



Rapid manufacture of certified metallic components.

# CaIRAM, Inc. Newsletter

January 15, 2010

Volume 1 Issue 1

## Staying in touch with customers

CaIRAM has created a newsletter to help keep our customers informed about improvements in additive manufacturing technology, its benefits, and how it can help your existing and future product lines. CaIRAM uses an electron beam melting manufacturing process to produce structural, metallic components for functional hardware applications. Our primary products have been made from Ti-6Al-4V, but, in the coming year, we are planning on bringing new alloys on line, including  $\gamma$  TiAl, nickel-base alloys, and refractory materials.

## Electron Beam Melting (EBM) Technology

EBM manufacturing technology is an "additive manufacturing" process that was originally developed by Arcam AB, located in Goteborg, Sweden. While similar to other layer building technologies, there are some critical factors that differentiate parts made via our process. Our process:

- Uses an electron beam as the energy source. The beam is manipulated by electromagnetic coils - no moving parts.
- Has a high energy density beam which results in rapid building. For instance, a 10-lb, complex part can be built in 24 hours.
- Builds parts in a powder bed. This allows overhangs and other complex features to be easily supported.
- Is conducted at elevated temperatures. This eliminates residual stresses in the as-built part and can eliminate the need for post-build stress-annealing.

Recent advances in the beam manipulation have also resulted in improved surface finish.

## Expansion and Upgrades

CalRAM recently procured a second EBM system. Both systems have been given a productivity upgrade with "Controlled Vacuum" (CV). This CV upgrade allows for a 33% increase in operational speed; a part that took 30 hours to build can now be built in about 20 hours. CalRAM also designed and erected an environmentally-controlled room to keep moisture away from the powders. This allows the metallic powder to be continually recycled without picking up oxygen thereby reducing costs and allowing us to pass the savings along to our customers.

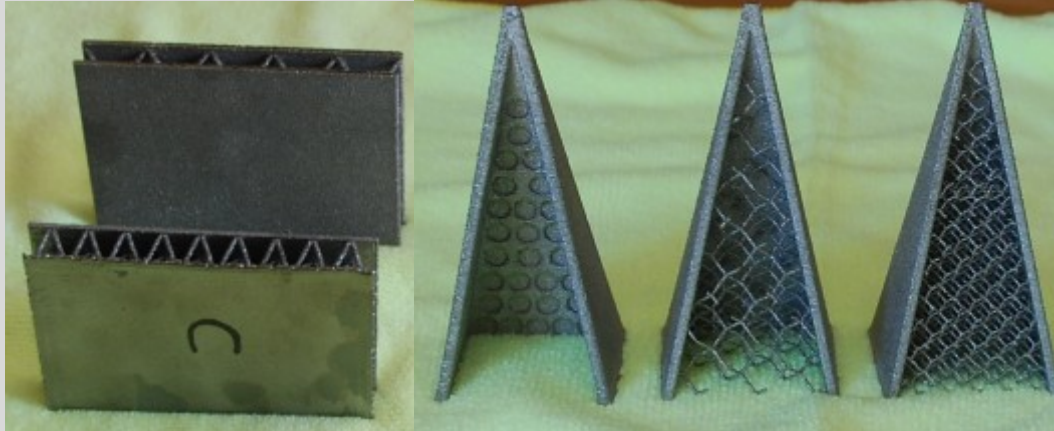


CalRAM's Two EBM Machines in Environmentally Controlled Environment

## SBIR Award

In 2009, CalRAM received its first SBIR award, 09-045, from the NAVSEA. The goal of the program is to apply lattice block structures to missile components for weight reduction. Initial samples have been fabricated from Ti-6Al-4V and thermally tested. More information on the progress of this program will be presented in future Newsletters.

<http://www.dodsbir.net/selections/abs091/navyabs091.htm>



EBM Ti-6Al-4V Lattice Block Structures Integrated into Solid Parts

### **Design Guidelines**

Many customers want to know how thin a part can be made, what type of tolerances can be produced, what is the as-deposited surface finish, etc., that can be produced by EBM manufacturing. Towards that end, CalRAM has developed a set of design guidelines. This information is being updated and can be made available upon request. Please contact the undersigned to obtain an updated design guideline.

### **Contact Information**

The following contact information is provided if you would like more information about CalRAM or metals additive manufacturing technology.

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For additional information on EBM technology, Arcam's website may be of use:

[www.arcam.com](http://www.arcam.com)

