

In modern warfare,
timing is critical.

From coordinated fleet operations
to satellite-based strike accuracy,
the **U.S. Navy** runs on time
measured in fractions of a
millisecond.

How does the U.S. Navy operate with
precision across air, sea and space?

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Atomic clocks provide the most precise timekeeping in the world.

ONR's atomic timekeeping research, launched in the 1940s, led to critical techniques like **laser cooling and ion trapping** that allowed scientists to slow atoms and measure their vibrations with precision.

By counting these oscillations, **atomic clocks generate time signals far more stable** than any mechanical or quartz system on Earth – enabling technologies critical to today's naval operations.

In naval warfare, time is location.

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Your phone's GPS runs on **atomic time**.

Each satellite in the GPS constellation carries **multiple synchronized atomic clocks**, broadcasting signals accurate to the nanosecond.

GPS receivers aboard ships, aircraft and weapons systems use those signals to calculate exact position in 3-D space.

From sea to space, today's naval operations rely on atomic time.

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GPS timing, powered by **ONR's** early atomic clock research, supports **coordinated Naval Fleet movement, targeting accuracy, weapons guidance and operational awareness** across the battlespace.

Today, **ONR** continues to lead in compact atomic clocks, quantum timing and resilient navigation for GPS-denied environments.

ONR's work reflects decades of engineering expertise and scientific discovery by our scientists and research partners.

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