

## NASA NIXES CREW FOR TEST FLIGHT OF NEW MEGAROCKET IN 2019

**CAPE CANAVERAL, Florida:** NASA's new megarocket will launch without astronauts on its test flight, now delayed until 2019 because of technical challenges, the space agency's top leaders said Friday. In February at the request of the White House, NASA began studying the possibility of putting a crew on the first flight. After reviewing the costs and risks, the space agency decided against it. The White House took part in the decision, said NASA's Acting Administrator Robert Lightfoot. Still in development, the super-sized Space Launch System rocket is meant to eventually send astronauts to Mars. The first launch had been targeted for next year, but now won't happen until 2019 when NASA will send an unoccupied Orion capsule to the vicinity of the moon for a three-week trial run.

The second flight will have astronauts on board. It is scheduled for 2021, but will almost certainly be later because of all the delays with the first flight. It would have cost a lot more money and time to add life-support systems and other human-required equipment for the test flight, said Bill Gerstenmaier, head of NASA's human explorations and operations.

"The best plan we have is actually the plan we're on right now," he said. The test flight can be more dynamic, as NASA calls it, without a crew, and the lessons learned can help advance the next mission when people finally are on board. Lightfoot said it would have been technically feasible to add a crew, given more funding, but decided to stay the course. It would have cost an extra \$600 million to \$900 million to outfit the system for astronauts on the initial flight, Gerstenmaier said.

Earlier this week, NASA reported that a section of test hardware was damaged during manufacturing in New Orleans. No one was injured in the May 3 mishap.

Technicians were lowering the dome for the bottom of a liquid oxygen tank, when the dome ended up ramming into a support structure. NASA is investigating. Gerstenmaier called it "an unfortunate event" but said it shouldn't affect the schedule much. Late last month, the US Government Accountability Office warned that a delay was likely for the first SLS flight, crew or not. The current exploration effort will cost nearly \$24 billion by the end of fiscal 2018, the GAO reported.

Lightfoot acknowledged that he and others are frustrated by the technical challenges that have slowed down the program. The agency is aiming for a sustainable program within the available resources, he said, not just a single-objective mission. The Apollo moon program of the 1960s and early 1970s represented a sprint to a single destination, Gerstenmaier noted. The SLS rocket is meant to support flights to not only the moon and Mars, but the moons of Mars and even farther into the solar system, with potential commercial activity as well.

The megarocket represents a robust foundation for ultimately moving human presence out into the solar system, Gerstenmaier said. "That's a grander vision in a way than just moving people to the moon for the first time, although that was a very special moment and a very special challenge for those teams moving forward. But we're building off of that legacy now to move in a more sustained manner," he said. Earlier this year, SpaceX announced a bold mission to send two paying passengers on a flight around the moon in 2018. SpaceX chief Elon Musk also aims to colonize Mars. "I've been saying it for a while. This is an 'and' proposition, this is not an 'or,'" Lightfoot said. "If you look at what we're trying to do, it's going to take really all of us, frankly, to get this done." —AP



ALASKA: Photo shows the exterior of the local school's wood-heated aquaponics greenhouse in Coffman Cove, Alaska. —AP photos

## NEW ALASKA HANDBOOK PROVIDES HOW-TO ON HEATED GREENHOUSES

**ANCHORAGE, Alaska:** Cold-climate greenhouses have long been an option for increasing the limited growing season in Alaska, where fresh produce is a rarity in a harsh environment. But for many remote communities that rely on costly imported diesel fuel for their power source, they're too expensive to operate. Now, the state has released a handbook that shows schools and community groups how to build greenhouses heated with a plentiful local resource: wood. The 98-page guide comes as greenhouses gain popularity in the vast state for several reasons, including improved technology and heightened awareness, according to officials who worked on the handbook.

Thousands of schools in the continental US have gardens and some have greenhouses where students learn to grow food. But Alaska's situation is unique given the lack of fresh produce from local sources in remote parts of the state. "There's nobody that comes close," says Bob Deering, renewable energy coordinator for the Alaska region of the US Forest Service, the handbook's main funding source. In villages off the state's limited road system, for instance, goods must be flown up or barged in. Steeply priced vegetables can be more than a week in transit and past their prime by the time they arrive at stores.

The new handbook covers a range of subjects - from community planning and funding options to types of greenhouses and management of plant nutrients - aimed at putting more locally grown food in Alaska kitchens and school cafeterias. It also contains curriculum and case studies of projects by several schools, including the one in the small Prince of Wales Island community of Thorne Bay, in southeast Alaska, which installed a 750-square-foot (70-square-meter) aquaponics greenhouse three years ago.

The school was able to cheaply heat its greenhouse year-round with cord wood cut by students. Wood and variations such as cord wood, wood chips and pellets are known in the industry as biomass. "They could never have afforded a greenhouse if they were heating their school with diesel heat," said Devany Plentovich, manager of the Alaska Energy Authority's biomass program. A year in the making, the guide was funded by federal and state grants totaling \$150,000. It involved input from multiple entities, including those with successful projects such as Thorne Bay, whose heating system was funded through the state biomass program. Inefficient wood-burning stoves and outdoor boilers have created a huge pollution problem in Fairbanks. The boilers used in the greenhouses, however, are far more efficient,

burning most of the pollution that otherwise would go into the atmosphere, thanks to a second combustion chamber absent in less sophisticated systems, officials say.

### Kids love to make money

The Thorne Bay school was the first of four in the Southeast Island School District to install wood-heated aquaponics greenhouses, which use live fish to provide nutrients for lettuce, kale, bok choy and other crops. Alaska bans fish farming so the schools can't use edible fish such as aquaponics-favorite tilapia. They instead rely on goldfish and koi, said district greenhouse manager Colter Barnes, who also is the principal at the school in Coffman Cove, a community of 200. Students in the district

older get paid to cut and stack wood, and load the boilers, Barnes said. He called the greenhouse program a work in progress that has been a hit with students. "It's been fantastic. Kids love to eat, and kids love to make money," he said. "They are engaged in it - way more engaged than any worksheet or textbook."

In Coffman Cove, 12-year-old seventh-grader Damon Holtman went even further. He and his parents just built a small solar greenhouse at their property. An agriculture buff, Holtman also spends more time in the school greenhouse than any other student. He said it's easier to remember lessons learned through hands-on experience. For example, calculating how much to feed the fish involves a lot of math. "These fish eat 3 percent of their body



ALASKA: Photo shows some of the produce grown in the local school's wood-heated aquaponics greenhouse in Naukati, Alaska.



CAPE CANAVERAL: This undated image made available by NASA shows an artist's rendering of the Space Launch System. Still in development, the super-sized rocket is meant to eventually send astronauts to Mars. —AP

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