

TESTIMONY BEFORE THE SENATE COMMITTEE ON COMMERCE, SCIENCE AND  
TRANSPORTATION, SUBCOMMITTEE ON SCIENCE AND SPACE

THE CASE FOR SPACE: EXAMINING THE VALUE

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Mr. Chairman and members of the Subcommittee, I appreciate very much the opportunity to testify on the important topic of the Case for Space: Examining the Value. My name is Lennard Fisk, and I am the Thomas M. Donahue Distinguished University Professor of Space Science at the University of Michigan. I also served from 1987 to 1993 as the NASA Associate Administrator for Space Science and Applications, and from 2003 to 2008 as the Chair of the National Research Council Space Studies Board.

My remarks today will be based in large measure on the recent National Academies Report: *America's Future in Space: Aligning the Civil Space Program with National Needs*<sup>1</sup>, which was Chaired by Gen. Les Lyles (Ret.), and for which I served as one of the Vice Chairs. My remarks, of course, are entirely my own.

I would like to talk today about civil space in its entirety, and so let me begin by defining civil space. For my purposes, civil space is all aspects of space that are not pursued for military purposes. It is the space activities of NASA and NOAA. It is all of commercial space: communication satellites, remote sensing satellites, and the many entrepreneurial activities that are now blossoming. It is also the civil use of military assets such as the commercial use of the signals from Global Positioning Satellites (GPS).

Taken in this broad context, the civil space program of the United States touches the lives of every American, each and every day. We are dependent upon GPS signals for transportation; we coordinate our telecommunication networks, internet infrastructure and electric grid and financial systems through the timing signals available from GPS. Our weather forecasts are based upon satellite observations. We have information on what is happening everywhere in the world at all times, in large measure due to satellite communications and observations.

Indeed, we can argue that the globalized world in which we live, where manufacturing is worldwide and economies are thoroughly intertwined, was able to develop because of space. The knowledge that we have about other societies and our ability to communicate instantaneously, transmitted through satellites, have given us a level of comfort to invest

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<sup>1</sup> *America's Future in Space: Aligning the Civil Space Program with National Needs*, report of the National Research Council Committee on the Rationale and Goals of the U.S. Civil Space Program, published October 2009.

throughout the world. And because of this we live in a safer world, where now many nations have a vested interest in each other's success.

We also live in a world of challenges, one of the main ones being global climate change. Whether or not you agree on the causes of climate change, nonetheless we must all accept that the climate of Earth is changing, and the outstanding question is what are the regional consequences to which we must prepare to adapt. The Department of Defense has stated that global climate change is a strategic threat to the United States, in recognition that climate change in the developing world can be de-stabilizing, and lead to increased threats from, for example, terrorism.

The knowledge of global climate change and its regional consequences will come uniquely from the civil space program. Comprehensive observations from the global perspective of space will be required. We may enter into treaties limiting fossil fuel emissions and other contributions to the greenhouse gases in the atmosphere. Only the global perspective of satellite observations will allow us to monitor compliance by the treaty signatories. "Trust but verify" will work equally well in climate treaties as it did for treaties limiting nuclear weapons.

We also live in a world of opportunities. We have the capabilities these days to use our civil space program to ask and to answer very fundamental questions about the universe in which we live: what is the origin, the evolution, and the destiny of our Sun, our solar system, and the universe beyond. Is there life elsewhere in the universe? Do we not also, as a rich and powerful nation, have the obligation to seek and to provide these answers on behalf of all humankind?

Our economy is reeling and the clear way forward to long-term economic growth and job creation is investments in innovative technologies. The civil space program can require the development of technologies that benefit the economic growth of the nation and it can unleash and encourage the entrepreneurial spirit on which the American economy is founded.

Our human space flight program has been able to inspire us to consider the endless opportunities of space. It also plays an important geopolitical role. Space has been and will always be the playground on which developed nations demonstrate their technological prowess. Our position in the world is in part determined by what we are able to accomplish in space.

Indeed, our entire civil space program permits us to define the image we wish to project as a nation. There are a growing number of nations with capabilities in space, and so dominance by the United States is no longer likely, nor for that matter desirable. Rather, we can use our civil space program to exert strategic leadership, in which we lead by example and in cooperation, and are valued in the world for what we are able to accomplish on behalf of all humankind.

Our civil space program can also make us more secure. We have military assets in space, which are judged to be vulnerable. It is reasonable to assume that they will be safer if space becomes a routine place for science and for commerce, just as rules-of-the-road make our oceans a lawful, not a lawless domain.

Our civil space program thus occupies a central position in the American way of life and our national goals. It assists our everyday lives; it helped create our globalized world; it satisfies our innate curiosity about the majesty of the universe; it will help determine the future of Earth; it can help drive the development of technology on which our economic future depends; it inspires us to believe that our tomorrows will be better; it is an essential component of our national image, and helps make it possible for us to be a strategic leader in a world full of challenges.

Given the centrality of the civil space program to our way of life and national goals it is somewhat troubling that we need to defend its value. I suspect this lack of appreciation results in part because space is now endemic in our society. It is so pervasive in our daily lives and national identity that we no longer fully recognize or appreciate its presence.

It is also true that we are not organized as a federal government to fully realize the benefits that our civil space program offers the nation. “National space policy is too often implemented in a stovepipe fashion that obscures the connection between space activities and other pressing needs of the nation. Consequently, the senior policy makers with broad portfolios have not been able to take the time to consider the space program in the broad national context. Rather, policies have been translated into programs by setting budget levels and then expecting agencies to manage to those budgets”.<sup>2</sup>

Thus, one of the key recommendations of the *America’s Future in Space* report is that “the President of the United States should task senior executive branch officials to align agency and department strategies: identify gaps or shortfalls in policy coverage, policy implementation, and resource allocation; and identify new opportunities for space-based endeavors that will help to address the goals of both the U.S. civil and national security space programs”.<sup>2</sup>

The *America’s Future in Space* report further recommends that we should, through policy implementation and resource allocation, formulate and execute a civil space program in the United States that is closely aligned with and clearly serves our national needs. The service to national needs is the basis on which our national investment in civil space has and ought to be made. We have entrusted the future of our nation and our sense of wellbeing as a people to the performance of our civil space program, and we need to insure that our investments in civil space are adequate and the emphases that we place best serve our national needs.

We need a civil space program that allows us to protect the Earth and its inhabitants through the use of space research and technology; that employs the global perspective enabled by space observations to monitor climate change and test climate models, to help manage Earth resources, and mitigate risks associated with natural phenomena such as severe weather and asteroids. “NASA and NOAA should lead in the formation of an international satellite-observing architecture of monitoring global climate change and its consequences and support the research needed to interpret and understand the data in time for meaningful policy decisions”.<sup>2</sup>

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<sup>2</sup> Quoted from the NRC report: *America’s Future in Space: Aligning the Civil Space Program with National Needs*.

We need a civil space program that allows us to pursue scientific inquiry and advancement of knowledge, which are fundamental to a nation's health: "the results inform and excite the public, stimulate technology development, create an interest in learning, and generally improve the capability of the nation to compete and to lead. A nation that asks question about the universe and wants to learn is a richer nation".<sup>2</sup>

We need a civil space program that develops advanced technology, "engaging the best scientific and engineering talent in the country wherever it resides in universities, industry, NASA centers, or in other government laboratories".<sup>2</sup> The research conducted should address the needs of the nation's entire space portfolio, both government and industry, and by doing so encourage the economic development of the nation.

We need a civil space program that actively pursues human spaceflight, "extending the human experience into new frontiers, challenging technology, bringing global prestige, and exciting the public's imagination".<sup>2</sup> The criterion by which we judge our human spaceflight program should not be based upon the capabilities or aspirations of other nations. Rather, our human spaceflight program should be held to the same standard we apply to the rest of our civil space program: "It must be capable of producing transformative cultural, scientific, commercial or technical outcomes."<sup>2</sup>

We need a civil space program that inspires current and future generations; "that builds upon the legacy of spectacular achievements to inspire our citizens and attracts future generations of scientists and engineers".<sup>2</sup> We live in a world of many immediate concerns, from a weakened world economy, to regional conflicts and global terrorism, to threats of the consequences of climate change and limited energy sources. "A vigorous civil space program provides a strong signal that our future as a nation is promising; that life can be better; that our prospects are boundless".<sup>2</sup>

We need a civil space program that allows us to pursue international cooperation in space proactively as a means to advance U.S. strategic leadership and meet national and mutual international goals. "Space is viewed by many countries of the world as global commons, a resource not owned by any one nation but crucial to the future of all humankind. Indeed, human beings around the world view space not just as a place, but rather as symbolic of the future itself. Thus, for the U.S. to exert strategic leadership there is no venue more special than space. True strategic leadership will be achieved not by dominance, which in many cases is no longer possible, but by example and in cooperation with other nations. In addition to protecting those activities in space that are judged to be essential to U.S. national interest, and for which the United States must be an undisputed leader, there should also always be concern for the larger world and for how the United States is viewed as a benevolent nation with foresight and determination to make a better world for all humankind".<sup>2</sup>

We need to recognize also that there are impediments to the success of a civil space program that best serves the national needs, and these will need to be overcome. There is the impediment cited above of the lack of a cohesive and coordinated national space policy that ensures that all participants have the capabilities, whether by policy or through resource allocation, to serve their functions in this broad national endeavor. There are also impediments at the foundational level.

There is need of a competent technical workforce, “sufficient in size, talents and experience to address difficult and pressing challenges”.<sup>2</sup> The aerospace workforce, which serves the needs of both civil and military space, needs to be replenished, as part of a broad national effort to ensure that the nation has the technical workforce necessary to maintain our competitive position in the world and that serves the needs of our people.

There is a need for a properly sized and structured infrastructure, which makes effective use of the full capabilities that the nation has assembled to conduct its civil space program, whether in NASA centers, universities, industry, or other national laboratories. “The health of the institutional infrastructure is in question. NASA still maintains 10 large centers, as legacies of the much larger Apollo program more than 40 years ago. Responding to funding limitations and associated political pressures, NASA has elected to focus its support on its own centers. As a result, the broad national capabilities in universities and in industry have atrophied and are under utilized – in some instances imperiled – with serious consequences for U.S. capabilities for future innovation. In the case of universities, where research and education are pursued synergistically, the proper training of the aerospace workforce is in jeopardy.”<sup>2</sup>

There is a need for a foundation of “sustained technology advances that can provide the development of more capable, reliable, and lower-cost spacecraft and launch vehicles to achieve space program goals”.<sup>2</sup> “Yet, because of budgetary pressures and institutional priorities, NASA has largely abandoned its role in supporting a broad portfolio of advanced technology development for civil space applications, and the space technology base has been allowed to erode and is now deficient.”<sup>2</sup>

In summary, the civil space program of the United States has a central role in our society today, and our goals as a nation. This role, however, is often not recognized or appreciated, with the result that our civil space program is not adequately coordinated; nor are its priorities properly aligned with pressing national needs, with adequate resources provided; nor are its deficiencies recognized and removed. The goal of course is to reverse this situation, to construct a civil space program that is truly aligned with and capable of serving the national needs. When we do, America does have a future in space, and even more important, space can help assure America’s future.