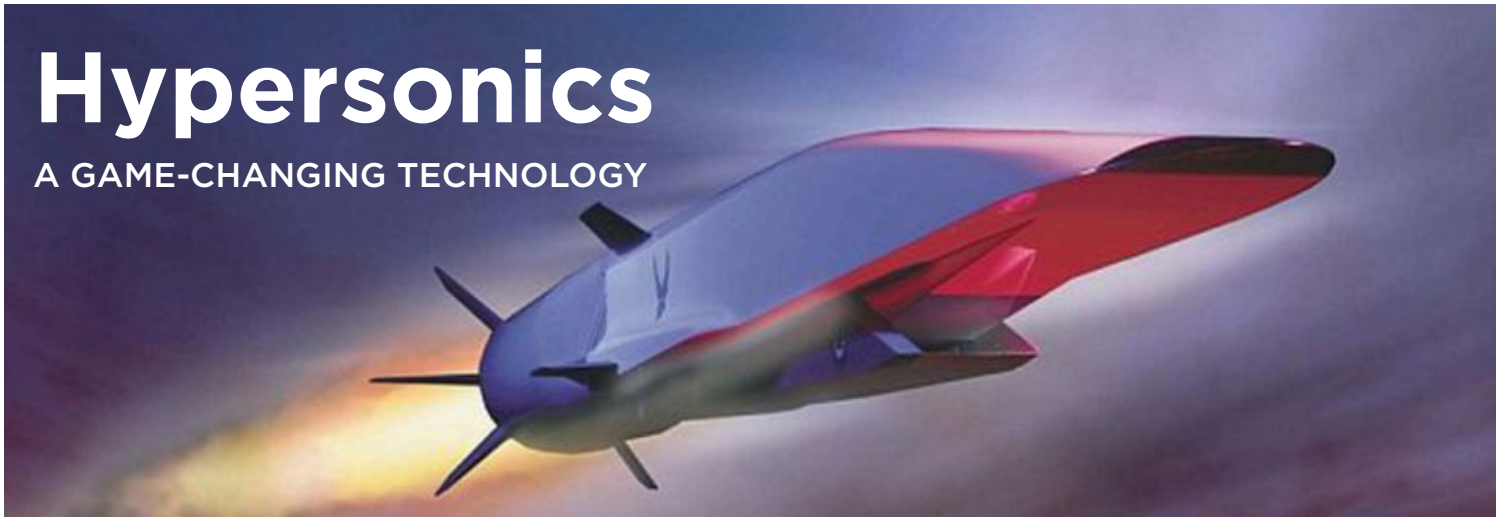
Hypersonics

A GAME-CHANGING TECHNOLOGY



WHAT IS HYPERSONICS

Hypersonic flight refers to speeds that are generally defined as greater than Mach 5, or approximately 3,400 mph. Vehicles flying at this speed operate at extremely high temperature as the friction of air against the surface of the vehicle causes heating to occur. Strong shockwaves – sudden jumps in pressure and temperature – also form around the craft. As these shockwaves reach the ground, we hear sonic booms.

Current interest in hypersonics is focused on so-called *lifting bodies*, slender shaped air vehicles that can slice through the air with minimal drag and use their bodies rather than wings to stay aloft and maneuver as they fly for sustained periods in the atmosphere. These high-lift hypersonic technologies could enable high-speed aircraft, but most immediately, will be used as high-speed maneuvering weapons, for either tactical or strategic applications.

APPLICATIONS/TECHNOLOGY

Hypersonic vehicles that operate for long periods in the atmosphere will generally fall into one of two distinct classes:

1) Boost/glide vehicles that are released at a high Mach number in the atmosphere after being rocket launched and which have the ability to glide and maneuver to a target.

2) Air-breathing vehicles that are propelled by their own engines in order to sustain hypersonic flight speeds and which have maneuvering capability during flight.

THE THREAT

The United States has long been the clear global leader in hypersonic research, development, and testing. That lead has now diminished if not been lost. While the United States was pursuing hypersonic technologies intermittently, starting and stopping programs and, in so doing, failing to achieve continual progress, **other nations have steadily made investments that have enabled them to reach parity or even to surpass us**, while largely building upon U.S. government-funded R&D work. This is consequential to our national security because **hypersonic vehicles can be effective weapons that are difficult to defend against due to their speed and maneuverability**. Hypersonic weapons can be launched from the land, the sea and the air where they are used to rapidly attack targets hundreds to thousands of miles away in a matter of minutes. Hypersonic missiles will be hard to detect, hard to stop, and offer little time for an effective defensive response. Some reports indicate that our **competitors, including China and Russia, are close to deploying various types of operational hypersonic weapons**. Meanwhile, in the United States, we continue to argue about committing to a sustained increase in funding for the development of hypersonic weapons. **We risk falling behind in developing defenses against threats to our nation's security**, including developing our own set of hypersonic weapons.

WHAT'S NEXT

To eliminate the resulting security gap in hypersonic technologies, it will be necessary for the United States to pursue the following:

- A sustained coordinated investment in hypersonic flight technology and platform development for both offensive and defensive military applications.
- Strengthening and rebuilding our workforce with expertise in all areas of hypersonic technology, from basic research to design and testing.
- Recommitment to college- and graduate-level programs in hypersonics to educate a newly prepared workforce.
- Investment in ground and flight test facilities and capabilities.