

Remarks by L. A. Fisk  
Symposium on Human Spaceflight and the Future of Space Science

January 14, 2010

I would like to share some thoughts with you today – almost philosophical thoughts – on the future of the interactions between the scientific exploration of space and the human spaceflight program.

My basic premise is that in large measure the opportunities for productive interactions between science and human spaceflight will depend on the extent to which there is an equality of essential goals between the two programs. There will never be an equality of funding, since the two endeavors have fundamentally different cost structures. But there needs to be a greater equality between the extent to which each program seeks to be transformative.

In the science program, we have an expectation, and a proven record, that our major science missions will be transformative. The Hubble Space Telescope has transformed our understanding of the universe, as has the Chandra X-ray telescope, the Spitzer infra-red telescope, and the earlier Compton gamma ray telescope. We have the same expectations for the other major astronomy missions now flying, and for the upcoming James Webb Space Telescope. The outer planets missions, Voyager, Galileo and Cassini. The many Mars missions have all transformed our understanding of the solar system. Our array of solar missions has drastically altered our understanding of the Sun. Our Earth science missions have transformed our understanding of the Earth, and allowed us to recognize that the Earth is a strongly coupled and highly interrelated system, and one which we as humans are altering.

We cannot make similar statements, of transformational events, about our current human spaceflight program. Apollo was certainly transformational, but the human spaceflight program that followed has largely not been transformational.

The expectation that our human spaceflight program should be transformational is not an expectation for scientific transformation. It is unlikely that the human spaceflight program will ever rise to the scientific transformational standard that we impose upon our robotic scientific program. For the simple reason that it is unlikely that humans, for the foreseeable future, will ever be able to go to the scientifically most interesting places. We will be limited to the Moon, perhaps asteroids, maybe Mars some day. But there are many other scientifically interesting places out there, even in our solar system, where we should not expect to be able to go with humans, and certainly the broader universe outside our solar system is unlikely to be accessible to humans for centuries.

But of course the transformations we should expect from human spaceflight are not scientific. Science is not the reason we should do human spaceflight. The usual reasons that are cited, and they are valid, are threefold.

Geopolitical. The United States has a stated national goal to be a strategic leader in the world. Our human spaceflight program, as part of our broader civil space program, needs to be an integral contributor to achieving this goal.

There has been a somewhat transformational event within our current human spaceflight program, and that is the international cooperation that has led to the construction of the International Space Station. This broad collaboration of nations has weathered many trials, but

has achieved a remarkable engineering feat, and has transformed the interactions among nations with human spaceflight capability, particularly the interactions with the Russians.

We need to build on this success, and create a worldwide human spaceflight program that involves a broader array of nations, particularly those with emerging human spaceflight capability.

And the stated goal of this international, broader human spaceflight program should be to make the world a safer place. Space today is primarily a lawless frontier. We do not have the same rules of the road or expectations for behavior in space as we have enjoyed for centuries on the world's oceans. Yet we and other nations have military assets in space, on which we are dependent for our security, and which we consider to be vulnerable.

The extent to which we can use our civil space program, and our human spaceflight program in particular, to make space a routine place for transit, for commerce, and for science, and where each spacefaring nation has a vested interest in space being a secure environment, this will help transform the world into a safer place.

The second transformational goal for human spaceflight should be economic. To date, the primary economic benefits from space have come from robotic spacecraft, or from the civil use of robotic military space assets. The financial transactions of the world are timed by GPS signals. We are beginning to be able to understand and hopefully control the economic impact of global climate change, based upon space observations. We communicate through satellites. We have extensive knowledge and insight into other societies from our global news coverage; direct broadcast satellites, and so on.

Indeed, one can argue that the globalized world in which we live, in which manufacturing and trade are worldwide, has resulted in large part from the knowledge and the enhanced communications that have been made possible by robotic spacecraft.

The jury is still out on whether human spaceflight will open up similar or even greater economic opportunities. There are many of us who would like to think such opportunities will be possible. There are certainly historical analogies. The railroads of the west were an event in which an enhanced transportation capability into a region somewhat hostile and not readily accessible opened up enormous economic opportunities.

Perhaps history can repeat itself in space, when humans can routinely live and work in space. Certainly it would be a transformational event for our human spaceflight program, of major proportion, should this occur. And it is certainly a worthy goal for our human spaceflight program to see if the opening of economic opportunities for humans in space is possible.

And then there is the question of inspiration. Do we have and can we use our human spaceflight program to inspire our young to pursue careers in science, engineering and math. And more broadly, can we use our human spaceflight program to inspire our people that tomorrow is more promising than today. That our economic future, and the future of our society is without bound.

We need to be careful in deciding what is inspirational. The nations of the world that are just now entering human spaceflight are reliving the glory days of Apollo. It is inspirational to their people that citizens of their country are flying in space on vehicles of their making, and that their nation is one of only a few true spacefaring nations.

We have passed through that period. We are no longer inspired by simply orbiting the Earth, and have created for ourselves an image that space travel into low Earth orbit is a routine and hardly a newsworthy event, except in the case of a serious accident.

Surely then to be inspirational for Americans our human spaceflight program needs to go somewhere, out of low Earth orbit, to new and inspirational adventures.

And we need to do so with technology that in reality and in perception is viewed as being transformational. We in this business recognize the difficulty of building and flying routinely and safely a human-rated rocket. But it is hard to convince anyone that this is an inspirational event, since it was done with remarkable success by our forbearers more than 50 years ago.

Rather, somewhere in this adventure in human spaceflight there need to be new capabilities developed. Not in the base rocket, since the technology of that is well established, but certainly in the on-orbit capabilities, whether it is maneuverability, or life-support systems, or means to overcome the debilitating efforts of weightlessness or radiation.

If the purpose of our human spaceflight program is to open up space for human activity and to set the standard for the world for how this is to be done, then we need to achieve a level of technical capability for human spaceflight that is truly transformational. And in doing so we will inspire our technically literate society, and those who aspire to be contributors to our technical advancement.

Imagine then a human spaceflight program that aspires to be more transformative, and is in pursuit of this goal. In such circumstances there can be a constructive synergism between the human spaceflight program and science.

Space and Earth science has always relied upon international collaborations for its major missions. But surely there will be more opportunities for international collaboration if the human spaceflight program is engaged with and supportive of all the major spacefaring nations, in pursuit of human spaceflight.

To encourage the economic expansion of human activities into space, easy, reliable and cost-effective access to space is required. And science would certainly benefit from that.

If the human spaceflight program opens up new capabilities in space, for living and working in the near space environment and being able to maneuver in this environment, surely this capability will provide opportunities to deploy, construct and, if necessary, to repair scientific satellites, in a variety of orbits, just as the Shuttle provided the capability to repair the wounded Hubble Space Telescope.

And then there is the traditional one. The presence of humans on planetary bodies such as the Moon, or asteroids or Mars, or even in the vicinity, provides the opportunity to apply human intelligence and reasoning capability directly to the scientific exploration of these bodies.

And we would all benefit from a truly inspirational human spaceflight program that inspires the next generation to pursue careers in science, engineering and math, and which encourages them to consider and to pursue the opportunities that space offers.

The human spaceflight program that I have described in general terms, which is more aggressive and more transformative, also requires more funding than what we are currently providing, and I fear will require more funding than the President is currently considering.

Herein lies the dilemma. The United States has been willing to make investments in the science and technology agencies that are perceived as being able to help restore our economy to robustness. There is ample evidence that NASA is not to be included among the agencies. NASA was left out of the America COMPETES Act, which resulted in substantial increases in funding to the NSF, NIST, and the DoE Office of Science. NASA received only a small share of the stimulus money, relative to its size.

I suggest that relegating NASA to a minor player in the economic recovery results in large part because NASA, and in particular human spaceflight, is not perceived as being essential to the national agenda.

We have described a human spaceflight program which, if carried out aggressively, and which results in transformative events for our nation's future, would in fact be central to the national agenda.

But there is a clear leap of faith here. You have to believe that if the required investment is made in human spaceflight, that indeed, a worthy transformative human spaceflight program will result. And it is not clear to me that we have made the case effectively for that leap of faith to occur.

What posture then should the science community take relative to human spaceflight? The first posture is of course a defensive one. We may recognize that human spaceflight needs more money, but we have transformative goals of our own, and we do not wish to be the source of that money.

The second posture is an offensive one. We need to recognize that the current human spaceflight program is a drag on the reputation of the agency, and therefore on us, and offers little advantage to us. We should thus be advocates for a more aggressive human spaceflight program, which is capable of transforming our society, our economy, and our future. A human spaceflight program that is an essential component of our foreign policy, our economic future, and the inspiration of our people. And if such a program develops, there will be opportunities for synergies, and mutually supportive capabilities, and all this will be advantageous to us.

Thank you very much.