

TECH: Satellite Technology (Communications) Module

Summary

A new pdf. update in April 2012. Students will learn basic concepts about what a satellite is and how satellites work using print and web based media. Students will be able to understand how satellites are used and how they impact their life.

Time Frame

2 class periods of 45 minutes each

Group Size

Pairs

Life Skills

Thinking & Reasoning, Communication, Systems Thinking

Materials

1. Computer with Internet Access 2. Software *Internet Browser - such as Internet Explorer *Java *Google Earth *Analytical Graphics, Inc. - free software addition for Google Earth labeled KMZ (which is a file extension for keyhole markup language)

Background for Teachers

The curriculum has been redesigned as a web-based learning tool in 2012. Students are to figure out where to put a new communications satellite in the Clark Belt. They have to evaluate all the potential collisions that could occur with satellites in orbits currently from their launch site. It uses NASA J-tracker 3D and AGI's free data on satellites in a keyhole markup language (KMZ) for Google Earth. When students arrive for class, the teacher will need to have printed copies of the first 14 pages of this booklet out to read. The booklets can be bound with a paper binding and stapled together. The software will need to be loaded on computers. It is suggested that the teacher be familiar with the software programs J-tracker 3D, and Google Earth. The images on this document come from a variety of sources. They are either public domain, royalty fee, created by the author, or used by arrangement with the copyright holders. No permission is granted for the copying or re-use of any images used in this document, copyrighted or otherwise. Satellite Technology© USOE has purchased rights to the document which gives individual teachers within the state of Utah rights to print this document for use in their classes.

Student Prior Knowledge

Students will need to be able to use a computer, and locate their own state or province on Google Earth or NASA's J-Tracker 3D.

Intended Learning Outcomes

Practice problem solving skills and explore ways to develop independence and take responsibility. Explore Communication technologies used in our world. Use career information to explore various occupations of personal interest. Practice skills to function effectively in a group. Identify school courses that support career interests.

Instructional Procedures

1. Students read the booklet and answer the first 10 questions of the booklet while reading. 2. Students follow the directions in the booklet and determine where to place their satellite in the Clarke Belt. They use NASA's J-tracker 3D to access this placement. 3. Students open up the AGI data file for Google Earth and follow the steps in the booklet to determine if there are any potential risks with satellites currently in Low Earth Orbit (LEO) 4. Students answer the worksheet questions as they complete the tasks of their investigation.

Strategies for Diverse Learners

The computer can be set to read the pages of the curriculum to the non-reader, struggling reader, or Special Needs Student. The document will need to be downloaded and saved to the computer. Then open the document up from the file on the computer. Acrobat 7 Reader is required for this. To have the computer read the entire document use Shift+Ctrl+B. To read 1 page of the document the shortcut is Shift+Ctrl+V.

Extensions

If some students finish early, students may need a goal such as determining the space station's current longitude and latitude in human space flight pages where the International Space Station is observed: <http://spaceflight.nasa.gov/realdata/tracking/>

Assessment Plan

Students receive a grade for completing the worksheets. The answers to first set of questions are from the booklet. The answers to the 2nd set of questions are from their investigation of NASA J-tracker and Google Earth with the AGI satellite data and the booklet.

Bibliography

REFERENCES: Bailie, C. (Photographer) U. S. Air Force. (September 3, 2003) Delta launch [Photograph] Image# 030903-F-0000S-001 Retrieved on February 28, 2012 from <http://www.af.mil/shared/media/photodb/photos/030903-F-0000S-001.jpg> Brusich, S., Fales, J., Kuetemeyer, (1999) Technology today & tomorrow (p.22). Peoria: Glencoe/McGraw-Hill Bureau of labor statistics, Atmospheric scientists, U.S. department of labor, Occupational Outlook Handbook, 2012-13 edition, Retrieved March 29, 2012, from <http://www.bls.gov/ooh/Life-Physical-and-Social-Science/Atmospheric-scientists-including-meteorologists.htm> Bureau of labor statistics, Physicists & astronomers, U.S. department of labor, Occupational Outlook Handbook, 2012-13 edition, Retrieved March 29, 2012 from <http://www.bls.gov/ooh/Life-Physical-and-Social-Science/Physicists-and-astronomers.htm> Bureau of labor statistics, Telecommunications Equipment Installers and Repairers Except Line Installers, U.S. department of labor, Occupational Outlook Handbook, 2012-13 edition, Retrieved March 29, 2012 from <http://www.bls.gov/ooh/Installation-Maintenance-and-Repair/Telecommunications-equipment-installers-and-repairers-except-line-installers.htm> Careeronestop, U.S. department of labor, Atmospheric and Space Scientists, America's career infonet, 2010 statistics, Retrieved March 3, 2012 from http://www.careerinfonet.org/occ_rep.asp?next=occ_rep&Level=&optstatus=011111111&jobfam=19&id=1&nodeid=2&soccode=192021&stfips=49&x=72&y=15 Curtis, A., (n.d) Q 'n A, answers to your questions, have there been any earth-orbiting satellites or manned shuttle flights that have orbited the earth around the poles, rather than the equator? Space today online, Retrieved January 14, 2006, from <http://www.spacetoday.org/Questions/PolarSats.html#SatAltitudes> Curtis, A., (n.d.) What is the Orbit of a Satellite? Space today online, Retrieved January 14, 2006, <http://www.spacetoday.org/Satellites/SatBytes/SatOrbits.html> Discovery channel school. (2000). Satellite technology. [Video Tape #760173]. United States: Discovery Communications Gilchrist, M., Gottschalk, S. (August 1, 2002) . Satellite command & control training for the 21st century, [Electronic

version]. Air & space power chronicles : Chronicles on-line journal, Retrieved January 14, 2006 from Air & Space Power Chronicles web site: <http://www.airpower.maxwell.af.mil/airchronicles/cc/gilchrist.html> Jones, R., & Robb, J. (1986). Communication & technology. In *Discovering technology communication* (pp. 18 - 23). Orlando: Harcourt Brace Jovanovich.

Kelso, T. S. (May 20, 2011). Chinese ASAT test. Technical Summary, Center for Space Standards & Innovation, Retrieved March 14, 2012 from <http://celestrak.com/events/asat.asp>

Meares, M., (Photographer) Schriever Air Force Base. (February 4, 2004). Controlling satellites [Photograph] Image# 040205-F-0000C-001, Retrieved on March 28, 2012 from <http://www.af.mil/shared/media/photodb/photos/040205-F-0000C-001.jpg>

Meinhardt, M. (Photographer), (January 21, 2007), Sattruck [Photograph] Retrieved January 14, 2012 from <http://en.wikipedia.org/wiki/File:Sattruck.jpg>

NASA (n.d.) Electromagnetic Spectrum [Illustration] Retrieved January 21, 2012 from <http://science.hq.nasa.gov/kids/imagers/ems/>

NASA (June 2008) History of on-orbit satellite fragmentations, 14th Edition, NASA/TM--2008-- 214779, Orbital Debris Program Office, Retrieved March 31, 2012 from <http://orbitaldebris.jsc.nasa.gov/library/SatelliteFragHistory/TM-2008-214779.pdf>

NASA (May 23, 2010), International Space Station, [Photograph] Human Space Flight, STS-132 Shuttle Mission Imagery, Image# S132-E-012208 Retrieved February 11, 2012 from <http://spaceflight.nasa.gov/gallery/images/shuttle/sts-132/hires/s132e012208.jpg>

NASA / Jet Propulsion Laboratory. (November 1, 1990). Earth & moon, [Photograph] Image #PIA00342, GRIN database #: GPN-2000-001437., Retrieved on January 28, 2006 from NASA GRIN web site: <http://grin.hq.nasa.gov/ABSTRACTS/GPN-2000-001437.html>

NASA (March 2012) Orbital debris frequently asked questions, NASA orbital debris program office, Retrieved March 10, 2012 from <http://orbitaldebris.jsc.nasa.gov/faqs.html>

NASA Orbital Debris Program Office (February 13, 1997). An impact that completely penetrated the antenna dish of the hubble space telescope. [Photograph] Image# S82E5206, Retrieved March 28, 2012 from <http://orbitaldebris.jsc.nasa.gov/photogallery/gallerypage/HstAntenna.JPG>

NASA Orbital Debris Program Office (n. d.). Goldstone. [Photograph] Retrieved March 28, 2012 from <http://orbitaldebris.jsc.nasa.gov/photogallery/gallerypage/goldstone.jpg>

NASA (n.d) Sputnik 1 [Photograph] National Space Data Center, Retrieved January 21, 2012 from http://nssdc.gsfc.nasa.gov/planetary/image/sputnik_asm.jpg

Oberg, J. (March 17, 2008). Satellite turns 50 years old ... in orbit!, MNSBC.com, Retrieved February 11, 2012 from http://www.msnbc.msn.com/id/23639980/ns/technology_and_science-space/t/satellite-turns-years-old-orbit/

Pearlman, R. (September 05, 2008). Realtime satellite tracking via Google Earth, Collectspace.com, Retrieved February 4, 2012 from <http://www.collectspace.com/ubb/Forum33/HTML/000477.html>

Peterson Air Force Base. (December 8, 2011). 20th SPCS radar [Photograph] Image# 111205-F-ZZ987-003, Retrieved on March 28, 2012 from <http://www.peterson.af.mil/shared/media/photodb/photos/111205-F-ZZ987-003.jpg>

United States Strategic Command, (December, 2011). USSTRATCOM space control and space surveillance, Retrieved March 3, 2012 from http://www.stratcom.mil/factsheets/USSTRATCOM_Space_Control_and_Space_Surveillance/

U. S. Air Force. (December 18, 2006) 6th SOPS delivers critical weather data to warfighters [Photograph] Image# 061218-F-1234M-020, Retrieved February 28, 2012 from <http://www.af.mil/shared/media/photodb/photos/061218-F-1234M-020.jpg>

U. S. Airforce. (October 28, 2010) Space fence [Illustration] Image# 101026-F-0672C-100, Retrieved February 28, 2012 from <http://www.af.mil/shared/media/photodb/photos/101026-F-0672C-100.jpg>

Utah vocational core curriculum. (1986). Satellite technology. Salt Lake City: Utah State Office of Education

Utah vocational core curriculum. (1992). Satellite technology. Salt Lake City: Utah State Office of Education

Volb, G. A. (Photographer) U. S. Air Force. (January 24, 2008) Weather watchers [Photograph] Image#080117-F-5248V-202, Retrieved on March 31, 2012 from <http://www.af.mil/shared/media/photodb/photos/080117-F-5248V-202.jpg>

Wall, M. (April 5, 2011). Space junk threat will grow for astronauts and satellites, Space.com, Retrieved February 11, 2012

from <http://www.space.com/11305-space-junk-astronauts-bigger-threat.html> Welsh, J. (December 5, 2007), Chinese ASAT test, Center for Space Standards & Innovation, Retrieved March 1, 2012 from <http://www.centerforspace.com/asat/> Zaitsev, Y. (Aug 15, 2007) Nuclear power In space, Space daily, Retrieved February 4, 2012 from http://www.spacedaily.com/reports/Nuclear_Power_In_Space_999.html

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