

Wayfinders as spacecraft trackers

NASA's Nelson on 2022 budget priorities

Building UAM ground infrastructure

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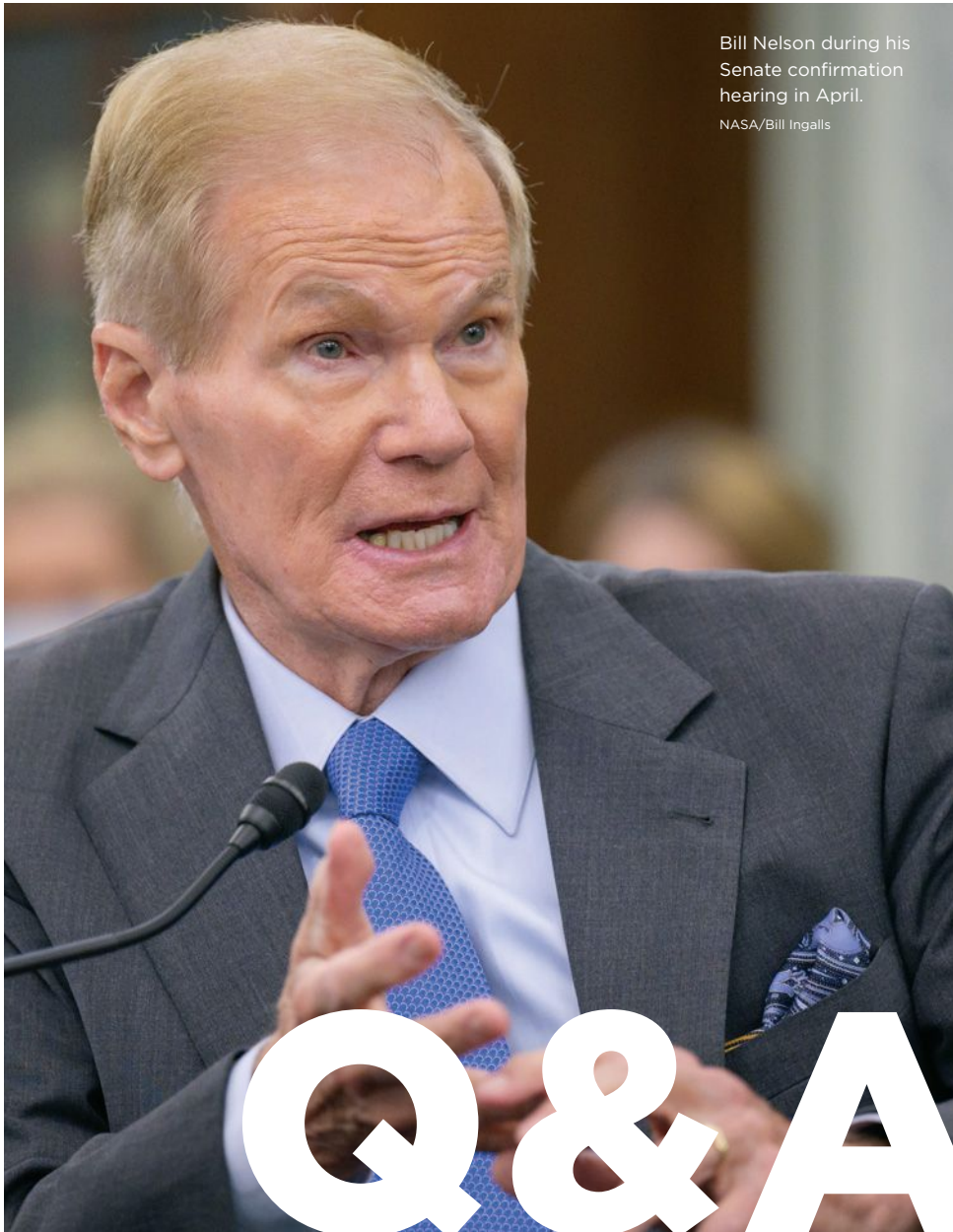
The text you're reading now is sized to represent the tonnage of satellites that fall back to Earth annually. The text would need to look like this...

MEGA

...to represent the tonnage from the coming megaconstellations. Learn about the risks. [PAGE 34](#)



A giant leap for
**SPACE
TOURISM?**
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Bill Nelson during his Senate confirmation hearing in April.

NASA/Bill Ingalls

BILL NELSON

POSITIONS: NASA administrator since May; U.S. senator from Florida, 2001-2019, and top Democrat on the Senate Commerce Committee that authorizes NASA programs, 2015-2019; in the U.S. House of Representatives, represented districts adjacent to NASA's Kennedy Space Center, 1979-1991; chaired the space subcommittee of the House Science Committee for six years.

NOTABLE: After completing astronaut training for those outside of the space program, became the second sitting member of Congress to go to space, flying aboard space shuttle Columbia in 1986 as a payload specialist conducting medical experiments. Ten days after Columbia landed, shuttle Challenger exploded, killing all aboard and prompting NASA to end its practice of sending those from other professions to orbit. As a senator, co-authored with then-Sen. Kay Bailey Hutchison, R-Texas, the NASA Authorization Act of 2010 that, among other provisions, directed the agency to design and build "a Space Launch System" rocket for deep space missions, to be ready by Dec. 31, 2016.

AGE: 78.

RESIDENCES: Orlando, Florida; Arlington, Virginia.

EDUCATION: Bachelor of Arts in political science, Yale University, 1965; Juris Doctor, University of Virginia School of Law, 1968.

Meet the new boss

After years of shaping NASA's priorities as a member of Congress, Bill Nelson must now steer the agency through what might be its greatest budget challenge yet. Plans call for proceeding with the multibillion-dollar Trump administration goal of returning astronauts to the moon in 2024 while also making climate research a "substantial" focus by starting development of the first of five planned Earth System Observatory satellites, all amid continuing robotic space missions and aeronautics research. To accomplish all this, the White House in May requested \$24.8 billion for NASA in fiscal 2022, a 6.6% increase over what Congress appropriated for the current year. Now Nelson has the opportunity to explain to his former lawmaker colleagues how NASA will balance these competing priorities. I spoke with him in June via phone from his office at NASA Headquarters in Washington, D.C. Here's our condensed and edited conversation. — *Cat Hofacker*



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Q: During Administrator Jim Bridenstine's confirmation hearing, you were hesitant that a politician was the best choice to lead NASA. When President Biden called in January, what did he say to change your mind and get you to accept the nomination?

A: Fortunately, I've been a part of the NASA family for quite a while. I came to Congress in 1978, was assigned to the House Science Committee. Six years later, I'm the chairman of the space science and applications subcommittee [now called the House Subcommittee on Space and Aeronautics]. It was in that role as chairman that I was selected to train and fly with the crew of the 24th flight of the space shuttle. Then in the Senate, likewise having been either the chairman or the ranking member — depending on what party had the majority of the Senate — of the space subcommittee for almost all of my 18 years in the Senate, and then the last four years being the ranking member of the full Senate Commerce Committee. So when you have that kind of experience, it's been a privilege for me to be a part of the NASA family.

Q: The fiscal 2022 budget request would increase funding for almost all NASA programs across the board. How does that align with the priorities of the Biden administration?

A: The president has a number of major focuses. Climate change is clearly one of them, and that is reflected in the budget that they put out. There will be substantial work that will be done by NASA on climate change, but the president also has lots of other priorities. He wants to emphasize American jobs from research and development, which NASA is uniquely capable and positioned to do. The president wants to get a workforce that is the kind of workforce that we need for the 21st century, such as in STEM: science, technology, engineering, mathematics. You will see that as a major effort for NASA as well. Remember, the previous administration, they would zero out the STEM part of NASA [the Office of STEM Engagement] and the Congress would always restore it. The president also wants the federal workforce to be reflective of the American people in its diversity and inclusion, and we have that going as well. And then NASA has this unique role of helping the United States government project soft power because of the respect and the identification of NASA by people all over the Earth. A lot of that comes from the gee-whiz stuff that we do, not only in Earth science and planetary science — notice the enthusiasm all over the Earth about little Perseverance and the little helicopter — so not only in the direct sciences, but also in the exploration program, and it's not lost on many people that NASA is going back to the moon and on to Mars. And then finally, even another part of climate change is the first A in NASA, which is aeronautics. What you see there is NASA's developing an electric airplane, the result of which will be another way of diminishing pollution in the air that ultimately is causing a greenhouse effect in the Earth.

Q: The aeronautics directorate has historically gotten only about 3.5% of NASA's budget. Should aeronautics funding be increased, given the urgent need to help the aviation industry meet its portion of achieving carbon neutrality by 2050?

A: I'm not sure that I can answer the question about the money,

“SLS is the largest, most powerful rocket ever. Needless to say, that will be a red-letter day.”

at this point, but an example of NASA's contribution is the X-57, an all-electric experimental aircraft. There's one version now; they will then go into a different version that is more advanced. The one that they have now is scheduled for launch later this year, and we are working on the standards for electric aircraft, which could have a profound effect on air transportation, but it's in the research stage. I'd also call your attention to a study that had been done over the last three years at the Charlotte airport in North Carolina. It is complementary to what is well underway, the setting up of the next generation of air traffic control that involves NASA and FAA. What that does is get the aircraft routed, operating off of satellites instead of the traditional radar and voice system that we have, so that you can have a lot more efficient routes, as well as descending into airports and save a lot of time and fuel. And what NASA did at the Charlotte airport over the last three years, they said, “Let's see what we can do in the operation of aircraft from pushing off at the gate to the runway, and then getting to altitude.” And what they found, they could save a million gallons of fuel and, gosh, you had millions of pounds of carbon dioxide that were saved; you had thousands of hours of engine runtime, that affected maintenance. So you had fuel savings, emission savings and maintenance savings, all done by this pilot study.

Q: Given the number of obstacles facing the country, including recovering from the covid pandemic and reducing greenhouse gas emissions, can you make the case for keeping the 2024 goal of landing on the moon?

A: The goal is 2024. Space is hard. And when you develop the technologies to keep humans safe in that environment, often you run into, as history would tell us, delays. So I think we have to be soberly realistic, but the goal is 2024.



Q: One possible delay is if the U.S. Government Accountability Office upholds the protests on the lunar lander award. Would that put a 2024 landing out of reach?

A: We already have a delay because of everything being on hold for a hundred days. So that's my answer, and I will answer your question once I know what the result of the decision is.

Q: Two big flagship missions are scheduled to launch this year: the Space Launch System and the James Webb Space Telescope. Given the delays both programs have had over the years, how confident are you that they will launch in 2021?

A: I'm confident. SLS is the largest, most powerful rocket ever. Needless to say, that will be a red-letter day. On Webb, I'm feeling good. I've seen some press reports. They make a big deal about another delay. The delay has nothing to do with NASA. It's only a couple of weeks, and it's because of the throughput at the French space center that they can only prepare the Ariane rocket one at a time, because you only have one building and they've got two other Ariane 5 launches before the James Webb. So their work throughput in that building is what they're anticipating. That's going

to delay the Webb launch two weeks, but in the big scheme of things, that's not very much.

Q: NASA and European Space Agency officials have also attributed the delay to ongoing reviews of the Ariane 5 because of an unspecified issue with the payload fairing. How are you feeling about the rocket?

A: I've talked to Dr. Z [Thomas Zurbuchen, head of NASA's Science Mission Directorate] and I rely on his judgment.

Q: And speaking of 2024, Congress has only authorized the International Space Station through that year. What's the status of the extension?

A: When I was in the Senate, Sen. Ted Cruz, R-Texas, and I passed the NASA bill in the Senate, extending ISS to 2030. I am very optimistic that the Congress will pass and extend it this year to 2030; that is in the NASA authorization bill that passed the Senate in June, and I believe that the House will agree with that.

Q: In parallel, NASA is requesting \$101 million to help develop privately owned space stations, but

▲ The James Webb Space Telescope was scheduled for launch on an Ariane 5 rocket on Oct. 31, but the date has been pushed out to mid or late November. "In the big scheme of things, that's not very much" of a delay, says NASA Administrator Bill Nelson. In this photo, Webb's 6.5-meter primary mirror is deployed at Northrop Grumman in California in 2020.

NASA



Congress last year underfunded that request. How are you making the case to lawmakers so you'll get the funds this year?

A: With regard to a low-Earth-orbit commercial follow-on, I've already talked extensively to the people on the Hill about NASA's position that we want the commercial industry to be ready to go with their own space station when the ISS would be shut down after 2030.

Q: Also looking to the future, do you foresee the day that NASA won't need its own rocket and can instead purchase rides on commercial launch vehicles for all its missions?

A: Eleven years ago, when Kay Bailey Hutchison and I wrote the bill that set NASA on the course it's on now, the anticipation was "get the commercial industry into low-Earth orbit and get NASA out of low-Earth orbit and go explore." What we have seen is the capability of extraordinary things being done just in the commercial world, which leads to your question and the answer to your question. There's always going to be a need for a government space program with government vehicles, with NASA vehicles, the commercial world on contract with NASA to produce the vehicles. Why this is important for the future:

as we venture farther out with humans into the cosmos, NASA has to be involved in that because of the safety of astronauts and the cutting-edge and very expensive technologies that it's going to take to take a human crew all the way to Mars. Depending on the transit time, it could be as long as a total of three years. Therefore, I envision a combination of commercial and NASA, but when it comes to the human exploration, I think NASA will continue to be very heavily involved.

Q: Fast forward 50 years: How do you think NASA's role will continue to change as the private space industry keeps growing?

A: I'll give you an example. I think it's going to take NASA — as we have already demonstrated — to go to an asteroid and bring material from the asteroid. That's going to give us all kinds of science and understanding of the origin of the cosmos. But I see private industry eventually, with NASA's help, getting to an asteroid and doing mining on an asteroid that would have rare metals, rare materials. So I think it will be a joint partnership in some cases. We've already seen technology dramatically change since Kay and I wrote the bill, so stay tuned. ★

▲ The electric X-57 Maxwell is an example of NASA's work developing carbon-neutral aeronautical technology, Nelson says. Here the aircraft undergoes testing at NASA's Armstrong Flight Research Center in California in May, ahead of its first flight, scheduled for later this year.

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