

Statement of

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Before the

**Committee on Science and Technology
U.S. House of Representatives**

**“Averting the Storm: How Investments in Science Will Secure the Competitiveness
and Economic Future of the U.S.”**

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Chairman Gordon and Members of the Committee, thank you for this opportunity to discuss the results of the report prepared for the National Academies that was released this past week and is titled, “Rising Above the Gathering Storm, Revisited: Rapidly Approaching Category 5.” I would also like to take this opportunity to thank the Committee for its key role in supporting science and engineering in America and, through those disciplines, improving the quality of life of all our nation’s citizens.

The most recent report, “Rising Above the Gathering Storm, Revisited” traces its origin to a request by this Committee and its counterpart in the Senate. That request was made on a bipartisan basis some five years ago and resulted in a National Academies study that came to be known as the “Gathering Storm study” after the first line in the title of the report that presented its findings. The request from the Congress asked that the Academies address America’s future competitiveness outlook...which the Academies committee quickly came to define as the ability for all Americans to compete for quality jobs in the new global marketplace. It is those jobs that will largely define the quality of life that will be enjoyed by working individuals and their families, and it is the income from those jobs that will provide the tax resources needed by our government to provide the benefits that we all have come to expect, such as homeland security, healthcare, social security and much, much more. I believe it is fair to state that the report enjoyed strong bipartisan support of the members of this body.

The original National Academies committee was composed of 20 members having rather diverse professional backgrounds, including then present and former CEO’s of large firms, presidents of major public and private universities, the head of a state public K-12 school system, and three Nobel Laureates. The principal result of their deliberations was a series of 20 specific, interdependent actions that could be taken by the federal government to enhance the ability of Americans to compete for jobs in the increasingly competitive world employment market. This prioritized list was headed by the imperative to improve the nation’s K-12 education system and was immediately followed by the need to double within seven years the nation’s real investment in basic research.

The report placed particular emphasis on science and engineering because numerous studies have indicated that at least half the growth in the nation’s GDP during the past half-century can be attributed to advancements in these fields. With the accelerating pace of science and engineering one can reasonably expect the creation of jobs in the next 50 years to exhibit an even greater dependency on developments in such disciplines. It should be noted in this regard that the Gathering Storm committee considers jobs in science and engineering to be means to an end and not an end in themselves...that is, only four percent of America’s workforce is employed in science and engineering—the disproportionate importance of these professions stems from the fact that they create jobs for a very large number of other citizens.

In its original report, released exactly five years ago, the Gathering Storm committee concluded that America was on a path whereby large numbers of its citizens

would not be competitive for quality jobs—and that chronic built-in unemployment would be a likely consequence of structural weaknesses...again, most prominently, under-investment in education and under-investment in the creation of knowledge through research—the underpinnings of innovation.

A number of important initiatives were undertaken following the completion of the work of the Gathering Storm committee as well as that of numerous other groups, including the establishment of ARPA-E, increasing research funding approximately on the profile the Gathering Storm committee recommended, implementing steps to improve K-12 education, strengthening policies affecting student visa applicants and funding for research and development tax credits.

However, most of the above actions were authorized under the America Competes Act and were funded as part of the economic recovery package. As you know, the Competes Act requires reauthorization this year and the recovery package is approaching its sunset insofar as it serves as a source of funding. Thus, the efforts that are now underway find themselves on a budgetary precipice.

Underlying the Gathering Storm committee's findings was such evidence as that cited by Frances Cairncross writing in *The Economist* who noted that "distance is dead"...a victim of the advent of modern aircraft and information systems. Distance no longer matters to those seeking employees for a large variety of quality jobs. In the words of Tom Friedman, in his book, *The World is Flat*, "Globalization has accidentally made Beijing, Bangalore and Bethesda next door neighbors." This is particularly true when Americans must compete for jobs.

The report released this past week, "Rising Above the Gathering Storm, Revisited: Rapidly Approaching Category 5," was prepared at the request of the presidents of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The same Committee that prepared the original Gathering Storm study conducted the more recent examination—with the exception of three members who were unable to participate. One of these members is our much admired colleague and Nobel Laureate, Josh Lederberg, who passed away. The other two are currently serving in key roles in the federal government. The findings of the remaining 17 Committee members were unanimous.

The Committee focused on events occurring during the past five years that have impacted the initial conclusions and recommendations and their continued appropriateness. The members found the need to continue to support the original proposed actions even more compelling and urgent today than at the time they were initially proposed. Both specific events as well as overarching matters that occurred during the five years since the initial report was prepared led to this conclusion. Examples of the former include:

- Six million more American youth have dropped out of high school since the original Gathering Storm report was produced and each of these individuals now faces an extraordinarily high prospect of prolonged unemployment.
- The World Economic Forum has ranked the U.S. 48th in quality of mathematics and science education.
- In 2009, 51 percent of U.S. patents were awarded to non-U.S. companies.
- Federal funding of research in the physical sciences as a fraction of GDP fell by 54 percent in the 25 years after 1970. The corresponding decline in engineering funding was 51 percent.
- The Information Technology and Innovation Foundation ranked the U.S. in sixth place in global innovation based competitiveness and ranked the U.S. 40th in the rate of improvement over the past decade.
- China has now replaced the United States as the world's number one technology exporter.
- Eight of the 10 global companies with the largest R&D budgets have established R&D facilities in China, India, or both.
- General Electric, like a growing number of other firms, has relocated the majority of its R&D personnel outside the United States.
- Ninety-three percent of U.S. public schools in fifth through eighth grade are taught the physical sciences by a teacher without a degree or certificate in the physical sciences.
- The United States ranks 27th among developed nations in the proportion of college students receiving undergraduate degrees in science or engineering.
- The United States ranks 20th in high school completion rate among industrialized nations and 16th in college completion rate.
- An American company recently opened the world's largest private solar R&D facility...in Xian, China.
- Between 1996 and 1999, 157 new drug formulations were approved by the United States. In a corresponding period 10 years later, the number dropped to 74.
- Two-thirds of those receiving PhD's in engineering from U.S. universities are foreign-born. These individuals increasingly indicate their intention eventually to return to their home countries.
- All of the National Academies "Gathering Storm" Committee's recommendations could have been fully implemented with the sum Americans spent on cigarettes—with \$60B a year left over.

Turning to macroscopic developments, four circumstances warrant particular mention. The first of these is that other nations are rapidly improving their competitive ability due to a major emphasis on education, including the creation of new science- and engineering-focused universities and very progressive tax policies that favor innovation-driven firms.

Second, the ability of the U.S. to respond to the competitiveness challenges it faces has been increasingly hindered by the extraordinary budget pressures faced by the federal government as well as state and local governments.

Third, altogether unforeseen at the time of the Gathering Storm study five years ago, America's higher education system, long the gold standard of the world, is now being severely threatened. The source of this challenge is the serious financial condition of many states plus the loss of endowments suffered during the recent financial downturn. As a result, universities are taking heretofore largely unprecedented actions, including mandatory furloughs for faculty, faculty layoffs and large increases in tuition. Concurrently, universities in other nations are seeing this as an opportunity to attract many of the finest researchers and educators from America's educational institutions, particularly its research universities.

Fourth, at the time the original Gathering Storm study was conducted, the biosciences, or more precisely the health sciences, had just benefitted from a doubling of federal research funding and therefore were not given primary consideration in the Academies' work. Since that time, however, this upward trend has been reversed and the effects of inflation have further taken their toll.

The underlying dilemma faced by a firm seeking to determine where to build a new R&D facility or factory is illustrated by the following set of choices comparing two nations from a competitiveness standpoint:

In Country A, the average non-professional worker ranks in the lower quartile of the global high school class and expects to be paid a wage of \$17 per hour plus an additional third of that amount in benefits; the nation's economy is mature in terms of growth potential; it has the second highest corporate tax rate in the world; and the average firm spends almost three times as much on litigation as on research. In Country B, the average non-professional worker ranks in the top 10 percent of the global high school class and is eager to work for \$1.50 per hour with no additional benefits; five-year tax holidays are commonly granted to startup high tech firms; five to eight professional employees can be hired for the cost of one in Country A; and the domestic market for products is growing exponentially.

Country A is, of course, the United States, and even the most loyal CEO's and boards of directors of American firms will, given their fiduciary responsibilities, generally elect to move to Country B.

In summary, the Gathering Storm committee unanimously concluded that America's competitive situation is even more perilous today than it found it to be five years ago. The recommendations in the initial report are deemed still to be entirely appropriate—the task being to implement those recommendations on a continuing basis. Doing so will require reauthorizing the America Competes Act and providing the funding needed to carry out the above-mentioned recommendations.

It is noted that meeting the competitiveness challenge is a marathon, not a sprint, and will thus require our enduring efforts. It is the Gathering Storm committee's conviction that this is an endeavor in which all Americans can unite since the

fundamental issue is the quality of life we will leave to our children and our grandchildren.

Thank you for affording me this opportunity to share with you the findings of my colleagues on the Gathering Storm committee. I would 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 year. He retired as chairman and CEO of Lockheed Martin in August 1997, at which time he became a Lecturer with the Rank of Professor on the faculty of Princeton University where he served until July 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 current or 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 to the Department of Homeland Security, 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. He is a member of the American Philosophical Society, the National Academy of Sciences and the Council on Foreign Affairs, 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 24 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 over 100 countries and stood on both the North and South Poles of the earth.
