sensors distributed across the Antarctic Continent and collecting a variety of data on a year-around basis. This will in some respects require a quite different support network from that which exists today.

The study by the NRC formed the basis for the review my colleagues and I were asked to undertake, with our attention being principally focused upon safely and efficiently providing the logistical support that would be required to implement the NRC recommendations. In July of

this year our committee issued a 224-page report, "More and Better Science in Antarctica through Increased Logistical Effectiveness." We were assisted in our efforts, particularly in conducting cost assessments, by members and the staff of the Institute for Defense Analyses. I should note that we were provided unlimited access to facilities, people and documents by the National Science Foundation. The resulting report is solely that of our committee.

While our group noted a number of opportunities for enhanced efficiency in conducting support operations, overall the U.S. Antarctic program, in our view, has been and is being, extremely well managed. The construction of the new facility at the South Pole nearly on-schedule and very close to budget is perhaps the prime recent example. This was a truly monumental achievement.

It goes without saying that activities in Antarctica and the Southern Ocean are extremely unforgiving of error—in this regard I am reminded of our nation's pursuits in space. For example, temperatures of minus 127 degrees Fahrenheit have been recorded on the Antarctic Continent; the ice at the South Pole is some 9,000 feet thick; and the pressure-altitude at the Pole is about 11,000 feet. Very strong winds are common and darkness envelops the Continent for a significant portion of the year.

The logistical pipeline from the United States staging facility at Port Hueneme, California, is approximately 11,000 miles in length and involves cargo and tanker ships, icebreakers, fixed-wing aircraft, helicopters, sledges, and more. While science and "presence"—the latter largely justified by geopolitical considerations—form the primary motivation for U.S. activities in the region, it would not be an overstatement to assert that the dominant activity of the U.S. Antarctic program is logistics. For example, one of the key drivers of overall cost of activities in the Antarctic is the number of person-days spent on the ice and in recent years individuals dedicated to the *support* of research have generally constituted over 85 percent of the total person-days. In fact, eighty cents of every dollar invested in the U.S. Antarctic program is devoted to logistics (including infrastructure).

As is evident from such considerations, the arithmetic of operating in the Polar region is cruel. For example, if logistics costs under a fixed overall budget were to rise by thirteen percent, the science program would have to be cut in half. At the same time, the leverage for increasing science is enormous if support costs can be reduced. The latter was our objective…when it could be done in a safe and sensible manner.

As I have noted, our committee did observe a number of opportunities to reduce logistical demands as well as a few instances where current logistical activities were, in the judgment of the committee, unacceptable from the standpoint of the safety of both people and equipment. In addition, the committee identified several single-point failure modes that warrant early attention.

Some of these were already in the process of being addressed by the Office of Polar Programs; however, further work is required.

If one were to seek to identify a single root cause for the inefficiencies that we noted it would be that the Antarctic program does not have a capital budget—and, as you know, within our government that is not unique to the Office of Polar Programs. In the corporate world I am unaware of any successful firm that does not embrace capital budgeting for long-life assets, the costs of which can be amortized. Nonetheless, realizing that the government is unlikely to change its budgetary practices to accommodate the Antarctic Program, it is nevertheless possible for the Office of Polar Programs to maintain such a budget for *planning* purposes, even though its identity may be blurred during the annual federal budgeting process.

A second consideration that significantly complicates the national Science Foundation's effort to reduce the cost of logistical support in the Antarctic is the extreme nonlinearity of costs with throughput. For example, the imputed cost of a gallon of fuel at the South Pole is about seven times its cost to the government at the refinery. Furthermore, fuel, like people-days, is a major cost-driver. When considering the *fully-burdened* cost of fuel a long list of potential avenues to save money can thus be developed. However, the abovementioned issue of nonlinearities evidences itself because the saving of a single gallon of fuel will not materially decrease the cost of airlift unless it makes possible the elimination of one aircraft flight or one tanker ship's transit or enables the use of a smaller aircraft or a smaller ship. Further, such costs as those associated with icebreaker operations will be altogether unaffected. On the other hand, when enough gallons of fuel or tons of food or other supplies can be cumulatively reduced to the point where changes of the type cited above can be realized substantial savings can be accrued.

With these observations as background I would like to turn to the principal recommendations contained in our committee's report. These are as follows:

1. Antarctic Bases. Continue the use of McMurdo, South Pole, and Palmer Stations as the primary U.S. science and logistics hubs on the continent. There is no reasonable alternative to McMurdo that would eliminate the requirement for icebreakers.

2. Polar Ocean Fleet . Restore the U.S. polar ocean fleet (icebreakers, polar research vessels, midsized and smaller vessels) to support science, logistics, and national security in both polar regions over the long term. Follow through on pending action in the President's FY 2013 Budget Request for the USCG to initiate the design of a new icebreaker. (It is noted that current practice for supplying McMurdo and the South Pole is to charter Russian icebreakers when they are available.

3. Logistics and Transportation. Implement state-of-the-art logistics and transportation support as identified in the committee's report to reduce costs and expand science opportunities continent-wide and in the Southern Ocean. Replace some LC-130 flights with additional traverses by automating traverse activity and by constructing a wheel-capable ice runway at South Pole Station for C-17 use. Reduce the overall size of the LC-130 fleet.

4. McMurdo and Palmer Facilities. Upgrade or replace, as warranted by an updated master plan, aging facilities at McMurdo and Palmer Stations, thereby reducing operating costs and increasing the efficiency of support provided to science projects. In particular, modify or replace the pier and reconstruct the boat ramp at Palmer Station; install fire suppression—with back-up power—in unprotected berthing and key operational facilities; upgrade medical clinics; and improve dormitory use to prevent the transmission of illnesses.

5. USAP Capital Budget. Establish a long-term facilities capital plan and budget.

6. Science Support Costs. Further strengthen the process by which the fully-burdened cost and technological readiness of research instrumentation and observing systems, as well as overall projects, are considered in the review and selection of science projects. In this regard, increase the awareness among researchers of the true cost of support provided in Antarctica.

7. Communications. Modernize communication capabilities in Antarctica and the Southern Ocean to enable increased science output and reduced operational footprint. This will require increased bandwidth on as well as to and from the continent.

8. Energy Efficiency. Increase energy efficiency and implement renewable energy technologies to reduce operational costs. Provide additional wind turbine generators at McMurdo, better insulate selected buildings, and invest in technology for converting trash-to-energy and burning waste oil so that it does not have to be returned to the United States for disposition.

9. International Cooperation. Pursue additional opportunities for international cooperation in shared logistics support as well as scientific endeavors. The existence of numerous national stations in the Peninsula region offers a particularly promising opportunity to create an international supply system.

10. Antarctic Policy. Review and update the existing documents governing Antarctic Policy to better reflect current government organizational structure, changing science needs and increased opportunities for international cooperation.

The question of course arises how such undertakings can be funded in a time of severe budgetary pressures—even when the undertakings offer significant returns on investment. Indeed, major cost savings can be achieved and science and science support can be substantially enhanced within a period of about five years and a positive net present value realized. The necessary actions can be funded by increasing for each of the next four years the USAP's annual appropriation for support by six percent relative to the FY 2012 appropriation (an additional $16 million per year); diverting six percent of the planned science expenditures over the next four years to upgrades of the science support system ($4 million); and permitting the savings accrued from the five highest payout projects and the proposed 20 percent reduction in contractor labor cost to be reinvested in upgrading support capabilities ($20 million per year) during those four years.

The investments thus made would be repaid in approximately seven years from the five highest payout projects plus the 20 percent reduction in contractor staff. Thereafter, the annual savings generated will allow the USAP to increase science awards while ensuring safe and effective science support and appropriately maintained facilities. Given the important improvements in safety and science opportunities contained within the above option, a seven-year financial breakeven is considered by the Panel to be a reasonable investment, particularly when compared to the cost of not making it.

It should, however, be noted that this construct does not address the icebreaker issue that transcends the great majority of the U.S. Antarctic program's objectives, at least as they are understood by the Panel. Either the U.S. Coast Guard should be provided the resources to carry out its assigned responsibilities to the Antarctic Program or the National Science Foundation should be permitted to make less costly and more reliable long-term commitments to foreign operators to assure the continuation of key U.S. activities in Antarctica.

Again, Mr. Chairman and members of the Committee, thank you for the privilege of appearing today on behalf of my colleagues. I would of course be pleased to address any questions you might wish to raise.

NORMAN R. AUGUSTINE was raised in Colorado and attended Princeton University where he graduated with a BSE in Aeronautical Engineering, magna cum laude, and an MSE. He was elected to Phi Beta Kappa, Tau Beta Pi and Sigma Xi.

In 1958 he joined the Douglas Aircraft Company in California where he worked as a Research Engineer, Program Manager and Chief Engineer. Beginning in 1965, he served in the Office of the Secretary of Defense as Assistant Director of Defense Research and Engineering. He joined LTV Missiles and Space Company in 1970, serving as Vice President, Advanced Programs and Marketing. In 1973 he returned to the government as Assistant Secretary of the Army and in 1975 became Under Secretary of the Army, and later Acting Secretary of the Army. Joining Martin Marietta Corporation in 1977 as Vice President of Technical Operations, he was elected as CEO in 1987 and chairman in 1988, having previously been President and COO. He served as president of Lockheed Martin Corporation upon the formation of that company in 1995, and became CEO later that same year. He retired as chairman and CEO of Lockheed Martin in 1997, at which time he became a Lecturer with the Rank of Professor on the faculty of Princeton University where he served until 1999.

Mr. Augustine was Chairman and Principal Officer of the American Red Cross for nine years, Chairman of the Council of the National Academy of Engineering, President and Chairman of the Association of the United States Army, Chairman of the Aerospace Industries Association, and Chairman of the Defense Science Board. He is a former President of the American Institute of Aeronautics and Astronautics and the Boy Scouts of America. He is a former member of the Board of Directors of ConocoPhillips, Black & Decker, Proctor & Gamble and Lockheed Martin, and was a member of the Board of Trustees of Colonial Williamsburg. He is a Regent of the University System of Maryland, Trustee Emeritus of Johns Hopkins and a former member of the Board of Trustees of Princeton and MIT. He is a member of the Advisory Board of the Department of Homeland Security and the Department of Energy, was a member of the Hart/Rudman Commission on National Security, and served for 16 years on the President's Council of Advisors on Science and Technology under both Republican and Democratic presidents. He is a member of the American Philosophical Society, the National Academy of Sciences and the Council on Foreign Relations, and is a Fellow of the National Academy of Arts and Sciences and the Explorers Club.

Mr. Augustine has been presented the National Medal of Technology by the President of the United States and received the Joint Chiefs of Staff Distinguished Public Service Award. He has five times received the Department of Defense's highest civilian decoration, the Distinguished Service Medal. He is co-author of *The Defense Revolution* and *Shakespeare In Charge* and author of *Augustine's Laws* and *Augustine's Travels*. He holds 29 honorary degrees and was selected by Who's Who in America and the Library of Congress as one of "Fifty Great Americans" on the occasion of Who's Who's fiftieth anniversary. He has traveled in 111 countries and stood on both the North and South Poles of the earth.