NAWCWPNS Internet

Hypersonic, as used by the weapons community, generally **refers to the Mach 3.5 to Mach 8 range - about 2700 to 6100 miles per hour**.

These extraordinarily high velocities offer three distinct advantages.

The first is a short interval between weapon launch and target impact.
The second is greater penetration and destructive power.
The third is that hypersonic weapons are difficult to detect and even more difficult to shoot down.

To help the Navy and its sister services exploit these advantages, NAWCWPNS has instituted the Hypersonics Strike Weapons (HSW) Strategic Thrust.
The hypersonic weapon's immense destructive power results from kinetic energy. An object striking a target at Mach 8 will generate 64 times the force of an object of the same mass striking the target at Mach 1. This phenomenon makes hypersonic weapons well suited to attacking hardened or deeply buried targets such as command bunkers or biological-weapon storage facilities.

Several Navy, Air Force, NASA and Defense Advanced Research Projects Agency (DARPA) programs are studying technologies, designs and concepts of operations for hypersonic weapons. One purpose of the Hypersonic Weapons Strategic Thrust is to facilitate a coordinated approach to hypersonic weapons, not only across the Navy but throughout DoD. "We're building the framework for a collective-agreement approach to future DoD weapon systems," says Steve Lyda, leader of the HSW Strategic Thrust.

The Office of Naval Research sponsors the Hypersonics Weapons Technology (HWT) Program and the Low-Cost Missile (LCM) Program. The HWT Program is investigating technologies necessary for effective weapon-system operation in the hypersonic realm. The LCM Program - commonly known as Fast Hawk - is developing an entry-level capability for a Mach 4 hypersonic weapon. Much of this technology is being developed and tested at NAWCWPNS. The Technology IPT for the HSW Thrust, under the direction of Mike Mumford, ensures that research and development efforts - including the Air Force, NASA and DARPA technology programs - are efficiently aligned.

Both of these ONR programs will feed into the Hypersonic Strike (HyStrike) Program sponsored by the chief of naval operations (Capt. Robert Taylor, N88; Capt. Conrad Donahue, N87; and Capt. Dennis Stokowski, N86). At a recent Industry Information Day, RAdms. Dennis McGinn and Carlos Johnson, OPNAV N88, stated that HyStrike will begin the development of an operational hypersonic weapon that will be fielded in the 2005 to 2012 time frame. The HSW Mission Analysis IPT, under Jim DeSanti's lead, is helping to define the requirements for the weapon.

A unique aspect of the Navy programs is that their goal is a single hypersonic strike weapon that will be launchable from air, surface and subsurface platforms. "This is a first-time collaboration between these three communities to develop a common weapon system for time-critical and deeply buried targets," notes Lyda. "It will result in tremendously increased operations effectiveness as well as life-cycle cost saving." The HSW Thrust's Integration IPT, led by Mark Reynolds, is investigating the issues associated with weapon/platform integration as well as with integration of the weapon into the overall battlespace plan.

DARPA is engaged in hypersonic weapon activities through a program called the Affordable Rapid Response Missile Development (ARRMD). Emphasizing multiple launch platforms and the use of off-board sensors, ARRMD is envisioned as a multiservice weapon.

Air Force programs at Wright-Patterson and Eglin Air Force Bases are also investigating hypersonic weapons. NAWCWPNS HSW Thrust personnel have been talking with Air Force representatives in preparation for the development of a Memorandum of Agreement to formalize a cross-service, coordinated approach to hypersonics.
Aerothermic heating, caused by the friction of air passing the weapon body, is one area of intensive research. At Mach 4, as the hypersonic weapon passes through the lower atmosphere in the terminal phase of its flight, its surface reaches about 1200 degrees Fahrenheit. This level is within the tolerance range of new titanium and inconel materials. At Mach 6, however, the surface temperatures exceed 2800 F and at Mach 8 over 5600 F; skin materials, as well as internal temperature control, become a much larger issue.

As hypersonic weapons mature, they will require thorough testing at each development stage. NAWCWPNS already possesses a variety of facilities, such as the Aeroheat Test Facility (T-Range), for component testing. As in the current analysis and research efforts, complementary organizations and facilities at NAWCAD and various Air Force and Army installations will also be major participants in the test programs.

Flight-testing hypersonic weapons calls for unique range capabilities. Because of the high speed and high operational altitudes, the weapons could create a large sonic-boom footprint. NAWCWPNS' Sea Range and Land Range can accommodate these tests, and negotiations are under way with the FAA to establish a special hypersonic corridor between the two ranges.

When fielded, the hypersonic strike weapon will have a major positive impact on battlespace management. The weapon's greatly decreased time to target will give the command, control, communications, computers and intelligence (C4I) components more time to search for and identify time-critical threats. Powerful kinetic penetrators will defeat the enemy's tactic of burrowing deeper or building stronger bunkers. And the ability to take out threat weapons before they are launched will increase U.S. and allied survivability.
efficiently, cost effectively - and soon.

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