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Coast Guard Aux NEWS ▶

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**Coast Guard
Auxiliary News**



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GPS & The Sun – Flares Coming!

Over the years, we've written quite a bit about GPS technology. Interestingly, other than the first column, (see SSP, "GPS – Gee, How Does It Work?", 1/2/08), the other 5 columns were about what could go wrong and what you could do about it*. Why is that? Well, as the late Arthur C. Clarke once observed, "Technology sufficiently advanced is indistinguishable from magic." Well, when the magic stops, you need to understand how to cope. This column is about that.

Solar Flares

It may be hard to believe but 99.86% of all the mass in our entire Solar System is one object alone – the Sun. So, when things happen there, it is probably going to have an impact, particularly here if only because of our high-technology-based reliance on radio waves of all usable frequencies. On balance, the average day on the surface of the Sun clocks in at 10,000-degrees Fahrenheit. That, as we will learn, is a good day.

Solar flares are, essentially, an explosion in the Sun's atmosphere. When that happens, the surrounding solar atmosphere gets heated up to over 20,000,000-degrees Fahrenheit. That, as the saying goes, is a bad day.



This rips the surrounding atoms to pieces and sends electrons, protons and heavier ions shooting into space at the speed of light... This wave of atomic carnage spans the entire electromagnetic spectrum at all wavelengths, from simple radio waves to extremely high energy gamma waves. This, as scientists are fond of saying, is the problem.

Solar Flare Cycles

As you may know, the Sun has many cycles to it, and one of them is the roughly 11-year solar flare cycle. We are now coming up on the peak of the current cycle. In the two-years ahead ('11-'12), we will likely see a peaking in solar flare activity. Ten to twelve years ago, GPS technology was expensive and far less common than it is today. Now, GPS is virtually everywhere – boats, cars, integrated into EPIRBs, pocket-sized for hikers, etc. Now, as the Fates would have it, we know that based on recent studies that GPS receivers are unexpectedly vulnerable to bursts of radio noise produced by solar flares. When we were at the last peak, GPS was just much less common and the problems were thus minor in relative scope and attention.

The intense bursts of radio noise, caused by the charged particles shooting out from the solar flare at the speed of light, appear to peak in the 1.2 and 1.6 gigahertz bands used by GPS. Normally, radio noise in these bands is very low, so receivers can easily pick up weak signals from orbiting satellites.

This may also be a problem for aircraft navigation as the FAA uses reference GPS receivers on the ground for air traffic control. Although planes can and do fly without GPS, outages will force the FAA to increase the distance and timing between aircraft, delaying flights. GPS is also used to synchronize power grids and cell phone networks. And, of course, we use GPS in our boats (and cars.) We could increase the strength of GPS signals but that would require redesigning GPS satellite hardware and software. I think solving the "Y2K" software problem was easier.

Didn't we just turn off LORAN?

*** The prior articles on GPS technology are:**

1. The Hole in the GPS Sky, 4/29/09
2. My GPS Broke – Oh Jeez... (1 of 4) , 9/23/09
3. GPS is Out! Radio is Out! And I'm WAY Out! Home is..??? (2 of 4) , 2/03/10
4. GPS is Out! Radio is Out! And I'm WAY Out! Home is..??? (3 of 4) , 2/10/10
5. GPS is Out! Radio is Out! And I'm WAY Out! Home is..??? (4 of 4) , 2/17/10

BTW, if you are interested in being part of USCG Forces, email me at JoinUSCGAux2010@aol.com or go direct to John Blevins, who is in charge of new members matters, at FSO-PS@emcg.us and we will help you "get in this thing..."