

# NASA's \$5 Solution

## How NASA Solved a \$100 Million Problem for Five Bucks

A few years ago, back when the Constellation Program was still alive, NASA engineers discovered that the Ares I rocket had a crucial flaw, one that could have jeopardized the entire project. They panicked. They plotted. They steeled themselves for the hundreds of millions of dollars it was going to take to make things right.

And then they found out how to fix it for the cost of an extra value meal.

The problem facing Ares 1 wasn't a booster malfunction or a computer glitch. It was simple cause-and-effect physics. During the final stages of a launch, as the solid booster rocket burns down it makes the entire vehicle oscillate rapidly. Add that oscillation to the resonant frequency of the large tube that separates the booster and the crew cabin, and you get a crew capsule that vibrates like crazy. When humans are vibrating to that extent, it's impossible for them to read a digital display. If the astronauts can't read, they can't do their jobs. If they can't do their jobs, no more mission.

To evaluate the extent of the problem, NASA called in its Human Factors Division. They're the ones who study human perception and performance, from very basic research to very applied research. In fact, they were the ones who had done the most recent round of vibration tests: 50 years ago, for the Gemini project, back when displays were analog, steam-actuated dials and gauges instead of the

computer screens of today. Cockpits, like everything else, have changed a lot since those days. It was time for some new tests.

Step one was to set up a chair so it would vibrate purely in an up-down motion (or in-out, if you're lying on your back like an astronaut would be), which is how the launch vehicle was predicted to shake. The vibrational frequency of the rocket would be 12 hertz (on average, but it would fluctuate between 10Hz and 13Hz) so they needed something that could hit that range exactly. Luckily, that technology already existed; the same mechanism that causes your chair to shake in simulation rides at amusement park made for a perfect prototype.

The engineers also knew that as Ares I gained speed the shake would increase. They calculated that toward the final stage, when astronauts would be already subjected to 4 G's of acceleration, they would be getting an additional 0.7 G's of vibration. As NASA slowly ramped up testing in the chair, they discovered that at 0.7 G's even the largest numbers on the digitized display were almost entirely illegible.

Houston, we have a major effing problem.

Plans were drawn up to reduce the vibrations. Spring and counter-firing motors. Hundreds of millions of dollars to implement. Added years of development and implementation. A nearly insurmountable setback.

And then the people in the Vibration Lab had a really, really good idea: By simply strobing the display in time with the vibration, they could kill this

problem altogether. They bought a handful of circuits that only cost a few bucks, hooked them up to the screen, and set it to strobe at 12Hz. And it worked!

Well, almost.

The readability was vastly improved, but it wasn't perfect. The chair was vibrating at 12Hz and the screen was strobing at 12Hz, but they weren't perfectly in sync. The text was more visible, sure, but it looked like it was swimming around. NASA could do better. So they grabbed a few accelerometers and attached them to the chair. With the vibration and the strobing now perfectly in sync, the display became crystal clear. And the final cost was a fraction of a fraction of a fraction of what they'd anticipated. Victory.

If it sounds too simple to actually work, believe me, I felt the same way until I saw it with my own eyes during a recent visit to NASA Ames. My guides were only willing to take me up to 0.5 G's, but even at that rate the smallest column of numbers was completely illegible. As soon as they flipped on strobing? I could see it perfectly. The effect was stunning. We did our best to show the before/after by putting our camera on the sled, but the image-stabilization was just too damn good (well played, Sony. Well played). You'll have to take my word for it.

Because it was also important to know if the system worked while vibrating and feeling the real, face-melting G-forces that astronauts experience, NASA's big brains have incorporated a similar strobing/vibrating rig into the iconic G-force simulation centrifuge. They

wouldn't let me anywhere near that thing without all kinds of medical evaluations. Begging, bribery, and tearful theatrics proved ineffective. Maybe someday.

NASA has a patent pending on the technology, although the problems it solves are decidedly not NASA-specific; helicopters, planes, and fast-moving boats have similar vibrational issues, so it's very possible we'll see this implemented elsewhere. I just want to sync my TV up to a shiatsu massage chair. Nobody blurs my Beyonce.

So while the the Ares I rocket has been grounded, there's no question this research will live on and be implemented in NASA's next launch vehicle. It's nice to know that the next generation of astronauts will be able to see what they're doing, and that it didn't cost the tax-payers hundreds of millions of dollars. Good deal.

...<http://gizmodo.com/5880850/how-nasa-solved-a-100-million-problem-for-five-bucks>

## Another Power Grab

Media Minutes for March 23, 2012  
Producer: Stevie Converse, Megan Tady, Candace Clement

Verizon has joined forces with a cadre of cable companies, including Comcast, Time Warner Cable and Cox, in a

controversial deal that would divide up the broadband market.

Verizon is vying to buy \$3.6 billion in unused spectrum from the cable companies to expand its own network. Giving up the spectrum means cable companies will back away from investing in the wireless market. In return, Verizon has agreed to lay off of cable companies' turf by not building out residential broadband fiber networks.

Josh Levy, the Internet campaign director for Free Press, said the companies should be rivals, but instead are helping each other corner their respective markets.

Josh Levy: Verizon won't compete with the cable companies anymore, and the cable companies won't compete with Verizon anymore. It's kind of like the five families in *The Godfather* getting together and dividing up territory. This is pretty much what Verizon and these cable companies have done.

In addition, the companies have proposed a cross-marketing agreement to sell each other's services to their customers, further solidifying their dominance. Verizon is already the leading wireless provider in the country.

Levy said the deal is bad news for the public because it would stifle competition.

Josh Levy: If you live in a community that has one cable broadband provider and you've

been hoping that a company like Verizon would come in and build a high-speed fiber optic network, your hopes are going to be dashed. It's not going to do that anymore. You are going to be stuck with that cable provider. And that cable provider might not be willing to build out into underserved areas. It might not be willing to provide prices that are affordable to all residents. And so a lot of people who have been stuck with inadequate access or no access are still going to be stuck.

The deal has already raised eyebrows in Congress. The Senate Antitrust Subcommittee held a hearing this week to discuss the deal. And the Federal Communications Commission asked the companies to submit further details on the arrangement.

Levy said public outrage is growing against the deal.

Josh Levy: Big broadband companies like Verizon, like AT&T in the past, rather than try to innovate and serve customers through better service and better prices, instead make these power grabs. They can own even more of the market, charge us even more and get around the need to provide better service and greater choice.

To learn more, visit <http://www.SavetheInternet.com>.

...<http://www.freepress.net/node/95566>

## June Calendar

June 4 — Amiga-By-The-Loop Chapter  
7:30 PM — South Grand Prairie Library  
760 Bardin Road, Grand Prairie

June 4 — Board of Director's Meeting  
Approximately 9:15 PM — Location TBD

June 25 — Newsletter Deadline — 8:00 AM

MCCC 4418 Sharpsburg Drive Grand Prairie, Texas 75052  
<http://www.amigamccc.org>