

Physics Shows the Way

GPS – GLOBAL POSITIONING SYSTEM

- Emerged from federally funded studies leading to atomic clocks
- Provides location anywhere in the world for citizens, rescue workers, soldiers
- Yielded \$13 billion in US sales in 2003, with \$21.5 billion expected in 2008

SAVING LIVES WHEN NATURE STRIKES

- Tracks earthquake faults in regions such as southern California
- Aids studies of areas damaged by hurricanes such as Katrina
- Helped World Trade Center recovery efforts by finding original building locations

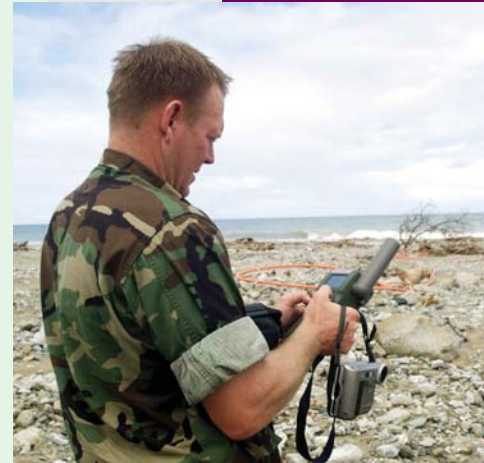


GPS examines damage to Mississippi coast in Katrina's aftermath

USGS, DHS, NSF and NASA are among the agencies that use GPS to study and monitor natural disasters and give efficient and accurate alerts

FINDING YOUR LOCATION ANYWHERE

- Can potentially determine a wireless caller's location during a crime or a car breakdown
- Helps soldiers maneuver through unfamiliar terrain
- More than 20 million GPS-enabled cellphones are expected in the US by 2007



DOD, US Air Force, Office of Naval Research and AEC (now DOE) funded research leading to GPS

GETTING YOU WHERE YOU WANT TO GO

- Combining in-vehicle navigation with real-time traffic reports to find the best routes will save drivers time, money and gas
- Market for in-vehicle navigation expected to increase 63 percent between 2004 and 2008

The Interagency GPS Executive Board (DOD, DOT, DOA, NOAA, DOC, DOI, DOJ, NASA, and the State Department) continues to support and nurture GPS technology and applications



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GPS TIMELINE

"The mast used to mark the South Pole has been returned to its true position after years of being stuck in the wrong place." (The Daily Telegraph, on the use of GPS)

1930s – Isidor Rabi tunes microwaves to the frequencies of atoms, enabling the design of atomic clocks (Nobel Prize, 1944).

1940s – Norman Ramsey improves the degree to which instruments can be tuned to atoms, paving the way to a more accurate time standard (Nobel Prize, 1989).

1950s – Researchers devise optical methods for tuning clocks to atoms. These methods are used today in the US-built NIST-F1, one of the most accurate clocks in the world.

1958 – The first American satellite is launched.

1964 – The Navy proposes a worldwide GPS navigation system consisting of satellites equipped with atomic clocks.

1970s-80s – The Air Force begins developing GPS. The first working prototype is launched in 1978.

1983 – After the downing of Korean Airlines Flight 007, President Reagan directs DOD to make GPS available to the Department of Transportation for civilian use.

1993 – The final GPS satellite is launched, setting the 24-satellite network in place so that it can provide continuous, worldwide coverage.

1995 – Captain Scott O'Grady, an Air Force pilot shot down in Bosnia, is rescued when his GPS wrist receiver alerts the rescue team of his whereabouts.

2000 – The US turns off "selective availability," increasing the accuracy of civilian GPS tenfold.

2004 – GPS-guided parachutes help deliver supplies to soldiers in an Iraq combat zone; thousands of soldiers use GPS units to find comrades and marked territory.

2006 – New satellites broadcast a second civilian GPS signal, improving indoor performance and making possible tiny, low-powered GPS receivers in watches and phones.

From Physics R&D to Widespread Use

Funding and Initial Research: DOD, US Air Force, DOE, ONR, NIST, USGS, NSF, NASA, 1930s-present.

Waterways

GPS facilitates search-and-rescue operations at sea, helps fishing vessels maximize their catches, and tracks movement of shipping containers to enhance port security.



Shipwreck

Archaeologists working with the Texas Historical Commission used GPS to locate a 17th-century French ship off the coast of Corpus Christi, Texas.



Aviation

Air traffic controllers are routinely using GPS to guide airplanes safely to landings under a variety of conditions.



Weather Forecasting

Ballons equipped with GPS transceivers carry probes to the upper atmosphere. The US National Weather Service tracks the time and location of crucial atmospheric readings such as wind, pressure, and humidity.

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