Written Testimony Before the Senate Committee on Commerce, Science & Transportation, Subcommittee on Science & Space, on "Assessing the Risks, Impacts & Solutions for Space Threats."

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It is my pleasure and honor to speak to this Committee today, just as it is my pleasure and honor to speak to students and the public about space many times each year. Based on that interaction with the public, I'm going to take a slightly different approach to assessing Risks, Impacts & Solutions for Space Threats by talking about the Threat of the American Public Not Understanding the Importance of Space. From my course on Space & Security[2] at Harvard Extension and Summer Schools, to speaking at the Mid-Coast Forum in Maine[3] in December 2012, and to the Blue Water Sailing Club earlier this month,[4] the number one comment I receive after talking about much the same material covered in my oral and written testimony today – the near-term importance of space to every American -- is, "why don't we know this stuff?"

Space, in my opinion and based on my interactions with the public, is not the final frontier, and it is not the next frontier. In 1997 I co-authored a book calling it the dormant frontier[5] but that isn't really correct either – quite the opposite given the ambitious and effectual work being done on the International Space Station (ISS). I would posit though that few Americans are even aware of work being done on the ISS. If the general public is more than casually aware of the ISS at all, it is as a lame-duck program waiting to be de-orbited some time in the near future. Space, for many Americans not living around a NASA Center, is largely a benignly-neglected frontier.

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[1] The views expressed here are the author's alone and do not represent the official position of the Department of the Navy, the Department of Defense or the U.S. government. The author thanks the Naval War College EMC Chair for its support to participate in this hearing.

[2] After teaching this course in during the Fall Semester 2011 at Harvard Extension School – with a student population rich in diverse student backgrounds and perspectives -- I wrote an article about student attitudes. See: "Guest Blog: Views on Space From an (Rare) Informed Public," *Space News*, January 5, 2011.

[3] http://www.midcoastforum.org/speakers/dr-joan-johnson-freese

[4] http://www.bluewatersc.org/news/27/BWSC-Visits-U-S-Naval-War-College-Newport/

[5] Joan Johnson-Freese and Roger Handberg, *Space: The Dormant Frontier*, Praeger, 1997.

The problem with space and public support, support as it translates into support for prioritized spending of their tax dollars, is that the public views space much as they view their cars. When they get into their cars, they just want it to run. They don't care about the mechanics of a combustion engine, or how to build or repair a car, they just want to drive it.

Much the same way with space, because of the resounding *success* of NASA and other organizations that have been responsible for putting space infrastructure into orbit, Americans – indeed people all over the world – use their ATM cards, use GPS in their cars and boats, and rely on the Weather Channel to tell them whether to wear a coat– totally oblivious to the role that space assets play in providing that information. I have had people ask me why the United States should invest in more weather satellites, when we already have the Weather Channel, unaware of the connection. So in that regard, the immediate benefits of space activity are forgotten to most of the public, or perhaps that knowledge was never known in the first place. Space is associated largely with exploration, and so considered "expendable" during times of economic restraint; something that is desirable and exciting to do, but can be put off until later.

But that premise is incorrect – even regarding exploration, as I will point out regarding the geostrategic importance of space. Infrastructure doesn't go up quickly – and once in orbit infrastructure must be maintained, and updated. And while some satellites – like GPS – are relatively easy for at least some of the public to understand because of they use it, other systems are less obvious. For example, the probes that study radiation belts and satellites that watch for solar storms to protect satellites and terrestrial electrical grids are essential.[6] Unfortunately though, the public generally views these activities as little more than interesting science projects, if they know about them at all. Yet, without them Americans' lives would fundamentally change. Let me to explain with a few brief examples.

GPS is – with the Internet – one of only two global utilities. Its usage allows us to, for example:

- use our ATM cards wherever we are in the world,
- to buy gasoline at the pump using a credit card,
- for emergency response vehicles to reach their destinations by the shortest possible route, potentially saving lives,
- for trans-oceanic air travel to be safer and more efficient because planes can fly closer together, and if the new satellite reliant air traffic control system is

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[6] Lisa Grossman, "NASA's tentacle spacecraft will probe solar storms," *New Scientist*, August 9, 2012. http://www.newscientist.com/blogs/shortsharpscience/2012/08/tentacled-spacecraft-will-prob.html

implemented, reduce jet fuel consumption by 1 million barrels annually – saving both money and the environment[7]

- and save the trucking industry an estimated $53B annually in fuel costs and better fleet management.[8]

In addition to the economic benefits of space, which are vital to the national interest, there are direct security implications of space.

The recent meteorite that hit in the Russian Urals with the force of an atomic bomb was a stark wake-up call regarding threats from space, and certainly raised awareness about the importance of space surveillance and the communication of threats. Press reports talked about the panic experienced by local residents, including that the world was coming to an end, and that one Russian official blamed the event on the United States.[9] Given the complex political state of the world, it is clearly imperative that government officials have accurate scientific data to distinguish between meteorites and missile attacks. Since miscalculation is a historic cause of war, we must be aware of our solar system.

The military benefits of space are too lengthy to be briefly catalogued, but suffice it to say that every letter in the acronym which basically describe military operations, C4ISR – Command, Control, Communication, Computers, Intelligence, Surveillance and Reconnaissance – is reliant on space assets. Space surveillance allows the military to have eyes and ears into locations otherwise inaccessible, on a 24/7 basis. It is also important to note that an estimated 80% of military communications is carried on commercial satellites,[10] making it imperative that the private space sector be kept healthy and viable. Without space-based assets, the United States would simply cease to be a superpower.

Geostrategically, America is hindered by our own success with Apollo. For many Americans, unfortunately, space exploration is viewed from a kind of been-there/done-that perspective. But for the rest of the world, space activity and space

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[7] Ann Schrader, "Air Traffic Control's Next Generation May Give Airlines' Fuel-Saving, Fliers a Lift, September 7, 2011, *The Denver Post*, http://www.denverpost.com/business/ci_18840006

[8] Eric Ogden, "Study: GPS Could Save the Trucking Industry $53 Billion," July 1, 2008. http://www.informationweek.com/mobility/business/study-gps-could-save-trucking-industry-5/229211071

[9] Associated Press, "About 1,100 injured as meteorite hits Russia with the force of an atomic bomb," February 15, 2011. http://www.foxnews.com/science/2013/02/15/injuries-reported-after-meteorite-falls-in-russia-ural-mountains/

[10] Stew Magnuson, "Military Space Communications Lack Direction," *Space Daily*, January 7, 2013. http://www.spacedaily.com/reports/Military_Space_Communications_Lacks_Direction_999.html

exploration still represents the Final Frontier, the Future, and, consequently, Global Leadership. Space capabilities add to U.S. prestige and soft power, which has spillover into U.S. influence in multiple other policy areas.

The U.S. is the global leader in space – one need only look at both the quantity and quality of spacecraft the U.S. has in orbit to verify that – but the U.S. has in some cases already lost the *perception* of being the leader in space, ceding that position to China.[11] The prospect of a U.S.-China Space Race has titillated the press and pundits for several years.[12][13] But the U.S. will cede space leadership to China not from the lack of scientific and technical potential or capacity in the United States, but due to the lack of political will to maintain it.[14]

Two final questions tie many of these issues together, and hopefully illustrate why a vigorous space program must be maintained.

First, would China have conducted a high-altitude kinetic ASAT test in 2007 – with the resultant debris threatening the sustainability of the space environment -- if it had been a partner on the ISS? This certainly question begs consideration of the best approach to dealing with Chinese space ambitions:[15] by cooperation, competition, or attempted isolation, the latter unlikely to be successful. The Baker Institute at Rice University recently recommended that China be included in the ISS partnership,[16] a

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[11] "China eyes lead in international space race," CBS News, July 11, 2011. http://www.cbsnews.com/2100-205_162-20078365.html; Clara Moscowitz, "US is losing in race to its own Moon," *Space.Com*, October 19, 2011. http://www.space.com/13331-china-space-race-moon-ownership-bigelow-ispcs.html;

[12] Peter Ritter, "The New Space Race: China vs the US," *Time*, February 13, 2008. http://www.time.com/time/world/article/0,8599,1712812,00.html; Clara Moscowitz, "US & China: Space Race or Cosmic Cooperation," *Space.Com*, September 27, 2011, , *http://www.space.com/13100-china-space-program-nasa-space-race.html*: Daryl Morini, "The Coming U.S.-China Space Race," *The Diplomat,* August 15, 2012. http://thediplomat.com/china-power/a-u-s-china-space-race-in-the-offing/

[13] Even in Russian press reports on the recent testimony of U.S. Director of National Intelligence James Clapper to the Senate Intelligence Committee, differing Russian views were given regarding whether China will try to threaten U.S. access to space, or whether threats are being hyped in the U.S. for budget purposes. "Will China Surpass the USA in Space?" *Voice of Russia*, March 13, 2013. http://english.ruvr.ru/2013_03_13/Will-China-surpass-the-USA-in-space/

[14] Joan Johnson-Freese, "Will China overtake America in Space?" *CNN,* June 20, 2012. http://www.cnn.com/2012/06/20/opinion/freese-china-space

[15] Joan Johnson-Freese, "A Long March Into Space," *Cairo Review*, February 10, 2013. http://www.aucegypt.edu/gapp/cairoreview/Pages/articleDetails.aspx?aid=297

[16] See: Marc Carreau, "Think Tank Recommends Role for China in ISS," *Aviation Week & Space Technology,* March 13, 2013.

recommendation with which I strongly concur. Ironically, however, there are individuals in the Chinese space and foreign policy communities who, though once interested in such a partnership, have lost interest because they feel the U.S. politics are too fickle for the U.S. to be a reliable partner, and consequently would hinder their own ambitious domestic space exploration efforts.

Second, if called upon to deflect a meteorite threatening Earth, are the technologies in place to do so, and are the mechanisms in place so it could it be done without it being a geostrategic nightmare? An International Space Code of Conduct[17] is currently being considered by on a global basis. Secretary of State Hillary Clinton endorsed the concept on behalf of the United States, and the Pentagon is on board as well.[18] This indicates recognition of a need for mechanisms or guidelines for international cooperation on space issues beyond national control, which encompasses nearly all space issues.

Space is increasingly described as a congested, contested and competitive environment. It is undoubtedly all of those in one way or another, which inherently means America must stay actively engaged. For that engagement to be effective though, will require the addition of another "C" to that list of descriptors – cooperative, as space and space activity is also inherently international, intercultural and interdisciplinary in nature.

In conclusion -- America will only stay ahead in space and thus capable of addressing economic, political, military and geostrategic risks and threats, by staying active. We must remind the American people, and remember ourselves, that space exploration and space development is not expendable, it is in our strategic national self-interest.

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http://www.aviationweek.com/Article.aspx?id=/article-xml/asd_03_13_2013_p05-01-558310.xml

[17] Micah Zenko, "A Code of Conduct for Outer Space," Council on Foreign Relations, http://www.cfr.org/space/code-conduct-outer-space/p26556;

[18] Sydney Freedberg, "Why the Pentagon Wants an International Code of Conduct for Space," *AOL Defense*, March 20, 2012, http://defense.aol.com/2012/03/22/safe-passage-why-the-pentagon-wants-an-international-code-of-c/