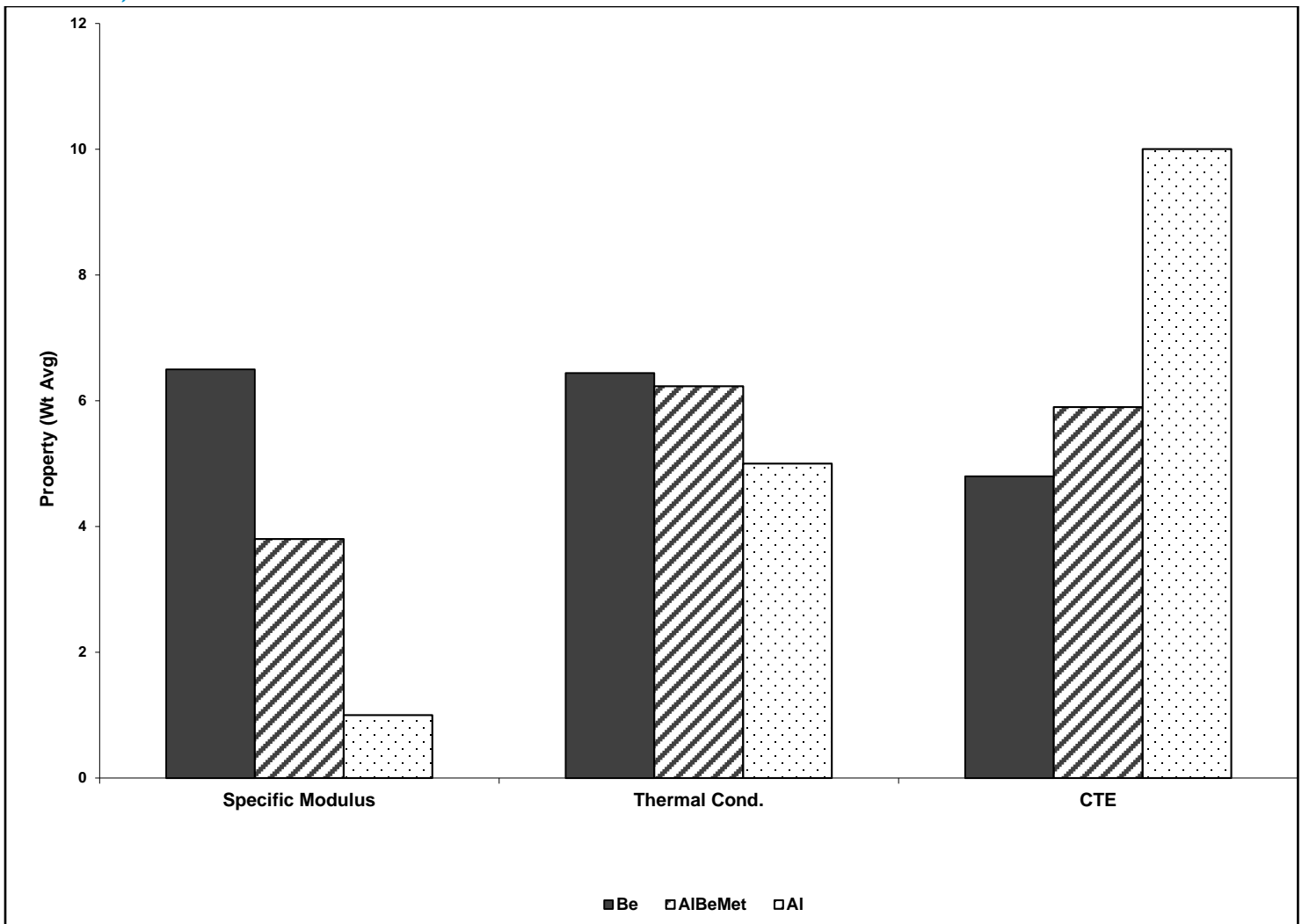


## Ballistic Missile Defense: AlBeMet<sup>®</sup> and Beryllium Make it Possible

### ABSTRACT

The family of beryllium metal matrix composites has historically been used in the design of Ballistic Missile systems. Beryllium's well-recognized combination of low density, high stiffness, low thermal expansion and long term dimensional stability is unmatched by any other structural material. These properties have allowed engineers to develop systems that offer pinpoint accuracy and long term reliability.

### BERYLLIUM, ALBEMET<sup>®</sup> AND ALUMINUM PROPERTY COMPARISON



MAAB-020

These same companies and their engineers have now been chartered with building multiple missile defense systems for the United States and its allies. The systems range from tactical to strategic continental defense. The goal is to establish a shield that will intercept all types of missiles that are launched in aggression.

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The system requires layers of satellites. The top layer will immediately detect a missile launch anywhere in the world. The satellite instruments will then determine the trajectory and ultimate target location. This data will be fed to a family of 30 satellites in lower orbits and to strategic defense positions on earth.

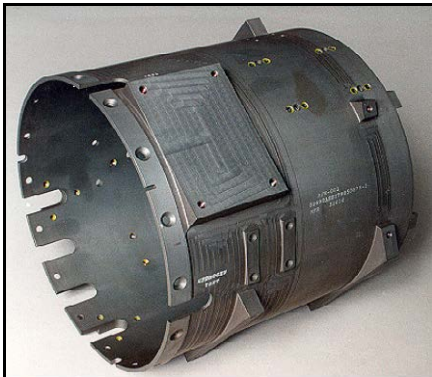
The smaller low orbit satellites will continue to track the missile, passing information from one to the other. At the same instant, data will be fed to appropriately positioned defensive intercept missiles. These will be launched and directed to the target. Once within range, the intercept missile will separate its Kill Vehicle. This Kill Vehicle will acquire the target with its own sensors and guide itself to directly impact the incoming missile.

The Kill Vehicle carries no warhead. It strikes the target and destroys it with its own kinetic energy. The process is like firing a handgun at an armed adversary 2 miles away and having your bullet strike their bullet in mid-air. Beryllium makes it happen.

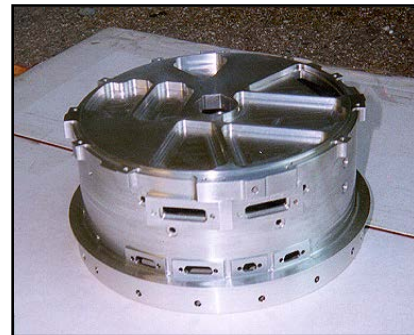
This complete system is being designed and tested as we speak and BWI materials are involved in every critical aspect of the design.

The space-based satellite borne super sensitive instruments that detect even the smallest missile launch are designed out of pure beryllium. This includes the gimbals and the mirrors of the optical sensors. Many of the electronic modules and enclosures required to transmit the information to earth stations are fabricated from AlBeMet® (**Aluminum Beryllium Metal**). The laser gyros that maintain the satellites in exact position are also fabricated from these materials.

The defensive intercept missile's Kill Vehicle requires super stiff high damping materials. This is critical because the optical sensors must be jitter free and must stay in perfect alignment with the rocket motor that is maneuvering toward the target. The slightest miss-alignment could cause the Kill Vehicle to be slightly off target. After travelling thousands of miles, a positional error of 12 inches is the difference between a successful intercept and a miss.



Sample AlBeMet® BMD part.



Sample AlBeMet® BMD part.

The U.S. Army and the U.S. Navy are procuring these missiles under multiple programs. The various designs are significantly different, each with their own specific requirements. The only commonality is they all rely completely on Materion Brush Beryllium and Composites products.

Note: Handling Aluminum-Beryllium Alloys in solid form poses no special health risk. Like many industrial materials, beryllium-containing materials may pose a health risk if recommended safe handling practices are not followed. Inhalation of airborne beryllium may cause a serious lung disorder in susceptible individuals. The Occupational Safety and Health Administration (OSHA) has set mandatory limits on occupational respiratory exposures. Read and follow the guidance in the Material Safety Data Sheet (MSDS) before working with this material. For additional information on safe handling practices or technical data on Aluminum Beryllium Alloys, contact Materion Beryllium and Composites.

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