

Virginia Tech's Atkins on autonomy

Advice for the Trump administration

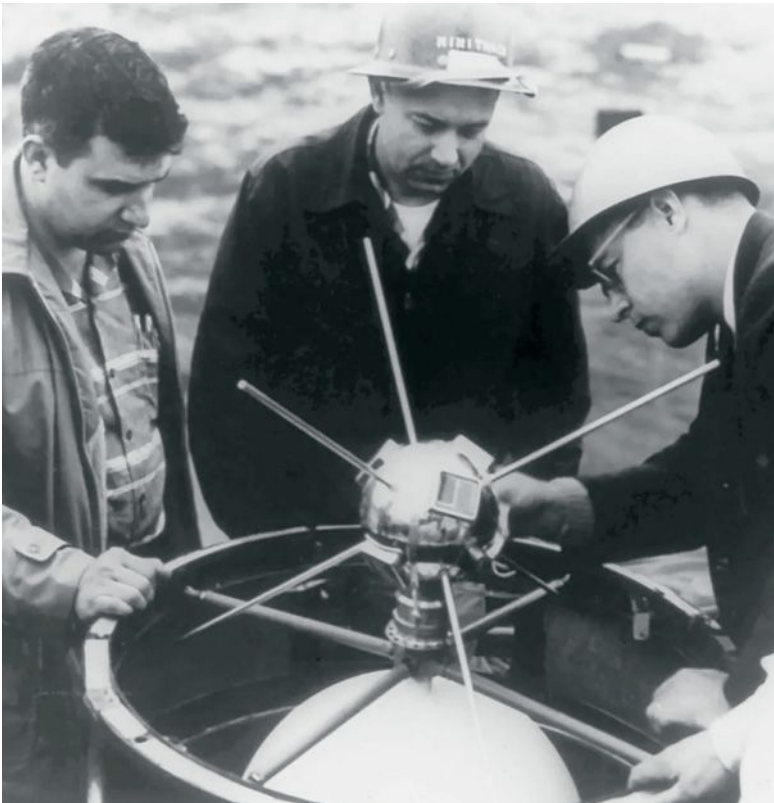
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TWO LAUNCHES TWO COMPANIES TWO BILLIONAIRES

New Glenn's partial success could give Blue Origin new momentum in its competition with SpaceX. Should gradatim ferociter get the credit? **PAGE 22**



Bringing home a piece of space history

BY CAT HOFACKER
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◀ U.S. Naval Research Laboratory employees prepare the Vanguard 1 satellite for launch.

Naval Research Lab

The Vanguard 1 spacecraft narrowly missed out on the distinction of being the first U.S. satellite, an honor that of course goes to Explorer 1. It is, however, the first satellite to convert sunlight to electricity.

Now, the grapefruit-sized aluminum sphere with spike-like antennas could gain another distinction. Engineers and a research analyst from Virginia-based consulting firm Booz Allen Hamilton have suggested that Vanguard 1's owners could capture it in orbit and return it to Earth. They outlined how this might be done in the paper, "Retrieving History: Options for Returning Vanguard 1 to Earth," presented at AIAA's SciTech Forum in January.

Recovering satellites isn't a new concept. NASA demonstrated one technique in 1984, when spacewalking shuttle astronauts snared two malfunctioning communications satellites and reeled them into the Discovery orbiter's cargo bay. Despite that success, satellite retrieval never took off. Now, however, interest is on the rise, given the orbital debris problem and the desire to extend the lives of satellites by repairing or refueling them in orbit.

Vanguard 1 is the perfect combination of "enormous historical value" and technical challenge for demonstrating techniques needed in the growing servicing field, says Matt Bille, a Booz research analyst and lead author of the paper.

Bille and his co-authors emphasize that this isn't a formal business proposal or an official Booz project. Bille shared the paper with the Naval Research Laboratory, which built and owns the satellite, and with NASA, which took over responsibility for Vanguard 1 in the late 1950s. So far, he says, there have been no additional discussions, but he learned that both organizations are separately looking into the possibility of a recovery mission.

The authors believe the best option would be a two-part mission: First, assess Vanguard's condition, likely with a spacecraft equipped

with cameras to take images and other measurements at a close range. The paper mentions a handful of existing spacecraft that have demonstrated this observing technique, including Astroscale Japan's ADRAS-J. That spacecraft spent much of last year approaching and inspecting a dead rocket upper stage in preparation for a planned deorbiting later this decade.

A big question is whether capturing Vanguard is even feasible, given that its multiple antennas "are now presumed to be too fragile to use as grab or attachment points," the paper reads.

If the assessment shows that retrieval is possible, the next decision would be whether to send a semi-autonomous craft or a human crew.

For the robotic option, an upcoming DARPA-funded demonstration might illustrate one technique: NRL is attaching a set of robotic arms, plus accompanying cameras and software, to a spacecraft frame built by SpaceLogistics, a Northrop Grumman subsidiary. That craft is to be launched to geosynchronous orbit later this year, where it will approach a handful of defunct communications satellites and, with its robotic arms, attach fuel jet packs to them. Perhaps a similar bus could grasp Vanguard.

For the crewed scenario, one possibility would be sending a modified SpaceX Crew Dragon capsule, similar to the one in which billionaire Jared Isaacman and three other passengers rode in September. Given that Dragon's nose opening was large enough for Isaacman and SpaceX engineer Sarah Gillis to squeeze through for their "stand-up EVA," the authors suspect the crew could bring Vanguard 1 into a Dragon that way and robotically package it in a container for the return trip.

"There's a lot of options to be studied here in more depth than we were able to do in just the paper. But the point is, it's a plausible mission," Bille says. ★