

35. National Aeronautics and Space Administration

Congress should phase out the National Aeronautics and Space Administration (NASA). To that end, it should

- upon completion, sell off the international space station to private parties or, failing that, allow an owner-chartered station authority, *not* including NASA as the U.S. representative, to provide minimal station supervision;
- allow the private sector to provide and pay for all future travel to and from the station as well as station operations, maintenance, and expansion;
- sell off the space shuttle or, failing that, strictly enforce the ban on the shuttle's carrying cargoes that can be launched by the private sector and turn over as much of shuttle operations as possible to the private sector;
- bar NASA from developing hardware, products, or services with potential commercial uses; and
- build down government civilian space activities.

From Exploration to Freight Hauling

Sending Ohio's Sen. John Glenn, who in 1962 became the first American in orbit, back into space on the shuttle in 1998 was NASA's version of bread and circuses. But that sentimental journey begged the question, "Why, 35 years after Glenn's first trip, are there no regularly scheduled commercial flights into orbit?" The Wright Brothers' first flight was in 1903; in 1927 Charles Lindbergh flew across the Atlantic; and by the late 1930s the first commercially viable aircraft, the DC-3, was up and flying.

NASA has publicized as “faster, better, cheaper” such missions as the \$150 million *Pathfinder* that landed on Mars and the \$154 million Mars Surveyor Orbiter. Those missions have yielded important scientific returns. But NASA could not mask its embarrassment when the \$125 million Mars Climate Orbiter was lost after reaching the Red Planet because technicians neglected to convert crucial numbers from English to metric units.

And in any case, such crumbs thrown to scientists divert attention from the fact that NASA hinders the advance of space science and commercial space development as surely as economic planning in communist countries undermined prosperity.

The space program and NASA were born of the Cold War race with the Soviet Union. In the late 1950s many Americans believed that only governments could undertake such endeavors. The lunar landings will forever be celebrated as great human and technological achievements. Yet today NASA is wasteful and inefficient, squandering the public’s goodwill and \$13.5 billion annually. While the government has a legitimate defense role in space, commercial ventures, and most scientific research and exploration, ideally should be left to the private sector.

Astronomical Costs

In the early 1970s, with Moon landings curtailed and Moon bases ruled out, NASA sought to preserve its big budgets and staffs with another big project: the space shuttle, which was sold to policymakers as reusable and thus cheaper than expendable launch vehicles for putting payloads into orbit. In effect, NASA’s mission went from science and exploration to freight hauling.

If at that time NASA had begun to turn over space activities to the private sector, space stations and Moon bases might be a reality today. Market competition usually brings down the real price of goods and services. For example, since 1978 the price of airline travel in constant dollars has been cut by at least 30 percent. Shipping costs for oil have dropped by 75 percent. And in the communications satellite industry, the one space activity principally in private hands, costs have dropped dramatically in real terms.

By contrast, as nearly as can be determined from impenetrable NASA accounting, the cost of putting payloads into orbit has skyrocketed. David Gump in *Space Enterprise* estimated that the cost, in constant dollars, went from \$3,800 per pound with *Apollo* to \$6,000 with the shuttle. Alex

Roland of Duke University estimated that the cost of a shuttle flight, including development and capital costs, is not the \$350 million claimed by NASA but as much as \$2 billion, or some \$35,000 per pound of payload.

As NASA developed and flew early shuttle missions, it had to fend off private competitors. In the late 1970s and early 1980s federal agencies were forbidden to contract with the infant private launch industry to put government payloads into orbit.

As it became apparent in the early 1980s that the shuttle was a costly white elephant, NASA needed a mission to justify the shuttle's continued existence. Regardless of any commercial or scientific benefits, an orbiting space station seemed to serve that purpose. But the cost of the station, which was suppose to be up and running in the early 1990s, went from a promised \$8 billion to nearly \$40 billion before a 1993 stripped-down \$30 billion redesign. A recent General Accounting Office report found that, through June 2002, the actual cost of designing, building, and launching the station will be \$48.2 billion. The cost of operating the station, after its assembly, through 2012 will add another \$45.7 billion to the price tag for a total bill of \$93.9 billion.

As station costs soared, NASA continued to ignore the private sector. For example, Space Industries of Houston in the 1980s offered to launch for \$750 million a ministation that could take government and other payloads a decade before the planned NASA station could. The government would not contract with that private supplier.

A Tale of Two Stations

After the fall of the Soviet Union, NASA decided that a good way to continue the station project would be to make it a truly international effort. One NASA justification for the now-named International Space Station (ISS) is that it fosters international friendship and cooperation with Russia. Russia was supposed to share costs and provide hardware for the station. But that country's participation is driving costs up. The United States will spend at least \$1 billion to cover Russia's expenses. Further, NASA has had to reschedule launches because Russia has been behind schedule in providing its components, with which there have been serious quality control problems. After years of delays and cost overruns, NASA and Russia each has finally launched the modules that will form the core of the completed station.

Problems with the ISS contrast with significant developments with Russia's 15-year-old *Mir* space station, which has been plagued with

problems. Russia was planning to scuttle *Mir* when a private company came to the rescue. MirCorp is about 40 percent owned by private Western investors and 60 percent owned by the mostly privatized Russian company Energia. MirCorp is supplying money to make the station into a fully private operation that will offer services such as in-orbit advertising, satellite construction and repair, scientific experiments, and Internet and television facilities. MirCorp footed the bill for the first privately funded manned space flight—a resupply mission to *Mir*. Most exciting for the general public is the prospect of space tourism. American Dennis Tito plans to be the first paying private passenger to travel in space. Further, Mark Burnett, producer of the hit TV show *Survivor*, has an agreement with MirCorp to allow 16 contestants to train and compete at Russia’s Star City; the winner will go on a 10-day mission to *Mir*.

Unfortunately, MirCorp has not been able so far to come up with enough money to keep the station up for the next few years until it can become truly self-financing. Further, NASA claims that if Energia continues to provide services to *Mir*, Energia will not have enough resources to meet commitments to the ISS. But Energia does have sufficient resources. In point of fact, behind the scenes NASA has been pressuring Energia to abandon *Mir*, threatening to cut Energia out of the ISS contract, because NASA fears the example of a private *Mir* competing successfully with a government ISS. Thus the Russians’ regrettable commitment to the ISS has meant that they might have to turn their backs on paying customers. The Russians have tentatively announced that they will deorbit *Mir*.

The lesson of the two space stations is that private money and the prospects of profit are far better motivators than is government management.

Rough Road to Mars

Some NASA defenders argue that only governments can sponsor scientific space ventures that promise no profit for decades, if ever. But indicative of NASA’s inability to prioritize its activities or hold down costs has been the planning of a manned mission to Mars. In 1991 President Bush announced the goal of placing humans on the Red Planet by 2019. Such a mission would bring unparalleled scientific returns. But NASA’s “90 Day Report” put the mission’s price at a staggering \$450 billion, effectively killing the idea.

Sensing that a less costly mission was possible, then—Martin Marietta engineer Robert Zubrin and other scientists devised what they called a Mars Direct approach that would use existing technology and dispense with

the space stations, Moon bases, and NASA's other expensive infrastructure. Zubrin saw that, instead of carrying return fuel to Mars, an unmanned ship could land first with a simple chemical laboratory to manufacture methane and oxygen (i.e., rocket fuel) from Mars's carbon dioxide atmosphere.

NASA put the cost of Zubrin's approach at between \$20 billion and \$30 billion, some 95 percent less than the government approach. Yet NASA continues to squander its \$13.5 billion annual budget on a space shuttle and a station that contribute little new, useful knowledge. That agency could mount two or three manned Mars missions for the cost of the space station.

Commercial Space Activities

A private commercial space sector, involving principally satellites, has been growing in recent decades. The Satellite Industry Association estimates that worldwide satellite industry revenues were \$83 billion in 2000, up from \$69 billion in 1999, with the American portion currently valued at \$37.5 billion. SIA estimates that there are 253,600 jobs in that industry worldwide, up from 205,400 in 1999, with 136,500 Americans employed. The International Space Business Council puts current industry revenues even higher, at \$96 billion in 2000.

The communications and information revolution has created an insatiable industry appetite for inexpensive bandwidth, which can be provided by satellites. But recent business failures have scared off investors and thus lowered projected industry growth figures. For example, Motorola's Iridium project placed 66 satellites in low Earth orbit to provide telephone service between any two points on Earth. But that system could not compete with cell phones.

Lockheed-Martin in the past decade has successfully commercialized its Atlas rocket launch services. It used to sell nearly all of its services to the government; now as many as two-thirds of its customers are private parties. It has held costs down and has had a yearlong backlog of orders for launches. Further, Boeing, which builds and launches the Delta rocket, is also competing for cargo and providing private-sector services.

A number of smaller companies also are trying to enter the launch market. Rotary Rocket rolled out a prototype of a planned fully reusable rocket in 1999, but problems have caused a suspension of activities. Astronaut Buzz Aldrin, the lunar module pilot on the first Moon landing, has developed what he hopes will be a totally reusable craft. Aldrin

also is a major advocate of space tourism and commercialization. Kistler Aerospace Corp., using refurbished Russian rocket engines, plans to soon launch what it hopes will be a cost-effective cargo rocket.

NASA, unfortunately, is still involved in developing new vehicles, despite private-sector efforts and a growing sentiment that NASA should restrict itself to purchasing data and services, not hardware. For example, NASA has joint ventures with Lockheed-Martin, Orbital Sciences, and Boeing to produce new launch vehicles: the X-33, the X-34, and the X-37 VentureStars, respectively. NASA was supposed to pay only for development of technology, with those companies deciding whether to build and operate the crafts. But those vehicles have experienced serious problems and delays. NASA requested an extra \$4 billion for those projects in 2001. Congress rejected the request. Such subsidies continue to take a toll. Beal Aerospace recently dropped plans for a geostationary satellite launcher because of NASA-financed rockets.

Privatize the International Space Station

Construction costs for the ISS are pegged at some \$50 billion, with the station costing taxpayers at least another \$2 billion to operate annually. In addition to these high costs, there are two other major problems with the station.

First, there is no prospect of any profitable commercial venture coming from NASA's operation of the station, since no customers could pay the actual costs of renting space on the station. NASA will have to give away space at a loss. This is not to say that commercial use cannot be made of the station. For example, the American company Spacehab and Russia's Energia plan to build a commercial module to be attached to the Russian part of the station to provide TV and Internet broadcasting. And Boeing and Russia's Khrunichev State Research Production and Space Center also want to build a module to provide commercial and station services. The problem is that NASA has no incentive to operate or experience in operating an economically viable enterprise and likely will mismanage it to the detriment of commercial ventures.

A special presidential advisory commission, chaired by Martin Marietta's CEO Norman Augustine, stated the second problem in 1991: "We do not believe that the space station . . . can be justified solely on the basis of the (non-biological) science it can perform, much of which can be conducted on Earth or by unmanned robots." Building a \$50 billion station to handle scientific experiments valued in only hundreds of millions

of dollars is like insisting on a chauffeur-driven limousine to go to the corner store for milk.

Since construction has already begun, it is unlikely that political leaders will have the will to scrap the station. A second-best option would be to sell the station to private purchasers upon completion and allow the private sector to provide and pay for all future travel to and from the station as well as station operations, maintenance, and expansion.

The station will have to be sold at a loss, but at least taxpayers will not continue to lose money on its operation. With unsubsidized private management, a real market, based on the actual costs for private launchers to transport payloads and technicians to the station, will develop. The prices for use of the station will change with real costs. Thus, for example, the price of space on the station may start low, but, as launch costs come down, greater demand for space will cause its value and price to rise. Most important, station policy will not be determined by politics or bureaucratic power.

Rick Tumlinson, president of the Space Frontier Foundation, suggests a variation of that approach. While still involving government funding, his Alpha Town approach contains elements to help create markets in space. The station's owners (i.e., the countries that are participating) would create a station authority, similar to a port authority. NASA would *not* be the U.S. government's representative on the authority though it could be a customer or tenant on the station. That authority initially would provide infrastructure, safety, utilities, and a regime that would allow private parties to run commercial operations on the station. The private sector could take over even those functions at some point. The authority would *not* be allowed to finance any station business operations, to expand into unrelated businesses, or to own any stock in station contractors. Those restrictions also would apply to NASA itself. In addition to commercial activities, the private sector would provide and pay for all future travel to and from the station, station operations, maintenance, and expansion.

Another provision of the Alpha Town approach would force NASA to sell off rather than scrap unused assets. For example, each shuttle flies 98 percent of the way to orbit with an external fuel tank the size of a 17-story building. Once the nontoxic liquid oxygen and hydrogen from those tanks burn off, the tanks are dropped into the ocean. If they were placed in orbit, with some 100 shuttle flights to date, there would be 100 platforms—with nearly 30 acres of interior space, about the size of the Pentagon—waiting to be sealed and “homesteaded” by private owners

for scientific experiments, space hotels, or any other activity of which an entrepreneur could conceive. But NASA currently has no incentive to create competition for its own space station by placing those tanks in orbit for private use.

Those approaches to privatization are similar to the approach used to privatize assets in formerly communist countries. Putting assets in private hands best guarantees their profitable use. Thus, future expansion of the station would occur only in response to market demands rather than bureaucratic dictates and would be paid for by customers, not taxpayers. If done right, such privatization would help to create a true market for space services.

Sell Off the Space Shuttle

Without a space station to build, there will be little reason to keep the overpriced shuttle in operation.

The Clinton administration announced a “privatization” of the shuttle in 1995, but what was actually meant was that the operation of the shuttle would be contracted out to a single private company at some set rate per flight. United Space Alliance operates seven shuttle flights a year for a price of around \$400 million per flight. Evidence suggests that this approach has held down costs and improved safety and efficiency.

But that approach is not true privatization, and not only because the American taxpayer continues to foot the bill. To begin with, United Space Alliance, for political reasons, is prevented from cutting staff to more reasonable levels.

In addition, when companies offering private launch services do compete vigorously with NASA for customers or complain about NASA’s neglect of the restriction on carrying on the shuttle cargo that could be launched on private rockets, NASA lets the companies know that their efforts are not appreciated. Those companies must take that into account because NASA still contracts out some of its launches to those companies, and they do not want to lose those and future contracts.

Finally, NASA has never charged private companies wishing to send payloads into orbit via the shuttle the real costs of the service. Such costs would include development costs as well as the operating costs for particular launches. Charges based on real costs would price the shuttle out of the market.

In coming years shuttle flights will be heavily dedicated to station construction. The shuttle should be allowed to fly already scheduled scien-

tific missions but barred from taking on new missions, and the ban on the shuttle's carrying cargoes that can be launched by the private sector should be strictly enforced. And NASA should not be allowed to dream up missions that must use the shuttle as a way to avoid the ban.

Such a reform could be a boon to the private launch companies. Those companies could have an incentive to build additional launch capacity to clear up launch backlogs; that would more than offset their costs. They then would have an incentive to cut launch costs to ensure continuing use of capacity, which in turn could allow entrepreneurs who were previously unable to meet high launch costs to take advantage of cheap access to space.

In addition, as much of the shuttle operations as possible should be turned over to the private sector. Perhaps NASA could allow the private operator of the shuttle to sell launch services to customers. United Space Alliance could seek paying customers and could "rent" the shuttle from NASA for such profit-making ventures. Since United Space Alliance would have to put some of its own money at risk, it would have an incentive to reduce the real costs of a shuttle flight.

That approach or some variation of it could help to ensure that the life spans of the shuttles were determined more by economic than by political considerations.

Build Down Government Civilian Space Activities

In general, all activities on the "near frontier" (the Earth-Moon system) should be turned over as soon as possible to the private sector. NASA should be restricted to the "far frontier" (everything else).

In 1998 Congress passed the Commercial Space Act that required NASA to begin contracting out whenever possible for services and even data. The act also repealed a ban on private parties' bringing vehicles, payloads, and even people back to Earth from space, changes essential for many future commercial space ventures.

There were four major legislative proposals before the 106th Congress to promote commercial space activities. The Space Investment Act (H.R. 2289), introduced by Rep. David Weldon (R-Fla.) and Sen. Bob Graham (D-Fla.), would allow tax-exempt bonds to be issued to finance the construction of spaceports for launches, the same way such bonds are used to finance airports. The Space Transportation Investment Act (H.R. 4676), introduced by Rep. Merrill Cook (R-Utah), would provide tax credits for space launch vehicle companies. The Commercial Space Transportation Cost Reduction Act (S. 469), introduced by Sen. John Breaux (D-La.),

would provide loan guarantees for companies offering certain space services. Those three proposals are meant to provide incentives for companies investing in risky space ventures that might pay off only in the long term, if at all. Those perhaps well-intentioned approaches are, in effect, forms of national industrial policy, though without actual government cash handouts.

A fourth proposal, the Zero Gravity, Zero Tax Act (H.R. 3898), introduced by Rep. Dana Rohrabacher (R-Calif.), would exempt from taxes many space activities. This approach is likened to leaving Internet commerce untaxed as a means of ensuring that a new realm of commerce not be crushed in its infancy by the heavy hand of government. This approach would be preferable to targeted government assistance.

But the most important way to help the commercial space sector is to continue to push NASA out of activities that can be provided privately, restricting the agency as much as possible to its original mission of exploration and science until the agency can be phased out. To that end, Congress, in legislation or oversight and enforcement of current laws, should do the following things.

Bar NASA from Building and Operating Launch Vehicles and Require All Other Nondefense Launches and All Nonemergency Defense Launches to Be Purchased from the Private Sector

Even as a market for private-sector launch services grows, NASA is still addicted to developing expensive hardware, like the problem-plagued X-series vehicles, while spending very small amounts on actual science. In addition to being barred from carrying shuttle cargoes that can be privately launched, NASA and all other government agencies should be required to contract out all launches.

The Pentagon ought not to be exempt from the push to privatize. The Defense Department clearly should continue to own and control intercontinental ballistic missiles that might need to be launched at a moment's notice. But many defense functions, such as remote sensing with satellites that require launch services, are planned years in advance. There is no reason why launches for such systems could not be secured from the private sector. The U.S. government should not be in competition with the private sector in those services any more than it should be competing in trucking or air travel.

Enforce the Commercial Space Act Requirement That NASA Acquire Scientific Data from Private Firms

Far more valuable from a scientific perspective than the space station and shuttle have been the planetary probes overseen by the Jet Propulsion

Laboratory in California, which is under NASA but has considerable independence. Although costs for the probes are not as high as those for the shuttle or the station, the arrangement is still wasteful and politicized. For example, 60 percent of the support contracts that the laboratory issues to the private sector are reserved for minority contractors.

Rather than build their own probes, even if they are carried into space by private launchers, the Jet Propulsion Laboratory and other NASA or government agencies should allow scientists to purchase data from the private sector. In effect, as part of a build-down of NASA, government science agencies would set a price for certain data and allow private-sector providers to compete with one another to acquire the data in a cost-effective manner that would allow them to make a profit.

That approach was considered for one of the toughest possible projects. In 1987–88 an interagency U.S. government working group considered the feasibility of offering a one-time prize and a promise to rent to any private group that could deliver a permanent manned Moon base. When asked if such a station was realistic, private-sector representatives answered yes, but only if NASA stayed out of the way and did not force the private providers to use the shuttle or the proposed station. Needless to say, that approach never bore any fruit. It has been revived by Zubrin, who suggests that offering a \$20 billion prize might be the best way to fund a manned mission to Mars.

Eliminate "Mission to Planet Earth," or Turn It Over to Other Government Agencies and Contract with Private Providers for All Data Services

NASA in recent years has seen environmental projects as potential cash cows. It has fought with other agencies—through its Mission to Planet Earth, a project to study Earth's ecology—for jurisdiction over satellites to monitor the environment. Typical of its tactics, in February 1992 NASA made screaming headlines with its announcement that a huge ozone hole could be in the process of opening over the Northern Hemisphere. In fine print, the data were skimpy at best. Still, the agency got the politically correct headlines as well as funding. There were few headlines months later when no ozone hole developed.

The mission itself is of questionable value. It seems to be aimed at selectively acquiring data to push politically correct agendas. Even if the mission is not shut down, it does not belong in NASA's portfolio. Some other department should direct the project. And if the government needs data, it should take bids from the private sector to provide those data.

Conclusion

NASA administrator Daniel Goldin has struggled to bring greater efficiency to his agency and find innovative ways to overcome bureaucratic inertia. But he is like the former Soviet Union's Mikhail Gorbachev, trying to save his failed system by introducing limited market reforms when what is really needed is a real free market.

People who believe that mankind has a future in space should think deeply and seriously about how to ease the government out of civilian space activities. Only by approaching this challenge with the same honesty and clarity of mind that were needed to put men on the Moon can Mars and other future goals be attained.

Suggested Readings

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