

Re: GPS under high acceleration

Source: <http://sci.tech-archive.net/Archive/sci.geo.satellite-nav/2007-05/msg00318.html>

- *From:* Sam Wormley <swormley1@xxxxxxxxxx>
 - *Date:* Tue, 29 May 2007 07:08:16 GMT
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Sean Q wrote:

On May 29, 3:35 am, Sam Wormley <sworml...@xxxxxxxxxx> wrote:

Sean Q wrote:

I was given the task of designing the GPS payload on a small sounding rocket. Its task is to record the range/position of the rocket in all phases of flight. It doesn't need to transmit the location, just store it onboard.

The problem that I'm coming across is that it will be traveling at very high acceleration/speed for a short period of time. In the first few stages of flight it will be traveling at 70g and reaching a top velocity of 680m/s, well outside the operational limits of the uBlox GPS receiver.

I understand that I will lose lock with the satellites for a short period of time. It will take around 6 seconds after launch to travel at a speed/acceleration within the operational limits of the Ublox.

After this time would the GPS of traveled to far to reacquire the satellites in Warm Start mode, or will it need to search for the satellites again in Cold Start?

The research I have done said that It needs to travel several km during the loss of satellites to require a restart in Cold Mode, however because the rocket is still traveling at speed (between 180m/s-400m/s)I am unsure how long reacquisition would take. Also are you aware of any examples that I could peruse of

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GPS

receivers operating under similar conditions?

Thanks

Many GPS receivers are restricted in dynamics for military reasons—dynamics not exceeding—

Dynamics:

Acceleration $4g$ (39.2 m/s^2)

Motional Jerk 20 m/s^3

Operational limits

Altitude $< 18,000 \text{ m}$ or velocity $< 515 \text{ m/s}$

Either limit may be exceeded but not both (in non-military GPS receivers).

These restrictions do not apply to the Space Shuttle or LEO satellites making use of GPS signals. You can always build your own receiver without restrictions of any kind.

When you say either limit may be exceeded, so you mean the receiver can travel at 600 m/s but as long as it is below $18,000 \text{ m}$ it will record fine? May I ask where you got this information?

I mean a manufacturer can sell you a receiver for higher than $18,000 \text{ m}$ but still