The Naval Research Laboratory – Pushing the Technological Edge

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By Bob Freeman, Special to American Forces Press Service

WASHINGTON (NNS) -- On a stretch of land adjacent to the Potomac River, some of the nation's top scientists and engineers explore the boundaries of science and technology to help solve the challenges confronting U.S. military forces.

Since 1923, the Naval Research Laboratory, or NRL, has been on the cutting edge of scientific research.

"If the Navy or Marine Corps have a significant technological issue that they are wrestling with, they will come to the Laboratory to see what sorts of applications we have," explained U.S. Navy Capt. Paul Stewart, commanding officer of NRL, in an Aug. 19 interview on "Armed with Science: Research and Applications for the Modern Military."

"The investment of money in the development of sonar back in the 1920s is a perfect example of that. We did not have the means to find submarines other than visible observations from the ship," Stewart said.

Sonar is just one of many advances developed by NRL. Stewart described the invention of radar in the 1920s: "A couple of scientists were sitting on the Potomac and talking by radio to each other across the river, when a ship passed between them. The reflections off that ship led to the concept of reflecting radio waves off of objects, and the first U.S. radar patents came from the Lab," he said.

"It was actually Thomas Edison that we credit with the idea of the laboratory," Stewart explained. As early as 1915, Edison had suggested that "the U.S. government should maintain a research laboratory to develop guns, new explosives and other techniques of military and naval progression," and he served as head of the Navy Consulting Board, a scientific body that helped formulate the Naval Research Laboratory that was commissioned in 1923, according to Stewart.

Stewart stated that many of the discoveries of NRL have applications beyond the military, and some have changed all of our lives. "We do have an eye for military applications," he said, "but not all of our research leads to that. The Global Positioning System, or GPS, is a perfect example of a wonderful basic research concept that was worked on here for many years but then clearly led to broad, worldwide applications."

In addition to the development of sonar and radar, Stewart said that NRL research led to such pioneering advances as nuclear propulsion in submarines, early satellite technology, high frequency wave propagation theory which led to the development of HF communications, fracture mechanics, the fire suppressant agent known as AFFF, and various anti-corrosive agents.

According to Stewart, there are four technical directorates at NRL: the Systems Directorate, the Material Sciences and Compondent Technology Directorate, the Ocean and Atmospheric Science and Technology Directorate, and the Naval Center for Space Technology Directorate.

"The Naval Center for Space Technology is a unique national asset," he said, "and they're the only federal organization that I'm aware of that can design, build, calibrate, control and test satellites, all under one roof right here at the laboratory.

Stewart noted that there are various satellite offices in addition to the main complex. Two of the larger ones are in Monterey, Calif., where they are co-located with the Fleet Numerical Meteorology and Oceanography Center, and at the Stennis Space Center in Mississippi where they are co-located with the Naval Oceanographic Office. Stewart emphasized the benefits of being co-located with fleet operators. "You want to make sure you are meeting the customer's needs, and you want to make sure you are relevant," he said.

In a world of new, unconventional threats to U.S. forces, NRL continues to play an important role. As an example, Stewart cited the development of light-weight body armor known as QuadGard that is used by Marines and Army personnel to better protect them against improvised explosive devices. "The scientists that are working on these problems are very passionate about it because they realize that the work they do here on a daily basis saves arms, legs, and human lives," he said.

Stewart explained that some funding provided to NRL is for pure research that will not become applied until sometime in the future. Rather than applying known science to immediate problems, NRL researchers are expanding our understanding of science to provide novel solutions to warfighting challenges.

Stewart described some of the unclassified work that researchers are currently pursuing. "Being able to move large amounts of data around the world safely and securely is a big issue, and we're doing a lot of investments that could potentially change the way the internet functions," he said. He also described ongoing work to develop new non-silicon nano-materials that may speed up computers by several orders of magnitude; research that may enable the production of non-polluting hydrocarbon fuels from seawater; the development of photovoltaic fuel cells for autonomous unmanned vehicles; and even research into the elusive solution to nuclear fusion.

"There's a lot of great basic research going on right now that could potentially change the way we work," Stewart said

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