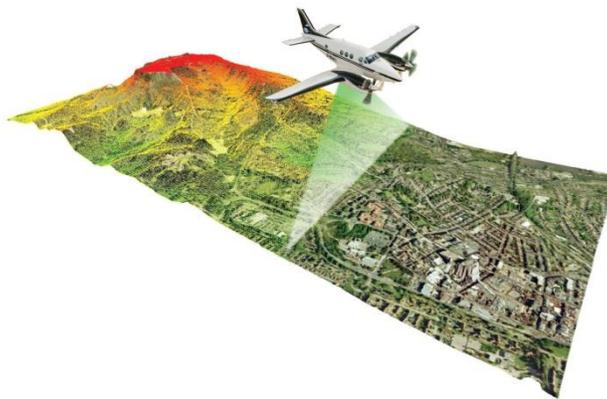


NEON is a government program that is dedicated to observing land areas across America and tracking their plant life and terrain. I have recently had the honor of going on a tour of a [NEON](#) (National Ecological Observatory Network) outpost with the Young Aviators group to see the Twin Otter aircraft there. They are still in the start-up phase, in which they collect the first data samples, setup field sites, and test equipment. The tour consisted of four parts: an explanation of LiDAR, an explanation of the imaging spectrometer, how they were operated in flight, and a look around the airplane.

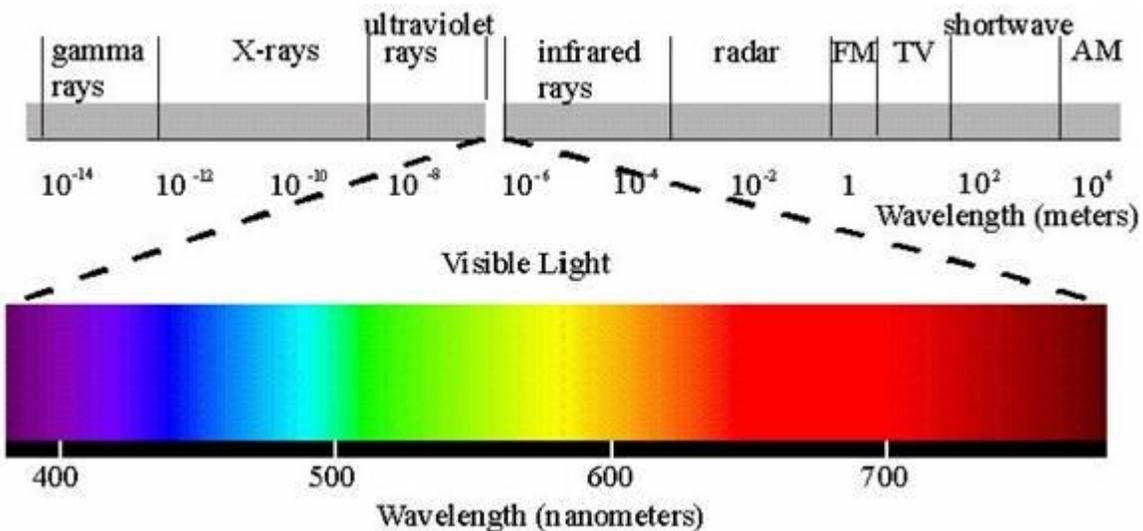
The first part of my group's tour was an explanation of LiDAR (Light Detection And Ranging). It is just like radar and sonar, but uses light waves instead of radio or sound. It works by sending out a laser to the ground in a swath below the airplane. By timing how long it takes for the laser to come back, it is possible to tell how far away things are (longer return time=further away).



LiDAR

The other instrument used for surveying is called an imaging spectrometer. It is a really powerful camera that takes in 425 light wavelengths at once, including infrared and ultraviolet. (Our eyes and smartphone cameras take in only visible light, which is three light wavelengths: red, blue, and green.) The amount of data this produces is huge, about one terabyte per four hours of operation. The imaging spectrometer was built by NASA, and is being tested in the NEON Twin Otter before possibly being used in satellites. The imaging spectrometer also has to be cooled to -200 degrees Fahrenheit. This requires the spectrometer to be powered externally when the airplane is not running. In order for the airplane to function properly the instrument cannot be disconnected from power for more than eight minutes. This can be problematic when

airports need to move the airplane away from power or when switching to external power.



The Light Spectrum

Using the LiDAR and the spectrometer accurately also requires a GPS (Global Positioning System) to track the exact location of the airplane, and an IMU (Inertial Measurement Unit) to account for the movement of the airplane in flight. The other difficulty of using the instruments is that they require an altitude of 1000-3000 feet above ground level, too high and the data becomes imprecise, too low and it will take a very long time to survey one area. This becomes difficult when the airplane is surveying mountainous regions.

The Twin Otter is a twin engine turboprop aircraft that can usually seat nineteen people. It is made to takeoff from particularly short runways, making it a good cargo aircraft for remote areas. It is also an effective medevac aircraft and is used by [smoke jumpers](#) and skydivers. . The aircraft cruises at a somewhat slow 170 to 180 MPH, compared to the 500-600 MPH of commercial aircraft. The NEON plane is modified to hold five crew and the data collection equipment.



A Twin Otter