



GNSS UPDATES FROM THE COMMERCE DEPARTMENT

Jason Y. Kim, Office of Space Commerce
Civil GPS Service Interface Committee
International Information Subcommittee
Munich Satellite Navigation Summit 2019

March 27, 2019

OVERVIEW



Leadership Priorities for Space

- Regulatory Issues
- Outreach to Industry and Students

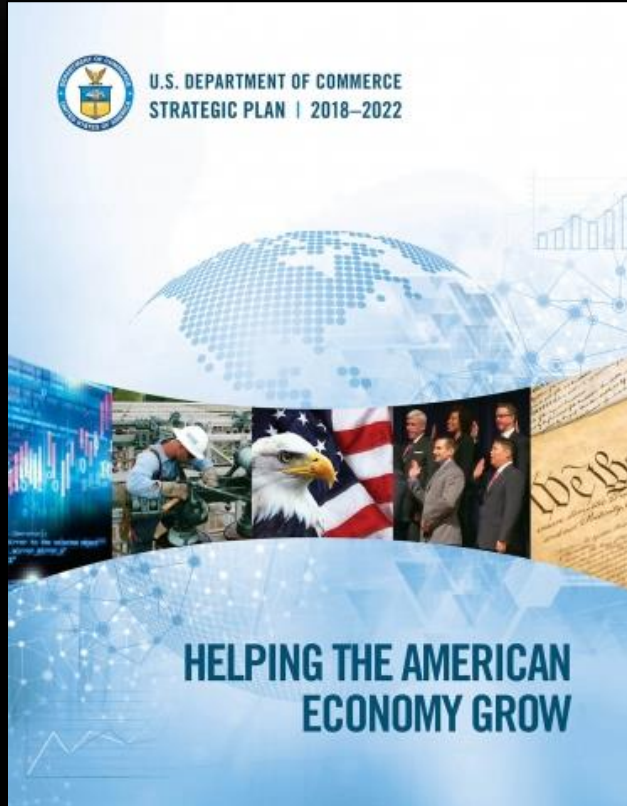
NATIONAL SPACE COUNCIL SPACE POLICY DIRECTIVES



- SPD-1: Reinvigorating America's Human Space Exploration Program
- SPD-2: Streamlining Regulations on Commercial Use of Space
- SPD-3: National Space Traffic Management Policy
- SPD-4: Establishment of the United States Space Force
- *U.S. Space-Based PNT Policy (2004) remains in effect*



STRATEGIC OBJECTIVE 1.1: EXPAND COMMERCIAL SPACE ACTIVITIES



- Expand the Office of Space Commerce
- Actively participate in the National Space Council to advance American leadership in commercial space activities
- Support American companies operating in space

OFFICE OF SPACE COMMERCE



Kevin O'Connell, Director

- Industry Advocacy
 - Domestic
 - International
- Removing Regulatory Barriers
- Industry Engagement
- Improving Analysis and Narratives for the Value of Space
- *Also: Hosting National Coordination Office for Space-Based PNT*

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GPS-GALILEO WORKING GROUP “B” ON TRADE & CIVIL APPLICATIONS

- Considers non-discrimination and trade related issues
- Established under GPS-Galileo Agreement of 2004
 - To avoid measures with respect to GNSS goods and services that could be used as a disguised restriction on or an unnecessary obstacle to trade
- Co-chaired by DOC and DG-GROW
- Met on Monday, March 25

FCC WAIVER FOR GALILEO

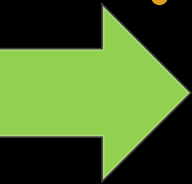
- Granted November 15, 2018
- First waiver of FCC licensing rules under foreign GNSS receiver waiver process established in 2011
- Permits non-federal U.S. receive-only earth stations to operate with specific signals of the Galileo GNSS without obtaining a license or grant of market access
- Based largely on cooperation under GPS-Galileo Agreement
- Request submitted to FCC by Commerce, on behalf of EC, with continual support from State and Commerce
- Benefits all Galileo equipment makers selling in U.S., as well as their customers

RADIO EQUIPMENT DIRECTIVE

- All radio equipment sold in EU must comply with RED for health & safety, EM compatibility, and efficient use of spectrum to avoid harmful interference
- U.S. industry is concerned about the treatment of GNSS equipment under RED
- Industry developed and supports ETSI's harmonized standard for GNSS receivers (EN 303 413, cited Dec 2017)
- But EC directed it be revised to apply radio telecom parameters that aren't appropriate for GNSS devices for determining avoidance of harmful interference
- There is concern that relying on telecom parameters for efficiency will lead to GNSS receivers being required to tolerate greater interference from adjacent bands
- Does European industry share this concern? If so, express to radio regulators and join GNSS efforts in ETSI

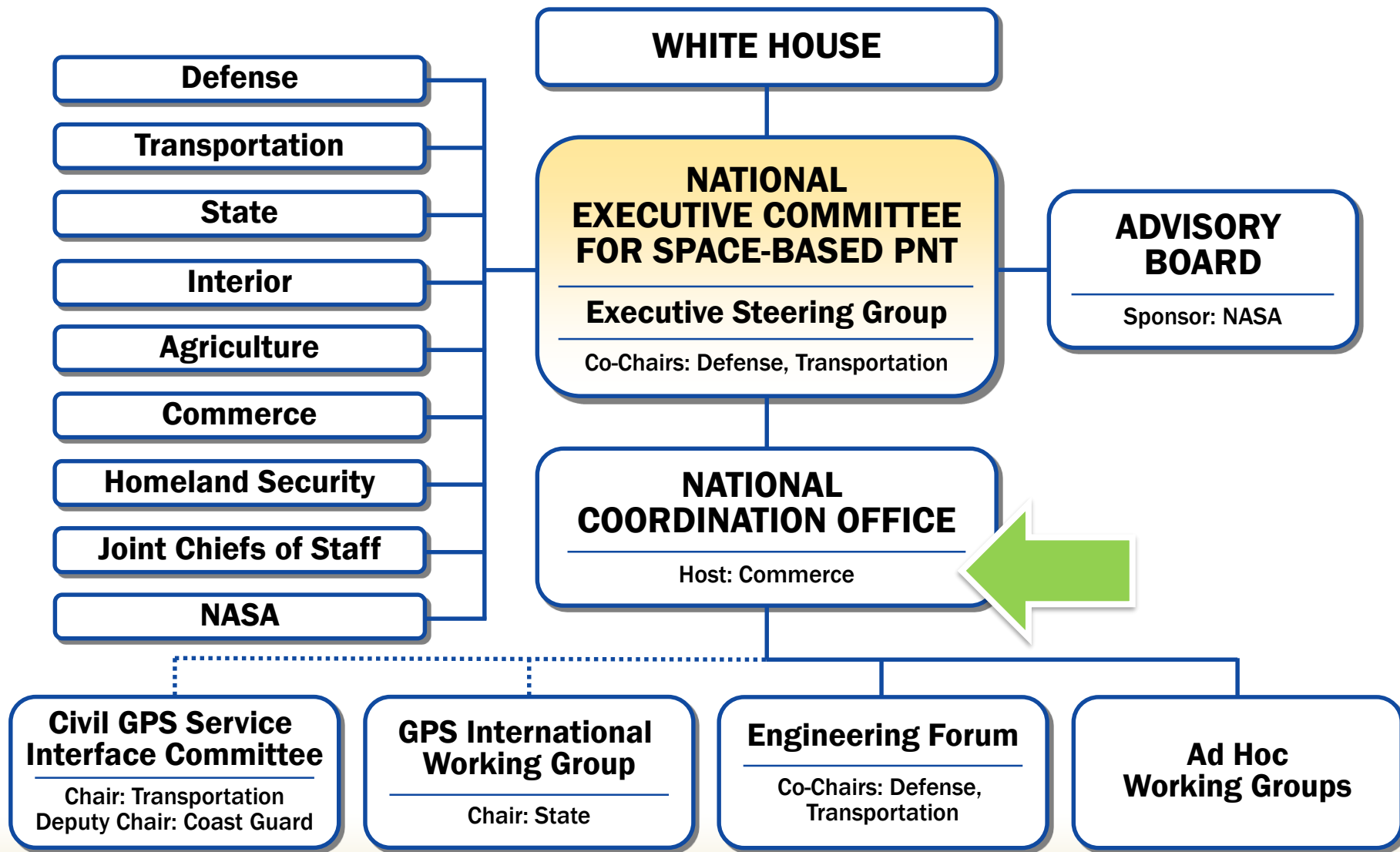
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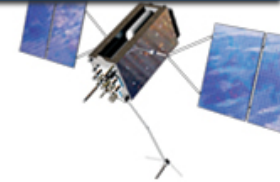


U.S. Space-Based PNT Organization Structure



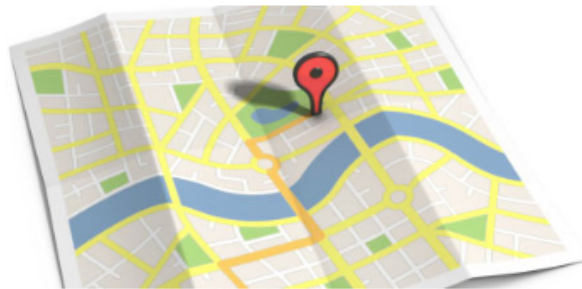
GPS: The Global Positioning System

A global public service brought to you by the U.S. government



INFORMATION FOR THE GENERAL PUBLIC

How to Correct Your Address in GPS Devices, Apps, & Online Maps



Do GPS devices show your home or business in the wrong place? **The problem is not GPS!** It's the mapping software.

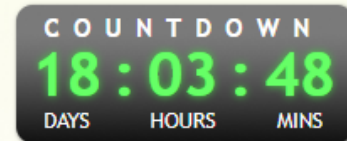
[Report your issue to the software providers](#)

Common Questions →

- How do I add or correct my address in GPS devices, apps, and maps?
- What can I do about trucks driving through my neighborhood?
- How do I report GPS service outages?

FOR GPS PROFESSIONALS

GPS Week Number Rollover on April 6, 2019



The GPS Week Number will reset to zero at 23:59:42 UTC on April 6, 2019. Are your critical time systems ready?

- **NEW** Article from DOE Office of Electricity (energy.gov)
- GPS Equipment Testing Notice (federalregister.gov)
- Memo for U.S. Owners and Operators Using GPS to Obtain UTC Time (us-cert.gov)
- Presentation on GPS Week Roll Over Issue (PDF)
- Interface Specification IS-GPS-200 (3.1 MB PDF)



New Additions to GPS.gov →

- *Mar 1: Advisory board meeting minutes*
- *Dec 12: New GPS III videos*
- *Dec 5: Advisory board presentations*
- *Nov 29: Advisory board meeting agenda*



Guidance for Critical Infrastructures


- **NEW** Time – The Invisible Utility
 - [Corporate Level Info Sheet \(PDF\)](#)
 - [Technical Level Info Sheet \(PDF\)](#)
- [Responsible Use of GPS for Critical Infrastructure - Dec 2017 \(PDF\)](#)
- [Best Practices for Improving the Operation and Development of GPS Equipment Used by Critical Infrastructure - Jan 2017 \(PDF\)](#)
- [Best Practices for Improved Robustness of Time and Frequency Sources in Fixed Locations - Jan 2015 \(PDF\)](#)

Report/Lookup GPS Service Disruptions →



Sample Materials





NCCIC
National Cybersecurity & Communications
Integration Center

NCC
National Coordinating Center for Communications

UNCLASSIFIED
TLP: WHITE

**MEMORANDUM FOR U.S. OWNERS AND OPERATORS USING
GPS TO OBTAIN UTC TIME**

Upcoming Global Positioning System Week Number Rollover Event

This paper is intended to provide an understanding of the possible effects of the April 6, 2019 GPS Week Number Rollover on Coordinated Universal Time derived from GPS devices.

Sponsored by the Department of Homeland Security's National Cybersecurity and Communications Integration Center in coordination with the Department of Homeland Security's Science and Technology Directorate, the Department of Homeland Security's National Protection and Programs Directorate Office of Infrastructure Protection, and the National Coordination Office for Space-Based Positioning, Navigation and Timing. This product is intended to assist federal, state, local, and private sector organizations with preparations for the April 6, 2019 GPS Week Number Rollover event.

SUMMARY: Critical Infrastructure (CI) owners and operators and other users who obtain Coordinated Universal Time (UTC) from Global Positioning System (GPS) devices should be aware of the GPS Week Number (WN) rollover events and the possible effect a GPS WN rollover event may have on the reliability of the reported UTC. The legacy GPS navigation message has a ten (10) bit parameter that represents WN. Thus, the WN parameter in the GPS navigation message "rolls over" to zero every 1024 weeks starting from 0000Z January 6, 1980. The next WN rollover will occur April 6, 2019. The IS-GPS-200H interface specification identifies both the ten bit WN parameter and the WN rollover events. A GPS device that conforms to the latest IS-GPS-200 and provides UTC should not be adversely affected. However, tests of some GPS devices revealed that not all manufacturer implementations correctly handle the April 6, 2019 WN rollover. Additionally, some manufacturer implementations interpret the WN parameter relative to a date other than January 5, 1980. These devices should not be affected by the WN rollover on April 6, 2019 but may experience a similar rollover event at a future date. For example, a particular GPS device may interpret the WN parameter relative to a firmware creation date and would experience a similar rollover event 1024 weeks after that firmware creation date.

UNCLASSIFIED
TLP: WHITE

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CISA
CYBER-INFRASTRUCTURE

DEFEND TODAY. SECURE TOMORROW.

TIME – THE INVISIBLE UTILITY

WHY IS TIME IMPORTANT?

Other It has been said that the world's most commonly asked question is "What time is it?" Accurate and resilient time is critical for sustaining nearly all modern organizations, yet many public and private sector organizations are unaware of their dependence on time. Without access to accurate and resilient time sources, critical functions (including cybersecurity, communications, and internet-connected devices) and critical services (including banking, utilities, and transportation) can become unreliable, inaccurate, or unavailable. Failure to properly manage time can have contractual or regulatory impacts.

SECTORS AND INDUSTRIES DEPENDENT ON TIME

Communications	Transportation	Power Grid	Finance	Security	IT
Telecommunication	Aviation	Frequency Monitoring	Regulatory Requirements	Cryptography	Smart Devices
Cloud Operations	Maritime	Multi-rate Billing	ATM Networks	Access Control	Incident Investigations
Internet of Things (IoT)	Pipelines Rail	Fault Detection		Forensics Surveillance	

WHY IS IT "INVISIBLE"?

Organizations are typically unaware of who or what sets the time on their systems. They assume the time on their systems is correct, or perhaps "correct enough." They may have been right in the past, but as our systems grow in complexity, becoming global and mobile, proper timekeeping on our systems is becoming a necessity in both the private and public sectors worldwide. In the United States, the U.S. Naval Observatory (USNO) and the National Institute of Standards and Technology (NIST) are the principal sources of time.

WHY SHOULD YOU BE CONCERNED ABOUT TIME NOW?

GPS has become the de facto time standard for many commercial users because of its relatively low cost and ubiquitous availability. In 2017, 5.8 billion Global Navigation Satellite Systems (GNSS) devices, such as those using GPS, were in use. By 2020, this number is forecasted to increase to almost 8 billion—an estimate of more than one device per person on the planet.¹ In 1997, the President's Commission on Critical Infrastructure Protection (PCCIP) identified dependence on the Global Positioning System (GPS) as a growing vulnerability within the United States Critical Infrastructure. Since that time, the use of GPS-dependent devices has grown significantly, increasing the risk to critical infrastructure.

¹ GNSS Market Report, Issue 5, copyright © European GNSS Agency, 2017, page 10. Retrieved from https://www.gsa.europa.eu/system/files/reports/gnss_mr_2017.pdf



GPS Educational Resources

For Students and Teachers

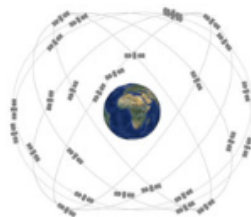


INFORMATION FOR STUDENTS

What is GPS?

The Global Positioning System is a U.S.-owned utility that provides users with positioning, navigation, and timing services.

- [Overview](#)
- [Space Segment](#)
- [Control Segment](#)
- [User Segment](#)



Who Uses GPS?

GPS is an essential element of the global information infrastructure. The technology is in everything from cell phones and wristwatches to bulldozers, shipping containers, and ATM's.



RESOURCES FOR TEACHERS

GPS-Based STEM Curriculum

The U.S. government has released a new curriculum that uses GPS concepts and activities to stimulate student interest in science, technology, engineering, and mathematics (STEM). The curriculum is designed for the middle/high school level and tied to the Next Generation Science Standards (NGSS).

Thanks to all the educators who helped us test the lesson plans in classrooms to see how students respond to the material. Your feedback improved the curriculum prior to its finalization.

We encourage schools, educators, and after-school programs to use this free STEM curriculum during the 2018-2019 school year. The curriculum is currently hosted at www.GPS-STEM.com, but we plan to migrate it to GPS.gov in the future.

[Check out the curriculum at GPS-STEM.com](http://www.GPS-STEM.com) →





GPS-Based STEM Curriculum



- **Uses GPS concepts & applications to stimulate student interest in STEM**
- **Designed for middle school**
- **Highlights STEM careers and diversity**
- **Low/no-cost classroom activities**
- **Maps to Next Generation Science Standards (NGSS) and Common CORE**
- **Inquiry based learning using stories, videos, etc.**



Curriculum Structure



Courses	Lessons (3 Per Course)		
Earth	Are we there Yet? Mapping it out with Longitude & Latitude	Do you read me? Radio, Magnets & Information Transfer	I'm on my way! Navigation & Global Positioning System
Space	Launching Explorations Satellites & Orbits	Living Weightless: International Space Station	Orbital Rendezvous: Calculating Resupply for ISS
Life	Baby is it Cold Outside? Weather Forecasting	Saving Mother Nature: Environmental Conservation	Feed the World: Agriculture & Precision Farming
Movement	Up Up & Away! Aviation Moves Us	Networks of Power: Energy & Information	Global Supply Chain: Planes, Trains & Automobiles



Sample Materials



Are We There Yet?!

Get 3 classmates and plan a trip from here to Orlando, FL...you're going to Disney World!

To plan your trip, what will your team need to determine?



- What are your Longitude and Latitude right now?
- What are the Longitude and Latitude of Orlando, FL?
- How long will you drive before taking a break? Where will that be?
- Using your map and a ruler, calculate the number of miles that you will need to drive to get to Orlando
- Given that ***Distance = Time x Speed***, how long will it take to drive there if you travel an average of 60 miles per hour when driving (remember your breaks!)?

Version 1.0



Sample Materials



GEOID & ELLIPSOIDS:

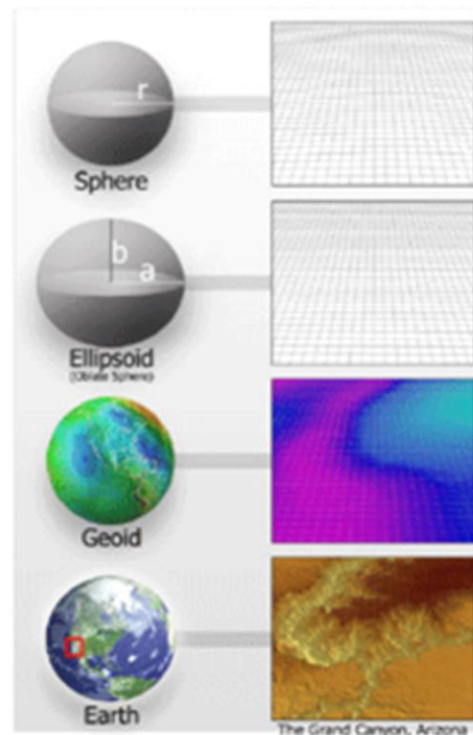
The Earth is an imperfect sphere

-It is Nearly Impossible to measure the surface of the Earth due to the irregularities such as mountains or valleys; and the rise and fall of the ocean tides

-To compensate, scientists use theoretical models: Geoids and Ellipsoids

Let's do an exercise...
Punching out the globe!

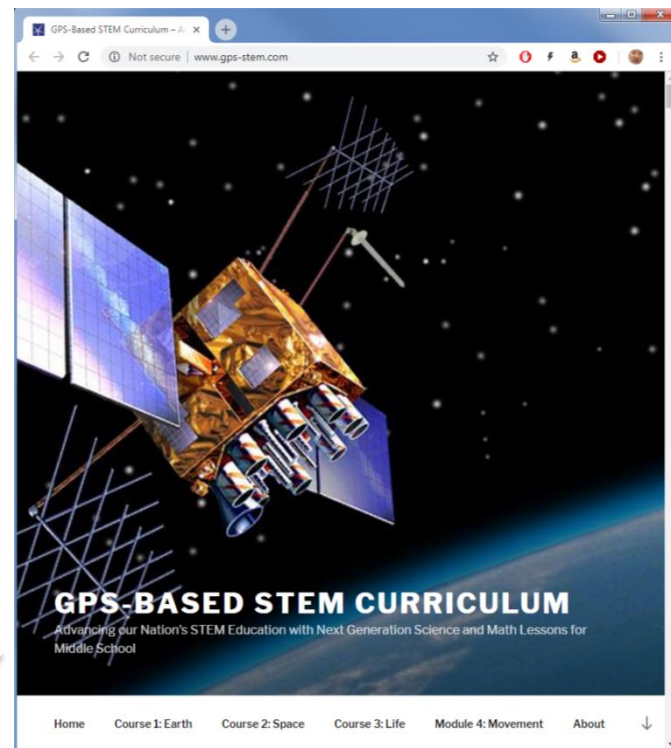
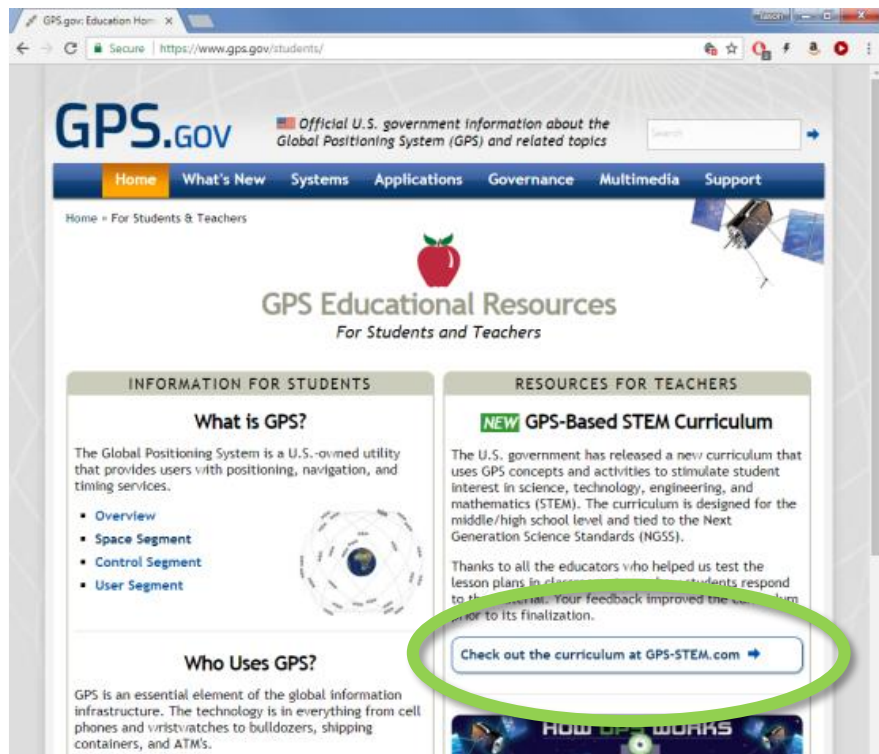
[POTENTIAL BREAKPOINT FOR CLASS SESSION AFTER THE EXERCISE]



Version 1.0



Check It Out



GPS.gov/students

**GPS-STEM.com
(temporary URL)**

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