



# Brainwaves

## Analyzing Brainwaves to Keep Pilots Sharp



Dayton, OH (Wright-Patterson Air Force Base)—  
 Scientists connect pilots to EEG machines so they can study their brainwaves while they use a flight simulator. They can determine when a pilot is overloaded or working too hard. The scientists are developing a computer-assist system that can assess the pilot and provide assistance during times of stress.

*"The brain is made up of millions of neurons—individual little cells that work together to actually accomplish tasks."*  
**James Christensen, research psychologist**

Framework	Standards
Middle School	<ul style="list-style-type: none"> <li>NSES - C.i.4 ➤ Specialized cells perform specialized functions.</li> <li>NSES - C.iii.3 ➤ Behavioral response to an environmental stimulus requires coordination at many levels.</li> <li>STL - 3.F ➤ Knowledge from other fields (neurology/computer science, for example) has an effect on the development of technology.</li> <li>STL - 4.D ➤ Technology affects human safety.</li> <li>STL - 17.H ➤ Communication systems allow information to be transferred.</li> </ul>

### Content Illustrated

➤ Neurons are cells in the brain that send signals to each other as part of the nervous system.



# Content



## Life Science

- The brain is made of millions of neurons - individual cells that work together to accomplish tasks. As neurons communicate with each other, they generate tiny electrical signals. When many neurons are working together, the electrical signals are strong enough to be detected by electrodes placed on the head.
- Brain activity increases especially in stressful situations. If you are stressed and overloaded, your brainwave patterns change.
- A pilot is more likely to be overstressed during take off, landing, or unexpected events. During those times, there is more variation in brainwaves and eye movement.
- Different parts of the brain control different functions.
- Visual processing takes place in the back of the head, decision making or thinking hard takes place in the front of the head.

## Technology

- Electroencephalographs (EEGs) read the brain's electrical signals via electrodes and graphically represent them as brainwaves.
- An electrode cap placed on head has 19 electrodes. Electrodes can also be placed on the face to measure eye movement.
- Brainwaves can be measured while a pilot is in a flight simulator or while directing an actual UAV (unmanned aerial vehicle).

## Engineering

- Engineers analyze brainwaves from stressful situations to help discover how to help a pilot during flight.

## Guiding Questions

*To think about as you watch:*

- Do you notice changes in your behavior or thinking when you are stressed out vs. when you are relaxed? Describe the differences. When are you working at your best?
- What are some physiological responses to stressful situations?

## Suggested Activities

- Research other measures of electrical activity in the body, such as EKG's (record of heart activity).
- Compare brainwave graphs of a person in different stages of sleep (REM, deep sleep).

## Keywords

brainwaves  
electrodes  
electro-encephalo-graph (EEG)  
heart rate  
neuron  
unmanned aerial vehicle (UAV)

- *Brainwaves* can be found online at [www.ndep.us/Brainwaves](http://www.ndep.us/Brainwaves). Visit [www.ndep.us/LabTV](http://www.ndep.us/LabTV) for a list of process skills modeled in webisodes.