



Space Careers Wayfinder

Satellites: The eyes in the sky

Background: Part A

From the smallest satellite in space, the Kalamasat, to the largest, the International Space Station, the movement of these Earth orbiting craft needs to be carefully monitored in order to avoid a catastrophic and costly collision.

There are an estimated half a million objects in Earth orbit today¹. The nature of these ranges from debris from collisions between orbiting craft and debris from deliberately targeted craft, up to fully operational craft. Saber Astronautics is just one of the many private companies joining governments efforts to track these objects. Their Terrestrial and Astronomical Rapid Observation Toolkit (T.A.R.O.T.) gives users some idea of the scale of the problem.

As society depends increasingly on the services provided through satellite technology, governments and private enterprise are scrambling to stay apace of the demand. The need to monitor the ever-increasing use of space has never been greater. The Union of Concerned Scientists (UCS) have compiled a satellite database (excel format) containing comprehensive details of satellite launches since September 1988 to Apr 2022².

The task

Use the UCS spreadsheet to complete the following:

1. From the Date of Launch data in the spreadsheet produce a column chart illustrating the number of satellites launched per year from 2002 to 2022.

¹ https://www.nasa.gov/mission_pages/station/news/orbital_debris.html

² <https://www.ucsusa.org/resources/satellite-database>



2a. Categorise the satellite data based on their purpose as listed in the database. Order the data in a table with the most common purpose to the least common.



2b. What percentage of the total satellites launched between 1988 and 2002 are owned or operated by Space X?



3. The UCS spreadsheet also lists the number of countries operating/owning satellites. Choose a suitable format to display the ten operator/owner countries with the highest number of listed satellites in the database.



Background: Part B

Around 20% of the satellites listed on the UCS satellite database are used for Earth Observation (EO). The data and images collected by EO satellites varies, from monitoring changes to the environment to particulate measurements in the atmosphere. Our understanding of the planet's health and ecosystems is mainly derived from the data collected from space.

A considerable amount of data and images recorded using satellites is freely available through a number of online platforms. In this activity we will use two of these platforms, Google Earth Pro (desktop version of Google Earth) and World Imagery Wayback. Both platforms have similar tools and properties along with a couple of options specific to each platform.

The activity uses historical images collected over several years to follow the establishment and growth of the Za'atari refugee camp (<https://www.unhcr.org/news/stories/jordans-zaatari-refugee-camp-10-facts-10-years>) in the Middle east country of Jordan. The refugee camp is the world's largest camp for Syrian refugees.

The task

1. Open Google Earth Pro. Search Za'atari Refugee Camp. Zoom in to the camp. Use the tools available on the platform to answer the following.
 - a. What are the coordinates for the structure which appears to be a solar farm located south of the main camp?



- b. What year did this structure first appear?



- c. What is the approximate area and perimeter of the refugee camp?



- d. The UNHCR recommend an average area per person of 45 m² in refugee camps. At its peak, the Za'atari camp held 120,000 refugees. Did the camp meet the recommended area per person during that period? The estimated number in the camp is now 80,000 refugees. Does the current number meet the UNHCR recommendation?



- e. The Melbourne Cricket Ground (MCG) covers an area of around 20,000 m². How many MCGs would fit within the area covered by the Za'atari Refugee Camp?



2. Open [World Imagery Wayback](#) Type in Mogo, NSW in the 'Find address or place', and open the link which appears. Using the timeline down the left of the screen answer the following.

One useful feature of the World Imagery Wayback platform is the Toggle Swipe Mode. This allows users to select two different dates and compare changes between the two dates. As an example, the area around Mogo in NSW was severely affected by the bushfires in late 2019. The fire damage captured in an image from an Earth Observation satellite is not that obvious when viewed alone. By selecting dates prior to the fire and after the fire passed through, the impact is far more apparent.

- a. Using the Toggle Swipe Mode, identify which of the 'before and after' dates give the clearest indication of fire damage. **NOTE** The actual date the image was captured is revealed by right clicking on the satellite image either side of the toggle.



- b. Imagine you are a member of the emergency services monitoring the fire behaviour using live satellite images. What advice would you have given to anyone planning to use Mitchells Road while the fire was burning in the area around Mogo?



- c. The owners of Mogo Zoo (Wildlife Park) were justifiably concerned for the welfare of their animals. What man made structure may have provided a break between the zoo and the area impacted by the fire?



³ <https://www.unhcr.org/news/stories/jordans-zaatari-refugee-camp-10-facts-10-years>