# NC

## 1 – CP

#### Counterplan: The United States federal government ought to increase funding for a public-private partnerships (p3) to test and refine space situational awareness (SSA) tech and small satellites, using tax credits.

#### The counterplan solves space debris and addresses the current lack of progress.

Long 19 ― George Long, Managing Member at Legal Parallax, B.A. in Political Science from Duke University, LL.M. in International Law from American University, LL.M. in Space, Cyber, and Telecommunications Law from the University of Nebraska, 2019. (“Monetizing Space Debris: Getting Tax Credits On Board”, *Space Traffic Management Conference*, February 27th, 2019, Available Online at: <https://commons.erau.edu/cgi/viewcontent.cgi?article=1262&context=stm>)

It is said that there is nothing harder to stop than an idea whose time has come. It cannot be disputed or denied that the time has now arrived for active harvesting of orbital debris to ensure the continual unfettered access to and the use, exploitation and exploration of outer space. The volume of space debris will not stagnate especially since there is no foreseeable decrease in the number of space launches which will traverse Earth’s gravity barrier and deploy new objects in orbit. While there has been marginal progress with mitigating the creation of new orbital debris arising from the decommissioning of satellites, much talk and little substantive action comprise the emerging legacy for extracting orbital debris. To date, it has been a governmental obligation to address the orbital debris problem which is consistent with the United States international obligations relating to the use and exploration of outer space. However, the lack of progress with the actual removal of orbital space debris demonstrates the importance of establishing a true public/private partnership with the sole focus on extracting orbital debris. This necessitates monetizing space debris extraction to attract the attention, energy and focus of prospective investors, startup firms and established actors in the space industry. As discussed and examined above, **tax credits** are one-means of monetizing the extraction of orbiting debris.

#### Tax credits motivate the private sector – solves case.

Long 19 ― George Long, Managing Member at Legal Parallax, B.A. in Political Science from Duke University, LL.M. in International Law from American University, LL.M. in Space, Cyber, and Telecommunications Law from the University of Nebraska, 2019. (“Monetizing Space Debris: Getting Tax Credits On Board”, *Space Traffic Management Conference*, February 27th, 2019, Available Online at: <https://commons.erau.edu/cgi/viewcontent.cgi?article=1262&context=stm>)

The dislike for taxation has a long history in the United States as it is one of the motivating basis for the country’s founding. Indeed, the slogan “[n]o taxation without representation” is embedded in the teaching of American history. Although taxation is now imposed by elected representatives, it seems taxation is assessed as a solution for many significant governmental undertaking for the common good. This view of taxation as the cure for a problem or to modify private sector behavior has surfaced in connection with orbital debris remediation. For instance, it has been suggested that the United States should levy a tax on satellite launches to generate revenue for governmental efforts to remove orbital debris or to mitigate the creation of new debris by modifying the behavior of private sector space actors.6 Since the use and exploration of space is a partnership between the government and the public sector, allocating some governmental financial resources to combat orbital debris is reasonable especially given NASA’s shrinking budgetary allotment.7 Imposing and collecting a tax on space actors, however, should not be the mechanism for or source of the government’s allocation of financial resources to address the problem. Assessing a tax on satellite launches should not be the source of governmental funding for orbital debris remediation. Instead, consideration should be focused on implementing tax credits as the potential source for the government’s financial contribution to remedying the orbital debris problem. Tax credits should not only serve to spur private sector investment associated with developing and, most importantly, implementing technology and procedures for removal and/or mitigation of space debris, but they are also consistent with the government’s obligation under the Space Resource Exploration and Utilization Act of 2015 (“Space Resource Act of 2015").8 Among other things, the Space Resource Act of 2015 mandates that the government: 1) facilitate commercial activities of U.S. citizens engaged in the exploration and recovery of space resources, and 2) discourage government barriers to American companies developing “economically viable, safe, and stable industries” for the exploration and recovery of space resources for commercial purposes.9 Tax credits associated with orbital debris remediation, therefore, can assist in satisfying an express governmental policy relating to the commercial use, exploration, and exploitation of outer space.

## 2 – DA

#### Strong commercial space catalyzes tech innovation – progress at the margins and spinoff tech change global information networks

Joshua Hampson 2017, Security Studies Fellow at the Niskanen Center, 1-25-2017, “The Future of Space Commercialization”, Niskanen Center, https://republicans-science.house.gov/sites/republicans.science.house.gov/files/documents/TheFutureofSpaceCommercializationFinal.pdf

Innovation is generally hard to predict; some new technologies seem to come out of nowhere and others only take off when paired with a new application. It is difficult to predict the future, but it is reasonable to expect that a growing space economy would open opportunities for technological and organizational innovation. In terms of technology, the difficult environment of outer space helps incentivize progress along the margins. Because each object launched into orbit costs a significant amount of money—at the moment between $27,000 and $43,000 per pound, though that will likely drop in the future —each 19 reduction in payload size saves money or means more can be launched. At the same time, the ability to fit more capability into a smaller satellite opens outer space to actors that previously were priced out of the market. This is one of the reasons why small, affordable satellites are increasingly pursued by companies or organizations that cannot afford to launch larger traditional satellites. These small 20 satellites also provide non-traditional launchers, such as engineering students or prototypers, the opportunity to learn about satellite production and test new technologies before working on a full-sized satellite. That expansion of developers, experimenters, and testers cannot but help increase innovation opportunities. Technological developments from outer space have been applied to terrestrial life since the earliest days of space exploration. The National Aeronautics and Space Administration (NASA) maintains a website that lists technologies that have spun off from such research projects. Lightweight 21 nanotubes, useful in protecting astronauts during space exploration, are now being tested for applications in emergency response gear and electrical insulation. The need for certainty about the resiliency of materials used in space led to the development of an analytics tool useful across a range of industries. Temper foam, the material used in memory-foam pillows, was developed for NASA for seat covers. As more companies pursue their own space goals, more innovations will likely come from the commercial sector. Outer space is not just a catalyst for technological development. Satellite constellations and their unique line-of-sight vantage point can provide new perspectives to old industries. Deploying satellites into low-Earth orbit, as Facebook wants to do, can connect large, previously-unreached swathes of 22 humanity to the Internet. Remote sensing technology could change how whole industries operate, such as crop monitoring, herd management, crisis response, and land evaluation, among others. 23 While satellites cannot provide all essential information for some of these industries, they can fill in some useful gaps and work as part of a wider system of tools. Space infrastructure, in helping to change how people connect and perceive Earth, could help spark innovations on the ground as well. These innovations, changes to global networks, and new opportunities could lead to wider economic growth.

#### Short innovation cycles mean every contract counts

John J. Klein 19, Senior Fellow and Strategist at Falcon Research Inc. and adjunct professor at the George Washington University Space Policy Institute, 1-15-2019, "Rethinking Requirements and Risk in the New Space Age," Center for a New American Security, https://www.cnas.org/publications/reports/rethinking-requirements-and-risk-in-the-new-space-age

Unfortunately, these variances in models between the MDAP’s lengthy development cycle and the commercial space sector’s 18-month innovation cycle are a result of stark differences in thinking about requirements and risk. Requirements and risk for MDAPs commonly focus on ensuring critical mission capabilities at a given cost. In contrast, the commercial space sector tends to focus more on providing innovation quickly using economies of scale. The commercial sector understands that time dynamically shapes decisions related to requirements and risk because of the relatively short innovation cycle. In a highly competitive space sector with tight profit margins, those unable to innovate quickly will likely be out of business soon. Alternatively, space systems with mission assurance requirements – where failures are detrimental to national security and military operations – often drive DoD’s timelines. Program managers of critical national security space systems commonly require additional time to test and verify that satellites can perform missions with a very low probability of failure.

#### Tech innovation solves every existential threat – cumulative extinction events outweigh the aff

Dylan **Matthews 18**. Co-founder of Vox, citing Nick Beckstead @ Rutgers University. 10-26-2018. "How to help people millions of years from now." Vox. https://www.vox.com/future-perfect/2018/10/26/18023366/far-future-effective-altruism-existential-risk-doing-good

If you care about improving human lives, you should overwhelmingly care about those quadrillions of lives rather than the comparatively small number of people alive today. The 7.6 billion people now living, after all, amount to less than 0.003 percent of the population that will live in the future. It’s reasonable to suggest that those quadrillions of future people have, accordingly, hundreds of thousands of times more moral weight than those of us living here today do. That’s the basic argument behind Nick Beckstead’s 2013 Rutgers philosophy dissertation, “On the overwhelming importance of shaping the far future.” It’s a glorious mindfuck of a thesis, not least because Beckstead shows very convincingly that this is a conclusion any plausible moral view would reach. It’s not just something that weird utilitarians have to deal with. And Beckstead, to his considerable credit, walks the walk on this. He works at the Open Philanthropy Project on grants relating to the far future and runs a charitable fund for donors who want to prioritize the far future. And arguments from him and others have turned “long-termism” into a very vibrant, important strand of the effective altruism community. But what does prioritizing the far future even mean? The most literal thing it could mean is preventing human extinction, to ensure that the species persists as long as possible. For the long-term-focused effective altruists I know, that typically means identifying concrete threats to humanity’s continued existence — like unfriendly artificial intelligence, or a pandemic, or global warming/out of control geoengineering — and engaging in activities to prevent that specific eventuality. But in a set of slides he made in 2013, Beckstead makes a compelling case that while that’s certainly part of what caring about the far future entails, approaches that address specific threats to humanity (which he calls “targeted” approaches to the far future) have to complement “broad” approaches, where instead of trying to predict what’s going to kill us all, you just generally try to keep civilization running as best it can, so that it is, as a whole, well-equipped to deal with potential extinction events in the future, not just in 2030 or 2040 but in 3500 or 95000 or even 37 million. In other words, caring about the far future doesn’t mean just paying attention to low-probability risks of total annihilation; it also means acting on pressing needs now. For example: We’re going to be better prepared to prevent extinction from AI or a supervirus or global warming if society as a whole makes a lot of scientific progress. And a significant bottleneck there is that the vast majority of humanity doesn’t get high-enough-quality education to engage in scientific research, if they want to, which reduces the odds that we have enough trained scientists to come up with the breakthroughs we need as a civilization to survive and thrive. So maybe one of the best things we can do for the far future is to improve school systems — here and now — to harness the group economist Raj Chetty calls “lost Einsteins” (potential innovators who are thwarted by poverty and inequality in rich countries) and, more importantly, the hundreds of millions of kids in developing countries dealing with even worse education systems than those in depressed communities in the rich world. What if living ethically for the far future means living ethically now? Beckstead mentions some other broad, or very broad, ideas (these are all his descriptions): Help make computers faster so that people everywhere can work more efficiently Change intellectual property law so that technological innovation can happen more quickly Advocate for open borders so that people from poorly governed countries can move to better-governed countries and be more productive Meta-research: improve incentives and norms in academic work to better advance human knowledge Improve education Advocate for political party X to make future people have values more like political party X ”If you look at these areas (economic growth and technological progress, access to information, individual capability, social coordination, motives) a lot of everyday good works contribute,” Beckstead writes. “An implication of this is that a lot of everyday good works are good from a broad perspective, even though hardly anyone thinks explicitly in terms of far future standards.” Look at those examples again: It’s just a list of what normal altruistically motivated people, not effective altruism folks, generally do. Charities in the US love talking about the lost opportunities for innovation that poverty creates. Lots of smart people who want to make a difference become scientists, or try to work as teachers or on improving education policy, and lord knows there are plenty of people who become political party operatives out of a conviction that the moral consequences of the party’s platform are good. All of which is to say: Maybe effective altruists aren’t that special, or at least maybe we don’t have access to that many specific and weird conclusions about how best to help the world. If the far future is what matters, and generally trying to make the world work better is among the best ways to help the far future, then effective altruism just becomes plain ol’ do-goodery.\*

## 3 – DA

#### Solar Shields prevent blackouts through early detection

Timon Singh, 11/15/10 (Timon Singh is a graduate of Liverpool University where he received a degree in Social and Economic History. He has previously worked for BBC Magazines on BBC Who Do You Think You Are? Magazine, the publication for the popular genealogy show. He has written extensively on the portrayal of history in cinema, worldwide construction projects and film.<http://inhabitat.com/nasa-devises-solar-shield-to-protect-us-national-grid/solarstorm/>

There are many things threatening the [US National Grid](http://inhabitat.com/2010/11/05/8gw-of-geothermal-energy-to-be-added-to-national-grid/geothermal-6/) at the moment – rolling blackouts, lack of funding and problems integrating renewable energy; but [NASA](http://science.nasa.gov/)is working on their defense against another threat: solar storms. NASA’s scheme, dubbed the[Solar Shield](http://science.nasa.gov/science-news/science-at-nasa/2010/26oct_solarshield/), will aim to prevent blackouts caused by solar storms through a forecasting system that would enable the Space Agency to pinpoint certain high-risk transformers. The Solar Shield would then warn grid operators, giving them enough time to isolate the problem and prevent widespread damage. Solar storms have become a major concern for utility providers and the national military in recent years. Although major solar storms only occur every 100 years or so, when a storm cloud from the sun (or coronal eruption) makes the Earth’s magnetic field shake,  it sends electrical currents all over the planet, disturbing systems on the ground and in the air. These events even have the potential to melt transformer parts.The last major solar storm was the [Carrington Event](http://science.nasa.gov/science-news/science-at-nasa/2008/06may_carringtonflare/), which occurred in 1859, disrupting the telegraph services. More recently, mild storms in 1989 and 2003 caused ‘power fluctuations’ in transformers in the US, Canada, Great Britain and other countries. Today, if a solar storm the size of the Carrington Event was to occur, it would cause major damage to the National Grid as well as affected electronic systems all over the world. As a result, NASA scientists believe an early warning system would give utility companies time to disconnect major transformers in time, preventing damage and even fire. A lack of an effective system could result in blackouts and very expensive repairs.In addition to acting as an ‘early warning system’, the Solar Shield would take images of any coronal eruptions via NASA spacecraft and satellites, and would order and assess the size and potential impact. While the Solar Shield is still in the experimental stages, NASA has recruited a number of utility companies to install monitors at their transformers. This stage should give the agency time to devise a suitable defense as the next major solar storm event is predicted for 2013

#### Solar superstorm is likely in the next few years and will cause catastrophic internet and electricity outages and global chaos.

Sparks 9/22/21 (Hannah, “Solar ‘superstorm’ could prompt ‘internet apocalypse,’ global outages”; New York Post; https://nypost.com/2021/09/22/solar-superstorm-could-prompt-internet-apocalypse-global-outages/)

Ninety-three million miles away, a solar storm brews with the power to prompt an “internet apocalypse,” according to recent findings. University of California Irvine assistant professor Sangeetha Abdu Jyothi presented the new research last month during the Association for Computing Machinery’s annual conference for their Special Interest Group on Data Communication (SIGCOMM). In [the report](https://www.ics.uci.edu/~sabdujyo/papers/sigcomm21-cme.pdf), Jyothi warned that an unmitigated solar “superstorm” could “cause large-scale Internet outages covering the entire globe and lasting several months” — pointing to inadequacies in submarine cables, a major component of internet infrastructure. Most of the time, we’re protected from the sun’s constant littering of radiation, called “solar wind,” thanks to the ionosphere, otherwise known as Earth’s magnetic shield. With nowhere to go, those magnetic particles are pulled to the North and South Poles, producing awe-inspiring auroras before dissipating. But sometimes, solar flares kick up what’s called a coronal mass ejection (CME), a solar storm strong enough to penetrate our shield and wreak havoc on just about anything powered with electromagnetism — which just about runs the world. It has [been estimated](https://www.eurekalert.org/news-releases/653733) that the potential damage caused by a disastrous CME in 2012, which only narrowly missed Earth, would have cost the US alone up to $2.6 trillion. “Our [internet] infrastructure is not prepared for a large-scale solar event,” Jyothi [told Wired](https://www.wired.com/story/solar-storm-internet-apocalypse-undersea-cables/) recently, ticking off the consequences: widespread blackouts, mass traffic jams and a breakdown in the global supply chain, to name a few. Local and regional internet infrastructure often relies on optical fiber, which isn’t affected by geomagnetic currents, or grounded short-span cables, which are by nature protected from an electromagnetic surge. But it’s a different story with undersea cables, which connect continents via the internet. While the cables themselves aren’t vulnerable, the electronic repeaters therein, which help amplify the optical signal, are susceptible to damage by geomagnetically induced currents. If enough repeaters blow out, the whole line could be shot. For some countries, damage to these mainline cables may cut their connectivity at the source — not to mention potential damage to satellites, which enable internet for many. It’s happened before, researchers have said. In 1921, a solar storm sparked fires in electrical equipment across the world, from train station control rooms to telegraph dispatch centers. Again, in 1989, a solar storm of moderate severity knocked the power out in northeast Canada for nine hours — still before the rise of internet-based infrastructure. Jeffrey Love, a geophysicist in the geomagnetism program of the US Geological Survey, [told the Independent](https://www.independent.co.uk/life-style/gadgets-and-tech/solar-storm-2021-internet-apocalypse-cme-b1923793.html) that the impact of that 1921 New York Railroad Storm would be much greater today. “When we look back at this time, anything that’s related to electricity wasn’t as important in 1921 as it is today,” he said. In an interview [for NextGov.com](https://www.nextgov.com/ideas/2021/05/racing-sun-protect-america/174029/) in May, Dr. Scott McIntosh, deputy director of the National Center for Atmospheric Research, told Dana A. Goward, president of the Resilient Navigation and Timing Foundation, that the sun’s current electromagnetic cycle, which lasts about 11 years, is projected to be a doozy. “We have every reason to believe that the current solar cycle which began in December 2019 could be the most active since the 1970s. This is a particular concern for the GPS,” said McIntosh, who estimated a 35% to 45% chance a CME will disrupt Global Positioning System service, for potentially several days, sometime during the next decade. He continued, “Strong solar storms can charge the atmosphere and prevent signals from getting through for days. The strongest can damage or even destroy satellites.” Researchers, as well as lawmakers, have discussed GPS alternatives in the past, prompting Congress to pass the National Timing Resilience and Security Act in 2018, asking the Department of Transportation to devise terrestrial backup for global navigation services, in the event satellites are rendered useless. Despite concerns, no progress has been made, according to RNT’s Goward. “Even with the most concerted government efforts, five or six years will be needed to establish systems and encourage, or where needed, require, users to protect themselves and vital services,” warned Goward. “Such a timeline will take us well into the coming solar danger zone.”

#### Electricity shortages causes civilization collapse and extinction—cascades down and wrecks every single industry.

Weiss and **Weiss 19** [Matthew Weiss, American Jewish University, 15600 Mulholland Drive, Bel Air, CA, 90077, USA. Martin Weiss, UCLA-Olive View Medical Center, 1444 Olive View Drive, Sylmar, CA, 91342, USA. Weiss, Matthew, and Martin Weiss. “An Assessment of Threats to the American Power Grid.” Energy, Sustainability and Society, vol. 9, no. 1, May 2019, p. 18, doi:[10.1186/s13705-019-0199-y](https://doi.org/10.1186/s13705-019-0199-y).]//Anton

Consequences of a sustained power outage

The EMP Commission states “Should significant parts of the electrical power infrastructure be lost for any substantial period of time, the Commission believes that the consequences are likely to be catastrophic, and many people will die for the lack of the basic elements necessary to sustain life in dense urban and suburban communities.” [[67](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y#ref-CR67)].

Space constraints preclude discussion on how the loss of the grid would render synthesis and distribution of oil and gas inoperative. Telecommunications would collapse, as would finance and banking. Virtually all technology, infrastructure, and services require electricity.

An EMP attack that collapses the electric power grid will collapse the water infrastructure—the delivery and purification of water and the removal and treatment of wastewater and sewage. Outbreaks that would result from the failure of these systems include cholera. It is problematic if fuel will be available to boil water. Lack of water will cause death in 3 to 4 days [[68](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y#ref-CR68)].

Food production would also collapse. Crops and livestock require water delivered by electronically powered pumps. Tractors, harvesters, and other farm equipment run on petroleum products supplied by an infrastructure (pumps, pipelines) that require electricity. The plants that make fertilizer, insecticides, and feed also require electricity. Gas pumps that fuel the trucks that distribute food require electricity. Food processing requires electricity.

In 1900, nearly 40% of the population lived on farms. That percentage is now less than 2% [[69](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y#ref-CR69)]. It is through technology that 2% of the population can feed the other 98% [[68](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y#ref-CR68)]. The acreage under cultivation today is only 6% more than in 1900, yet productivity has increased 50 fold [[69](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y#ref-CR69)].

As stated by Dr. Lowell L Wood in Congressional testimony:

“If we were no longer able to fuel our agricultural machine in the country, the food production of the country would simply stop, because we do not have the horses and mules that used to tow agricultural gear around in the 1880s and 1890s”.

“So the situation would be exceedingly adverse if both electricity and the fuel that electricity moves around the country……… stayed away for a substantial period of time, we would miss the harvest, and we would starve the following winter” [[70](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y#ref-CR70)].

People can live for 1–2 months without food, but after 5 days, they have difficulty thinking and at 2 weeks they are incapacitated [[68](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y#ref-CR68)]. There is typically a 30-day perishable food supply at regional warehouses but most would be destroyed with the loss of refrigeration [[69](https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-019-0199-y#ref-CR69)]. The EMP Commission has suggested food be stockpiled for a possible EMP event.

A prescription for failure

Even if all the recommendations of the Congressional EMP Commission were implemented, there is no guarantee that the grid will not sustain a prolonged collapse. There should therefore be contingency plans for such a failure.

There is also another consideration. The foundational pillars of prior American nuclear defense policy, in today’s climate, are of uncertain validity. Mutual assured destruction is the Maginot line of the 21st century. Nonproliferation will prove difficult to resurrect.

#### A new era of space means NASA is losing its power. It’s up to the private space sector to lead space projects now.

Christian Davenport 5/6/21 (“As private companies erode government’s hold on space travel, NASA looks to open a new frontier”; The Washington Post; https://www.washingtonpost.com/technology/2021/02/25/nasa-space-future-private/)

The four astronauts who will fly on a SpaceX mission by the end of the year will be a [bunch of private citizens](https://www.washingtonpost.com/technology/2021/02/01/spacex-st-jude-fundraising-flight/?itid=lk_inline_manual_2)with no space experience. One’s a billionaire funding the mission; another is a health care provider. The third will be selected at random through a sweepstakes, and the last seat will go to the winner of a competition. In the new Space Age, you can buy a ticket to orbit — no need to have been a fighter pilot in the military or to compete against thousands of other overachievers for a coveted spot in NASA’s astronaut corps. In fact, for this mission, the first composed entirely of private citizens, NASA is little more than a bystander. It does not own or operate the rocket that will blast the astronauts into space or the capsule they will live in for the few days they are scheduled to circle Earth every 90 minutes. NASA has no say in selecting the astronauts, and it will not train or outfit them — that will all be done by Elon Musk’s SpaceX. The money to pay for the flight also will not come from NASA — or any other government account. The cost of the project is being borne by a billionaire, Jared Isaacman, who has set it up as a fundraiser for St. Jude’s Research Hospital and a promotional device for his business, [Shift4Shop](https://www.shift4shop.com/?utm_term=shift4&utm_campaign=Product_Brand_Campaign_%5BKNOWN%5D&utm_source=adwords&utm_medium=ppc&hsa_acc=4516218500&hsa_cam=12263139112&hsa_grp=116935590466&hsa_ad=497758599975&hsa_src=g&hsa_tgt=kwd-304285625492&hsa_kw=shift4&hsa_mt=e&hsa_net=adwords&hsa_ver=3&gclid=Cj0KCQiA7NKBBhDBARIsAHbXCB5Tj74ZYo0YYuVh5NT5L3j0dYXlKbLrRC4e-1ilUTxRbUMfA7-OtVkaAnuyEALw_wcB), which helps businesses set up websites and process payments. This is the new look of human space exploration as government’s long-held monopoly on space travel continues to erode, redefining not only who owns the vehicles that carry people to space, but also the very nature of what an astronaut is and who gets to be one. And it comes as NASA confronts some of the largest changes it has faced since it was founded in 1958 when the United States’ world standing was challenged by the Soviet Union’s surprise launch of the first Sputnik into orbit. Now it is NASA’s unrivaled primacy in human spaceflight that is under challenge. Thanks to NASA’s investments and guidance, the private space sector has grown tremendously — no entity more than SpaceX, which [according to CNBC](https://www.cnbc.com/2021/02/16/elon-musks-spacex-raised-850-million-at-419point99-a-share.html) is now worth $74 billion. The commercial space industry is taking on ever more roles and responsibilities — flying not just cargo and supplies to the International Space Station, but even NASA’s astronauts there. The private sector will launch some of the major components of the space station NASA wants to build in orbit around the moon, and private companies are developing the spacecraft that will fly astronauts to and from the lunar surface. Space enthusiasts, including NASA, see enormous benefit in the shift — a new era of space exploration that will usher in a more capable and efficient space industry. But the changing dynamic also has left NASA, which for decades has set the pace for the American space project, with an uncertain role, a development NASA’s Safety Aerospace Safety Advisory Panel warns could have consequences for years to come. The growth of companies like SpaceX has "tremendous upside potential — and are accompanied by equally tremendous challenges for managing the risk of human space exploration,” [it said in its annual report](https://oiir.hq.nasa.gov/asap/documents/2020_ASAP_Report-TAGGED.pdf), released last month. “NASA leadership in human space exploration is still preeminent, but the agency’s role is evolving with critical implications for how risk and safety will be managed.” So far, NASA has done well “as it shifts from principally executing its programs and missions to commercially acquiring significant key elements and services,” it said. But as the agency continues to evolve, “NASA must make some strategically critical decisions, based on deliberate and thorough consideration, that are necessary because of their momentous consequences for the future of human space exploration and, in particular, for the management of the attendant risks.” In an interview, Steve Jurczyk, NASA’s acting administrator, said the agency is well aware of how its identity and role are changing, and he likened the agency’s role to how the U.S. government fostered the commercial aviation industry in the early 20th century. NASA’s predecessor, NACA, or the National Advisory Committee for Aeronautics, “did research, technology development to initially support defense … but also later on supporting a burgeoning commercial aircraft industry and aviation industry,” he said. “So that may be how we evolve, moving forward on the space side. We’re going to do the research and the technology development and be the enablers for continuing to support the commercial space sector.”