NASA may fly humans on the less powerful version of its deep-space rocket

NASA may make some big changes to the first couple flights of its future deep-space rocket, the Space Launch System, after getting a recent funding boost from Congress to build a new launch platform. When humans fly on the rocket for the first time in the 2020s, they might ride on a less powerful version of the vehicle than NASA had expected. If the changes move forward, it could scale down the first crewed mission into deep space in more than 45 years.

The SLS has been in development for the last decade, and when complete, it will be NASA's main rocket for taking astronauts to the Moon and Mars. NASA has long planned to debut the SLS with two crucial test missions. The first flight, called EM-1, will be uncrewed, and it will send the smallest planned version of the rocket on a three-week long trip around the Moon. Three years later, NASA plans to launch a bigger, more powerful version of the rocket around the Moon with a two-person crew – a mission called EM-2.

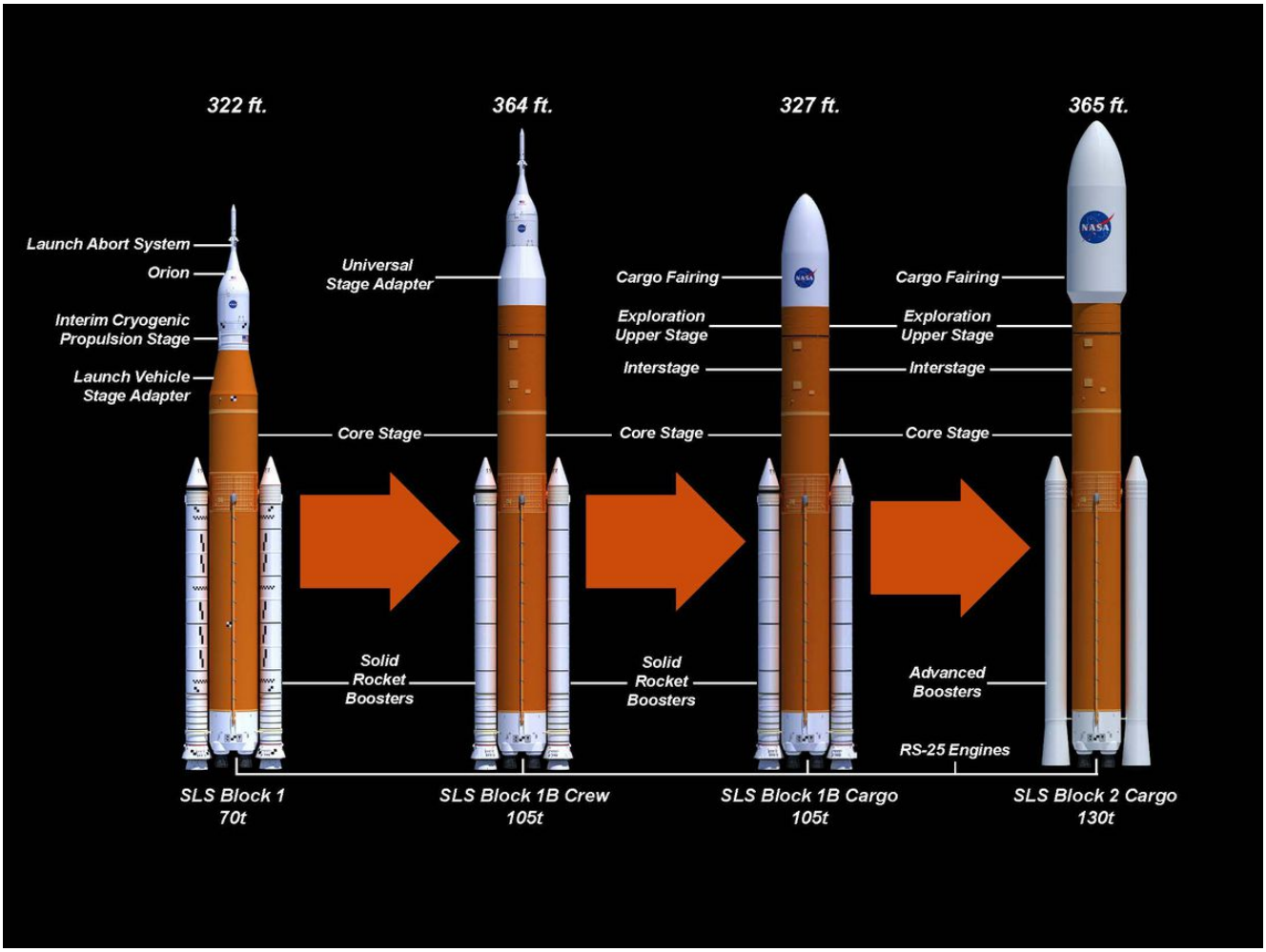
"If EM-2 flies that way, we would have to change the mission profile."

But now, NASA may delay that rocket upgrade and fly the same small version of the SLS for the crewed flight instead. If that happens, NASA would need to come up with a different type of mission for the crew to do since they won't be riding on the more powerful version of the vehicle. "If EM-2 flies that way, we would have to change the mission profile because we can't do what we could do if we had the [larger SLS]," Robert Lightfoot, NASA's acting administrator, said during a Congressional hearing yesterday.

NASA clarified that astronauts would still fly around the Moon on the second flight. However, the rocket would not be able to carry extra science payloads as NASA had originally planned. “The primary objective for EM-2 is to demonstrate critical functions with crew aboard, including mission planning, system performance, crew interfaces, and navigation and guidance in deep space, which can be accomplished on a Block 1 SLS,” a NASA spokesperson said in a statement to *The Verge*.

Modifying these first flights is only possible now thanks to an unexpected influx of cash that NASA got from the recent 2018 spending bill. The space agency received an extra $350 million to build a second launch platform for the SLS. And it’s giving NASA more flexibility in how it conducts the first few missions of the rocket.

The SLS is designed to take off from a portable launch pad — what’s known as a mobile launch platform — down at NASA’s Kennedy Space Center in Florida. To prep for the first flight of the rocket, NASA has been upgrading an old platform that it originally built for the cancelled Constellation program — an initiative under President Bush to send humans back to the Moon. The upgrades have taken a while though and cost upwards of $400 million, according to the Planetary Society. It’s more money than it took to build the platform in the first place.



A graphic of the evolution of SLS
Image: NASA

But NASA had a problem: The agency realized that after all the upgrades were complete, the structure would only be able to support launches of the smallest version of the rocket, what's called Block 1. The larger version of the SLS that's supposed to carry crew – called Block 1B – is much taller and heavier; the platform wouldn't be able to support the new height and weight of the vehicle. That meant the platform would have to go through *another* round of upgrades once the first uncrewed flight of SLS was complete.

NASA faced a scheduling mess. The space agency predicted that upgrading the mobile launch platform again would take at least 33 months, or nearly three years. And during that time, the SLS couldn't fly. The platform would be out of commission, so the rocket would be, too. Plus, any delays in upgrading the platform would further delay the first crewed flight into deep

space. Ultimately NASA did not officially request the funds for the extra platform, citing costs.

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So Congress decided to step in. It gave NASA the cash to build a second mobile launch platform from scratch – one that would support the bigger Block 1B version of the rocket. If the space agency starts building the platform now, it could be ready before the planned 2023 launch date for the crewed flight. And NASA wouldn't have to wait for the upgrades to be done to launch a second time.

Now that NASA has this cash, the agency is getting creative. It will have two platforms – one for the smaller SLS and one for the bigger version of the rocket. That means NASA can continue launching the smaller Block 1 vehicle until the bigger Block 1B SLS is ready. And NASA is jumping on that option, because it may be a while before the Block 1B can fly. That version of the SLS requires a big, critical piece of hardware known as the Exploration Upper Stage, which sits on the top of the rocket. It's what will give the SLS its extra boost of power, but it's a complicated piece of machinery that NASA has never built before. And NASA has already run into many scheduling delays with readying the SLS – a consequence of creating a new vehicle from scratch.



The current mobile launch platform at Kennedy Space Center Image: NASA

So, flying crew on the smaller version of SLS could decrease the time between the first two missions, something Lightfoot admitted to in the hearing. “Now knowing we’re going to build the second mobile launcher, I can keep this mobile launcher in place, buy another [Block 1] and still fly,” he said. But that means a crewed mission on Block 1 won’t carry any additional payloads – just crew. Lightfoot says the mission will still be enough to certify the SLS for human missions, though. “That still gets humans into orbit and that still allows us to check out all the systems we wouldn’t check out on EM-1,” he said at the hearing.

Meanwhile, it’s also possible that the second flight of the SLS won’t carry crew at all. NASA also needs to launch its upcoming mission to Jupiter’s moon Europa pretty soon. Known as Europa Clipper, the mission is *mandated* by Congress to fly on the SLS by 2022. Lightfoot mentioned that Europa Clipper could come before the first crewed flight of the SLS. It just

depends on if the Orion crew capsule, which will carry astronauts on the SLS, is ready before Europa Clipper is ready. If the Europa spacecraft comes first, then it could also fly on the small Block 1 rocket.

Overall, Lightfoot hammered home to Congress that NASA has many different options now: “It allows us to have the ability to fly SLS when we’re ready with whatever payload is ready to go.”

https://www.theverge.com/2018/4/13/17233684/nasa-space-launch-system