

FIRST BOAT

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The Hole in the GPS Sky

Vin Pica knows boaters rely on GPS, but what if it suddenly stopped working? How would you be affected?...

Guest blog by [Vincent Pica](#)



Easily the most sophisticated and yet easiest bit of consumer electronics available to "Joe the Boater", GPS has revolutionized everything from getting the groceries to sailing around the world. (See [Prevention of Collision at Sea - Thanks to GPS](#))

But what if GPS stopped working?

This column is about that...

The Local Notice to Mariners (LNM)

Did you know that the USCG will email you, each week and for free, all the updates, corrections, outages, pending construction projects, etc., etc., etc., for every creek, stream, bay, buoy, light and boat ramp within any specified district across the United States - including yours? (To sign up, go <http://www.navcen.uscg.gov> click away. You really should avail yourself of this free service!) Recently in the LNM, the following warning was quietly placed in Section VII - General News:

Reports have been verified that some SAAB R3-AIS transponders, when combined with an older GPS

receiver, have stopped working while GPS satellite PRN32 is in view. Vessels affected are reported being 'invisible' to other AIS equipped vessels in addition to some AIS equipped shore stations. It has been reported vessels equipped with the SAAB R3-AIS transponders continue to receive AIS information from other AIS equipped vessels. All vessels are advised to check the proper operation of their AIS and GPS equipment. GPS problems should be reported to the USCG.

So, I say to myself, this is pretty arcane stuff regarding the intersection of old GPS equipment, one specific GPS satellite of the 31 GPS satellites up there and one brand of AIS ([Automated Identification System](#)) transponders. But what else is out there that might be more broadly impactful on the private boater that no one is paying enough attention to? Well, there IS stuff out there and it might amount to the equivalent of a hole in the GPS sky!

DoD

As you know from this column, GPS was built by the military for the military - with taxpayer dollars so we got it "at the end of the day." The Department of Defense (DoD) is required by law to present a report to Congress every two years on the GPS system. The report is intended to detail for the lawmakers what the status is on all the many components of the GPS system. The last report was filed with Congress in 2010 so another is due this October. All seems well with GPS - save one scenario where it just stops working.

31 - 19 = Trouble!

The GPS system relies on many factors to give us the excellent coverage that it does but integral to all of those factors is that optimum coverage of the Earth is achieved with 24 satellites backed up an additional 7 redundant in-orbit spare satellites. Space is, as they say, a "harsh environment" (is no air, meteors, intense radiation plus the occasional solar flare just "harsh"?) and thus back-up is integral to reliability. But the DoD report states that 20 of the 31 GPS satellites are past their designed life and 19 are without redundancy in either navigation mission equipment, the satellite bus (this is what keeps the satellite powered up) or both.

Since the GPS satellites fly considerably higher than the Space Shuttle can go, we wouldn't be able to repair them in space - even if we still had an active Shuttle program. When a GPS satellite breaks, they de-commission it (leave it up there) and dial in its back-up satellite. But the report states that as many as 19 are in the mode where they have "single-thread failure capability." This is fancy talk that means that, if anyone of the 19 fails due to a single error, they can't be fixed. If 7 or more of those 19 fail, GPS starts to have holes in the sky. Now the odds on this happening are pretty long, admittedly. And the Air Force has two spare GPS satellites on the ground that they can launch - so the odds are even longer than 7 or more failing. In short, 9 or more have to fail. AND the Air Force has 12 more state-of-the-art GPS satellites being built.

But... There Is Always a "But!"

The "but" here is that these new state-of-the-art GPS satellites (GPS III space craft) are late in getting built and schedules somehow never catch up once they fall behind. And the report says, "Should delivery and launch of the next generation space and control segments be delayed, sustainment of the GPS constellation will be difficult, and the constellation population could fall below the 24 satellites necessary to meet published performance standards." And didn't we turn off LORAN too...?

Imagine if we had to switch to the Galileo System (Europe's answer to GPS), or GLONASS (Russia's answer to GPS) or Compass (China's answer to GPS) to find our place on US waters...?

Stay tuned!

BTW, if you are interested in being part of USCG Forces, email me at JoinUSCGAux@aol.com or go direct to the D1SR Human Resources department, who are in charge of new members matters, at [DSO-HR](#) and we will help you "get in this thing..."