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8891 Airport Road C-2, Blaine MN. 55449

Fifth Year of Publication

THE EDUCATION COORDINATOR OCTOBER 8, 2015



RADAR is a device that sends out radio waves for finding the position and speed of a moving object. The term is an acronym for “**R**adio **D**etection **A**nd **R**anging”, the U.S. Navy code to describe secret development conducted in 1939.

Short pulses of radio energy—key to the advancement of modern radar systems.

Radio Detection And Ranging was not a new idea. In 1862 Scottish physicist **James Clark Maxwell** predicted through his experiments and equations the existence of electromagnetic waves and radio waves. In 1868-1888 a German physicist **Heinrich Hertz** conducted a series of experiments that proved Maxwell’s theory. Hertz showed that the nature of these energy waves are similar to visible light in their ability to be reflected, refracted, and polarized. **Christian Hülsmeyer** demonstrated the use of radio echoes to protect shipping in bad weather but never developed his equipment further due to the lack of interest by naval authorities. In 1899 **Guglielmo Marconi** had conducted radio beacon experiments. In a 1922 paper submitted before the Institute of Electrical Engineers in London, he concluded that a transmitted beam of reflected waves could be transmitted across country or used on shipping lanes to reveal the presence and location of other ships. By 1915 **Robert Watson Watt** began his investigation of atmospheric phenomena and during the next 20 years developed ways to track thunderstorms using radio waves generated by lightning strikes detected by a directional antenna and display oscilloscopes. In 1927 Radio Research Station and the Department of Scientific and Industrial Research were formed in the United Kingdom. Watt’s was appointed Superintendent of Radio Research Station.

On February 12, 1935, Watson Watt sent the Air Ministry a secret report titled “The Detection of Aircraft by Radio Methods”. On June 17, 1935, radio-based detection and ranging was first demonstrated in Britain credited to the Radio Research Station team of Watt, Wilkins and Bowen.

Radar was patented in Britain in April 1935

The ASP-4 was an airborne light-weight, pod-mounted continuous-wave search Radar which was suitable for Airborne Interception (AI) or Air-to-Surface-Vessel (ASV) applications. This was a very advanced system that was first used by the U.S. Navy on carrier-borne aircraft F6F Hellcat and F4U-2 Corsair. The Radar dish could scan from side to side for (AI) applications and could be controlled to look up and down enabling search for surface vessels below (ASV) and aircraft from above.



ASP-4 Search Radar



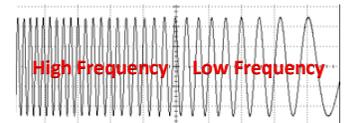
Pod mounted ASP-4

There are now many radar technologies

Physicists and engineering pioneers in the fields of Geophysics, electromagnetism, radio waves and theory of light provided discoveries and insights but were limited in further development by the lack of available material and technology of their time.

Physicist **Christian Andreas Doppler** in 1842 first described the frequency of light and sound and how these waves are affected by the motion of the source of sound and its relationship to the receiver. This phenomenon became known as the “Doppler Effect”. The experimental works of Christian Doppler are the key components in the advanced modern day Doppler technologies.

A listener watching as a speeding vehicle or airplane goes by will hear sounds attributed to the **Doppler Effect**.



At a stationary location the listener will become a receiver of a small wavelength and high frequency sound as the vehicle approaches. As the vehicle moves away it produces a long wavelength with low frequency sound. The Doppler Effect is the bases for a specialized Doppler radar that bounce microwave signals off a target and then analyze the returning signal to produce velocity data about the object at a distance and is used in aviation, police speed guns, radiology, healthcare and defense.

Pulse-Doppler radar systems combine the features of continuous-wave and pulse-radar. Pulse-timing techniques will determine the range of a target and the Doppler Effect of the returned signal is used to determine velocity of the target. Doppler techniques filter out the returned reflection of unwanted ground signals to reveal aircraft and vehicles. Most modern weather radar uses the Pulse-Doppler technology in meteorological radar that can determine wind speed from the velocity and direction of any precipitation in the air. Other radar techniques have been developed for aircraft and satellite-mounted imaging such as Synthetic-aperture radar (SAR) with its origins from an advanced form of side-looking airborne radar (SLAR) that uses the motion of the radar antenna to produce high resolution images of landscapes. Widely used medical intervention applications of Doppler take the form of ultrasound used in most diagnostic examinations.

An asteroid has been named for Christian Doppler discovered in 1984 by A. Mikos at Klit’ Czech Republic. 3905 Doppler

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Principal: John Philips CEMS Coordinator: Jennifer Birkmeier
CEMS offers students an opportunity to explore engineering and provides a strong foundation in math and science.

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University Avenue Aerospace, Children's Engineering and Science is a K-5 magnet School in Anoka-Hennepin District. Having a STEM focus and specializing in aerospace, the school approaches student learning in a unique way by utilizing it's aerospace theme to better engage and excite its nearly six hundred highly diverse learners. University Avenue ACES is also part of the Northwest Suburban Integration School District, which is a consortium of eight districts in the northwest metropolitan area. This allows those within these districts to enter magnet schools through a lottery process and also obtain transportation. Being a neighborhood school first, about 10% of University Avenue ACES is lottery based.

University Avenue ACES follows the rigorous Anoka-Hennepin district curriculum but has woven the specialty focus throughout core curriculum areas, as well as through special added-value events and partnerships including, but not limited to, working with such groups as the Anoka-County Blaine Airport and their Blaine Airport Promotion Group (BAPG), Civil Air Patrol (CAP), Jackson Middle School Observatory (JMO), STARBASE MN, and National Aeronautics and Space Administration (NASA). These experiences and partnerships work to narrow the opportunity gap that exists among our economically diverse student population, while engaging all of our students in hands-on, real-world, problem & project based collaborative learning.

Recently, University Avenue ACES has been recognized by the Magnet Schools of America, a national organization, as a *Magnet School of Excellence*. This is the top merit award category and is only awarded to a select group of magnet schools in the country. In 2014 the Metropolitan Airport Commission recognized University Avenue ACES for their promotion and support of the Anoka County Airport. Multiple articles have been written about the school in both district and local newspapers, as well as in the Minnesota Flyer Magazine.
Provided by University Avenue ACES

S.T.E.M.

SCIENCE • TECHNOLOGY • ENGINEERING • MATHEMATICS
The four parts of STEM have been taught separately and most of the time independent from each other for years. By adopting the STEM philosophy Science, Technology, Engineering, and Mathematics all play an integral part in the teaching of the whole. The science, engineering, and mathematics fields are made complete by the technology component that provides a creative and innovative way to problem solve and apply what has been learned. Many STEM education program participants are using highly specialized professional applications at very early ages. Programs that are usually reserved for college-level classes such as computer animation and CAD programs are being implemented in high school classrooms across the country as part of the STEM education initiative

STEM
SCIENCE • TECHNOLOGY • ENGINEERING • MATHEMATICS

PROJECT LEAD THE WAY (PLTW)

Project Lead The Way (PLTW) works with schools across the country to prepare a larger and more diverse group of students to be successful in engineering and engineering technology programs.

S.T.E.P.

Secondary Technical Education Program

STEP is a joint effort of the Anoka-Hennepin School District, the Minnesota State Colleges and Universities (MnSCU) system and Anoka County with nonpartisan support of the local legislative delegation, business and industry partners, students, and parents in the community. Anoka Technical College, Anoka Ramsey Community College and other higher education institutions were part of the planning process. Anoka County issued bonds for the construction of the middle college, to be repaid through a lease/purchase agreement with the Anoka-Hennepin School District. Partnerships with community groups, business, industry, and labor enhance the program.



SCHOOL DAYS AGAIN-FIND YOUR PLACES!!

