

to being able to predict, in 1900, that the coming of the automobile is going to lead to the suburb, or to drive-through fast food stands. . . .

I'm a bit reluctant, then, about trying to predict or describe what 2038 might look like. But I can describe what I'd like it to look like.

STRATEGIC U.S. GOALS IN SPACE FOR THE NEXT 40 YEARS

The committee has asked, "What should be the strategic goals of the U.S. in space for the next forty years?" I think that there are four overarching goals. (1) Foster a commercial space industry. (2) Explore the Solar System. (3) Settle the Solar System. (4) Explore the Universe.

For the first time, there now exists a nascent commercial launch services industry. It came slowly into existence during the last part of the 1990s, and it came into existence primarily because, for the first time, NASA didn't try to strangle this new industry in its cradle. The foremost thing a medical doctor learns is "First, do no harm." This prime principle of medicine should also become the foremost policy of the Federal Government with respect to the newborn commercial launch industry.

Exploration of the Solar System will be done by robots and by humans. In the case of robots, these missions will be primarily scientific, and could be pursued by the Government, or by academia, or both. Commercial data purchase is one method that either or both could pursue as a means to achieve their exploration goals, and at the same time save money, and again at the same time help to foster a commercial space sector.

Exploration by humans will probably be confined to the inner Solar System over the next forty years—i.e., Luna, Mars, and the small bodies (asteroids). These explorations will also be primarily scientific, certainly so in the case of Mars, but in the case of Luna and the asteroids, one can easily see economic rationales. There are thus business cases that can be made and that will be pursued.

Settlement of the Solar System may begin with Luna. There's lunar water ice at both poles, making settlements and outposts on Luna tremendously easier to accomplish than might have been otherwise. Lunar water ice, in a phrase, changes everything. One might even speak of a lunar "Cold Rush."

The exploration of the Universe is primarily a scientific one, using space-based astronomy facilities. Such work, of course, is done to "do" science, but a lot of this science will begin to lay the ground work for the first robotic missions to the near stars, possibly in the 22nd Century.

THE SINGLE ISSUE THAT MUST BE ADDRESSED

But before any of the above can be attempted, much less accomplished, there must be Cheap Access to Space. You need to be able to get to low Earth orbit ("LEO") easily, frequently, reliably, and cheaply. There is no inherent technical barrier to the creation of such a capability—"only" engineering development need occur for cheap, easy to operate, robust access to low Earth orbit to become available.

And as has been pointed out, once you're in LEO, in terms of energy, you're halfway to anywhere else in the Solar System.

ROLES OF THE FEDERAL GOVERNMENT

The second issue the Subcommittee wished addressed is "What are the appropriate roles of the federal government in pursuing those goals?" I would argue that there are four roles for the Federal Government. The first appropriate role is to support and encourage science, both directly funding it as well as

helping to encourage and underwrite its accomplishment by the private sector and academia. This also applies to exploration activity, both human and robot. The Government ought to help academia and the private sector explore, through underwriting, partnerships, tax credits, and other such mechanisms. In some rare cases, the Government itself might also mount its own explorations. These were the patterns and methods of exploration employed by Spain and England in the 1500s and 1600s, as well as by the United States in the 1800s.

The second appropriate role of the Federal Government in my opinion is to foster long-term, high-risk technology development. The Federal Government should strongly invest in next generation technology, including experimental reusable launch vehicles and military demonstration hardware.

The third activity that I feel is appropriate for the Federal Government to pursue is that of the use of space for the defense of the United States.

Finally, the Federal Government has, I believe, an important, if not critical, role in the encouragement and incentivization of the growth of the nascent entrepreneurial commercial launch industry.

SHORT TERM POLICIES TO ACCOMPLISH THESE GOALS

"What policies and priorities should Congress and the Administration be putting in place in the near term to begin the transition to the future?"

Here are a few of the possible options I think would go a long way in the short term for encouraging and incentivizing the growth of our emerging commercial launch industry.

NASA and the Air Force should procure all launch services via competitive bids that are truly open to all companies, not just the largest defense contractors. These "fly before buy" launch service contracts must not develop new launch vehicles; instead, they should be structured like the Air Mail "service" contracts of the 1930s to encourage private investment. During the next forty years NASA should transition totally out of operating space launch vehicles, or of on-orbit support infrastructure.

Space science data should be purchased by NASA in order to help to support science and the development of a commercial space sector. Resupply and support of the International Space Station should be provided commercially by the private sector, so as to also help support the development of a commercial space sector. The International Space Station should also be commercially operated.

In parallel, Congress can also pass legislation providing incentives to the commercial space transportation sector. One possibility is investment tax credits to incentivize the creation of launch service providers. Such credits ought to be able to be traded. Other possibilities include interest write-offs, leg-islated market incentives like "air-mail," and regulatory improvements. All of these incentives can help give birth to a thriving commercial launch industry modeled after today's aviation industry. The one thing we must not do is create a monopoly where a single company controls the ability to launch critical commercial and military assets into space. Guaranteeing government loans or market share for a single company would be catastrophic to the emerging commercial industry.

In the future tax credits may also be an appropriate mechanism for helping to encourage long term goals, such as Lunar missions and settlement.

A third policy thrust should be to robustly invest in the experimental technology and

military demonstration hardware that supports truly low cost space launch vehicles. No technology investment is required for expendable launch vehicles, as the commercial sector is well positioned to develop such vehicles today. Instead, the government should be investing in the longer term, higher risk reusable launch vehicle technologies that promise to reduce launch costs by two orders of magnitude.

Mr. Goldin at NASA has already done a good job with his early investments in experimental vehicles, but it's just the first step. NASA's early, but underfunded plan to fly many "Future-X" experimental vehicles is an excellent blueprint for the future. In the past, Mr. Goldin has shared his vision of "blackening the sky with X-vehicles"—not prototypes or commercial vehicles, but pure experimental demonstrators. If we truly want low cost launch vehicles, it will require the flight of many experimental vehicles built by many different companies.

The policy goal of flying X-vehicles for technology demonstrations should become the basic way that the government (and NASA) should approach technology development. Build 'em, fly 'em, and break 'em—both by intent and accident, this approach has led to today's thriving commercial aviation industry.

In coordination with NASA, DoD should also be investing in their own experimental vehicles and early military demonstration hardware. Either the Air Force or the Navy should develop a Military Spaceplane capability that supports global reach and the ability to defend U.S. interests "anywhere, anytime," with dramatically smaller force structures than exist today. Blue ribbon panel after blue ribbon panel has advocated the need for such technology investments starting with General Moorman's Space Launch Modernization Panel in 1994. Most recently, the Defense Science Board is recommending an ongoing investment in the Space Maneuver Vehicle flight tested at Holloman AFB just last month.

Finally, while institutional changes are not necessarily required at NASA, the mindset must change. NASA should be the leading advocate of change and the transition to a primarily commercial space industry. Nonetheless, the real change is up to Congress. NASA, the Administration, and Congress must decide to place funding and budget priorities on the side of change. The Government should be investing in technology, experimental vehicles, and military hardware for the defense of the country.

2038: FREE PEOPLE IN FREE SPACE

The United States is at a seminal point in our transition to a commercial space industry. If we choose to encourage and incentivize the move towards a commercially based space industry we can accelerate and fundamentally enable America's move into space. We did this once before when America invested in the technology of commercial aviation, and it paid handsome dividends. Now it's time to build the same bridge to the future of commercial space.

Thank you, Mr. Chairman, for this opportunity to present USL's views. I would be pleased to answer any questions you or any other Members might have.

The SPEAKER pro tempore. Under a previous order of the House, the gentleman from Florida (Mr. HASTINGS) is recognized for 5 minutes.

(Mr. HASTINGS of Florida addressed the House. His remarks will appear hereafter in the Extensions of Remarks.)