**Catching the Perfect SAR Waves – Understanding the Problem**

**ANSWER KEY**

1. What is a wave?

**A wave is a continuous oscillation of energy in space time.**

1. ****Draw wave with a low frequency and one with a high frequency.
2. List the seven electromagnetic radiation waves in order from low frequency to high frequency.

**Radio, Microwave, Infrared, Visible, Ultraviolet, X-ray, Gamma Ray**

1. For each wave listed above, approximate the size of each wavelength in terms of an object.

**Buildings, Humans, Honey Bee, Pinpoint, Protozoans, Molecules, Atoms**

1. What does the acronym RADAR stand for?

**Radio Detection and Ranging**

1. Draw a diagram of how a radar system works. Use the keywords transmitter, receiver, antenna, target, and radar display to label your drawing.

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**A Radar System is composed of an antenna, a transmitter, a receiver, and a display. The transmitter produces an RF pulse of energy that is propagated by the antenna. A receiver captures, amplifies, and demodulates the backscatters. The radar image is displayed on the indicator.**

1. What is the difference between Synthetic Aperture Radar and Inverse Synthetic Aperture Radar?

**In the synthetic aperture radar model, the radar is mounted onto a flying**

**platform and sends radio waves to ground targets. For inverse synthetic**

**aperture, the radar is stationary and sends radio waves to moving targets.**

1. Fill in the missing word: Essentially, radar systems are \_\_\_\_\_\_\_\_\_\_\_\_\_\_ calculating devices.

**Distance**

1. The Pythagorean Theorem is only applied to what type of angles?

**Triangles with one 90 degree angle – Right Triangles**

1. Give the formula for the Pythagorean Theorem, the representation of each variable, and what we can use it for.

**a² + b² = c²**

**a, b are the short legs and c is the hypotenuse of a right triangle**

1. In your own words, restate the problem in slide number 11 (Rise to the Challenge).

**We are NASA aviation engineers asked to construct, calibrate, and evaluate**

**the latest Radar system design within four days.**

1. List the engineering technologies that electrical engineers use to design SAR systems.

**Electrical engineers use electronics, electromagnetics, and image processing technologies to design SAR systems.**

1. Given that SAR technology provides structural information to geologists and target information for military operations, what other functions may SAR technology provide? Consider a gulf coast oil spill.

**SAR technology provides information on oil spill boundaries on water to environmentalists.**