

# Government Funding for NASA Should Not Be Reduced Yet

By Michael McBrien

The United States government is in huge debt and is adding to that every year with the deficit, which has prompted many to push for a more balanced budget. This raises the question: should revenue be increased or spending reduced? It seems that the answer is a little bit of both. Surely, this has its advantages and drawbacks, and it is very important to consider where these cuts have been made. Most of the reduced spending has come from programmatic cuts [1]. This means that funding for different government programs has been reevaluated and many programs have experienced a decrease in support. The National Aeronautics and Space Administration, NASA, is one of the programs that the government has decided it cannot continue to finance at its current rates, and the money being put into NASA has been cut back. This is definitely not a smart place to make spending cuts and, at least for the near future, this trend of lessened government support needs to be reversed. By using budget cuts as a possible solution to the massive deficit, many important programs have seen huge chunks cut out of their funds, and NASA is one of those programs. NASA's budget continues to be reduced from almost \$18.5 billion in 2011 to \$17.8 billion in 2012, with potentially increased cuts in 2013 [2]. Evidently, the United States government does not think that NASA is worth more than about 0.4% of the federal budget. In light of these recent cuts, world-renowned physicist Michio Kaku has said:

Back in 2004, President George W. Bush laid out an ambition plan. The space shuttle was to be phased out this year, and five years later the replacement for the space shuttle (the Ares system) would be fully functional and operational. Then, by 2020, the plan was to establish a permanent human presence on the moon, and after that maybe even the planet Mars. Forget about it - everything is out the window! [3]

The government has decided to slash funding for many of NASA's projects in an attempt to cut back on the deficit and ultimately boost the economy. They claim they need every penny they can get in these rough times. The economy is doing poorly, and government money is better spent elsewhere, and apparently they feel that government money would be better spent outside of programs like NASA. However, there are many sources that directly counter this opinion, claiming that NASA is an investment to stimulate the economy, and not just money being "shot into space". The cost of NASA, as is true of almost any government agency, is worth it, because it can benefit the economy directly through the purchase of goods and creation of jobs, and indirectly by inspiring people in industries that spawn from invented technologies or materials. Many companies have gone on to be very successful private businesses after working with materials invented by NASA. The Tempur-Pedic mattress company got its start when NASA scientists wanted to provide comfortable seating for pilots that needed to remain in one position for a long time. Umqua is a water purification company that began with NASA, and has continued to be successful in the private marketplace [4]. There are many cases like these in which niches have been created for companies due to progress made at NASA.

Cutting spending to NASA also harms the economy because it cuts jobs. The recent retiring of the space shuttle has been estimated to have cut over 4,600 jobs [5]. Indeed, many attempts have been made to directly measure the affect NASA has had on the economy, but ultimately none

have been very successful in finding a conclusive answer. Undoubtedly, NASA's promotion has obvious benefits, such as the improvements it makes to the telecommunications industry, but it is very difficult and costly to distinguish what effects NASA has had on any part of the economy, and much more difficult to determine its effects on the economy as a whole [4]. However, some "estimated ratios of revenue generated compared to spending have been as high as 14-to-1" [5] for NASA. This indicates a very high return on the money spent by the government on NASA, but many dismiss these ratios as very generous. There have been more conservative results that are closer to 3-to-1 or 2-to-1 [5]. Even if these conservative estimates can be believed, it still means that NASA ultimately provides more money to the economy than the government spends on it. Other estimates have been made, and the conclusion has been widely drawn that based on "the mission success of the life sciences effort and ample evidence of other social benefits... it can be concluded that NASA Life Sciences investments have more than 'paid for themselves'" [5]. While all of the studies don't agree on the exact numbers, all of these studies do agree that NASA is a generally good investment for the US government. Therefore, the argument that NASA funding should be cut because of the tough economy is not one that can be supported with any substantial evidence.

These advances were all made in the past, and looking forward it might not be as easy to determine how NASA can help the economy. NASA is often tasked with extremely difficult challenges and they often succeed. Who could have guessed 50 years ago that today our country would have hundreds of man-made satellites in orbit around the Earth? [6] Many of the devices we use every day require these satellites to operate, including cell phones, GPS systems, satellite television, and weather satellites. They all rely on advances NASA made years ago. In the past, it was not known that NASA would contribute so much to society, so how can one claim that NASA will not provide even more advances in the science and technology fields that will greatly alter the economy for the better? The truth is that NASA pushes boundaries. While it appears that NASA does contribute positively to the economy, the point of NASA is not to make money for the economy. Therefore, "for a mission-focused organization like NASA, which isn't making a play for profits, any ratio of economic benefits versus spending that exceeds 1-to-1 is a success" [5]. NASA serves many other purposes which are reason enough to continue to fund it at a steady, if not increasing, level. One extremely important reason NASA must continue to be funded is defense. More specifically, defense of the entire planet and the human species as a whole from extraterrestrial threats. Asteroids can be as big as football stadiums and travel more than ten times the speed of a bullet, and they pose a serious risk to life on Earth. It is widely believed that an asteroid caused the mass extinction of the dinosaurs 65 million years ago. This asteroid, known as the Chicxulub asteroid, is thought to have been 10km in diameter and, upon impact, caused planet-wide fires and tsunamis, subsequently ending most life on Earth [7]. Asteroids of this magnitude obviously do not strike Earth very often, but smaller asteroids do pose a threat. Asteroids over 10m in diameter are not terribly frequent but can punch through the atmosphere and strike the ground causing an explosion [8]. Due to the huge surface area of the Earth and the relatively tiny surface area people have covered, the chances of an injury being caused by such an asteroid are still quite small. The Tunguska asteroid in June of 1908 was about 50 meters in diameter and struck in an isolated region of Siberia. The impact caused devastation in a region about 70km by 50km and people were reportedly knocked off their feet at distances of 60km away from the impact [7]. Nobody was harmed in this particular incident, but if an impact of this magnitude were to occur today in a populated region, the effects could be tragic.

With asteroids of this size, the damage depends on where they strike. However, asteroids over 100m in diameter can be expected to kill a hundred thousand to a million people if they strike the Earth. These casualties can be caused by the impact itself and the massive explosion that would ensue, or by the effects of tsunamis created if the asteroid strikes an ocean. If an asteroid bigger than one kilometer in diameter struck the Earth, it could cause over a billion deaths. Debris thrown up from the impact and the possible fires caused could block out sunlight and change the global climate. This could lead to worldwide crop failures and widespread starvation. Incredibly, asteroids of this size strike the Earth about once every million years on average [8], however, this is averaged over a very long period of time, and there is no way to know what can be expected in the near future, at least not yet.

In 1991 after studies related to asteroids were released, "the U.S. Congress directed NASA to conduct workshops on how potentially threatening asteroids could be detected, and how they could be deflected or destroyed" and later in 1994 " the House Committee on Science and Technology directed NASA...to identify and catalogue within 10 years the orbital characteristics of 90% of all comets and asteroids larger than 1 km and in orbits that cross the orbit of Earth" [9].

Congress finally realized the importance of the defense of the planet against asteroids and asked NASA to take action. This was continued even further in 2005 when Congress tasked NASA with " detecting 90% of near-Earth objects with a size greater than 140 meters in diameter by 2020"[9]. NASA was to attempt to find most of the dangerous asteroids that had a chance of hitting the Earth. In response to these challenges, several programs were started including the Lincoln Near Earth Asteroid Research (LINEAR) and the Lowell Near Earth Object Search (LONEOS), among others, to map all Near Earth Objects (NEOs) . They have made progress but have not catalogued all of the 1 km and larger NEOs ,let alone the still-very-dangerous greater-than-140m asteroids [9]. Congress has told NASA that they should be mapping these imminent dangers, at least the ones that pose a serious risk to humans, yet funding is still being cut year after year. The plans for NASA's funding are approximated at just under 18 billion dollars for 2012 and potentially the same for 2013 as well [2]. This is less than 18 billion dollars a year to learn about and defend against global threat. This is a race against time, and with more money there is a greater chance of predicting and preventing catastrophe. Yet there is still more money going into the defense of the United States from whatever threats there might be from other groups of people. In 2013 the plan is to spend 614 billion dollars on National Defense [2]. Every year the government spends more money in the Department of Defense than has been spent on NASA in its entire history. Everything NASA has ever produced, everything they have accomplished in 50 years - going to the moon multiple times, implementing the Hubble Telescope, placing many weather detection satellites into orbit, sending spacecraft to the far reaches of our solar system, landing a rover on Mars, and so much more - has been done with less money [10] than is spent on two years of defending United States citizens [2] from whatever threats are coming from other people and nations. If the new focus of NASA is directed towards finding and protecting us from asteroids, why is it not being given the resources required to do so? Is space defense really that much less important than any other defense? If there is such a desperate need for spending cuts in these upcoming years, the cuts should be made elsewhere in the enormous budget, and, at the very least, maintain the current level of funding for NASA, as they represent a vital part of the country's, as well as the world's, defense. This poses the

question of “What could NASA accomplish with more money?” With more funding, more telescopes and radar can be focused on locating and predicting the paths of asteroids that pose even a slight threat to the world. With more funding, essential employees can be trained to run these early-detection systems. This catalogue of determining threatening asteroids needs to be completed as soon as possible, and a system for detecting new threats needs to be developed. To potentially save lives on Earth, it is not enough to simply know where all these asteroids are and where they are headed. Asteroid 99942 Apophis is 325 meters in diameter and was found in 2004. When it was first discovered it was thought to have a significant probability of colliding with the Earth in 2029. This has since been ruled out, however there is a chance that when the asteroid does fly by in 2029 the Earth's gravity will change the orbit of the asteroid enough to cause an impact on the next pass in 2068[11]. This may not seem like a great threat, but there is a 2.3 in a million chance that our entire planet could be at risk. And if the asteroid had been on a collision course for 2029, it may have been too late for us to do anything about it. It is not enough to simply know about all the asteroids and their paths; further actions must be taken to prevent an impact. Right now there are not many feasible options for stopping an asteroid of that size from hurtling towards Earth. One of the problems involved in this are that the asteroids are so massive that it takes a lot of force and time to change their paths. Currently, the most promising strategy is something called the "gravity tractor." It works by flying a spacecraft near the asteroid and slowly moving away, drawing the asteroid towards it ever so slightly. Over a long period of time this could be enough to change the trajectory of the asteroid enough to avoid an impact with Earth. This method was created by NASA astronauts Ed Lu and Stan Love as part of a private foundation B612 [9]. Although this foundation is now private, its founders began at NASA, and they are just a piece of the network that NASA has been working with to help detect and conjure solutions to avoid an impact.

Eventually private corporations may be able to take over for NASA in space exploration and research, but the simple fact is that they are just not yet ready to do so. There is very little short term profit for companies looking to go into space, and until profits can be realized, NASA must provide help and incentive to get the ball rolling, and there may never be a profit incentive to prevent asteroids from striking the Earth. The defense of the country is not privatized, it is one of the most expensive government programs. Why should the defense of the country be public, yet the defense of the world be private? NASA plays a vital role in defending every person on the planet, and it is too early to begin cutting its funds.

Another reason that NASA needs to be sufficiently funded for the time being is much less concrete than defense, and even less concrete than the effect on the economy. The things that NASA has accomplished have inspired the accomplishments of others. The historic photo dubbed "Earth Rise" has been credited with being the spark for the entire environmental act. The picture was first published in January, 1969 and features the Earth, full of life and color, rising over a desolate lunar landscape [11]. It inspired people to think of the Earth as a whole, of all the life on Earth as one entity. In the following three years, a slew of world-wide organizations and programs were formed. The Comprehensive Clean Air Act was passed in 1970, Earth Day was created in 1970, the Environmental Protection Agency was formed in 1970, Doctors Without Borders was formed in 1971, the Clean Water Act was passed in 1971, in 1972 the Endangered Species Act was passed and unleaded gas became popular. Why did these things all happen at this time? There were wars going on in the world, so why did people take the time to think of the

Earth as a whole rather than only a setting for their individual countries? It is impossible to say with conviction, but it is hard to deny that the work of NASA played some part in inspiring all of these events. NASA has a profound effect on our culture that is immeasurable, and inspiring wonder is something that goes hand in hand with NASA. What do the biggest dreamers as kids say they want to be when they grow up? Astronauts. It is awe inspiring to be a part of anything that NASA does. The best and brightest students strive to be a part of the work that NASA's work, and when many of the best and brightest are gathered in one place amazing things have, and will continue to happen. These are things that are not measured in dollars or by the government, but they are massively important.

It may be true that one day the government will no longer need to put taxpayer money into space exploration and research, but that day has not come yet. NASA does not drain nearly as much money from the economy as it contributes, so the funding that goes to NASA is not all lost and should be viewed as an investment. This program is key to the defense of not only the country, but the planet and human race as a whole. Cutting funding for a vital defense program is simply unfounded when it receives so little funding compared to other programs in the first place, and due to other intangibles, it is impossible to measure the true value of NASA to our culture. So, until the right time comes to let the private sector take over, funding for NASA must at the very least remain constant, and realistically should be increased.