

## REDUCING WEIGHT FOR TRANSPORTATION APPLICATIONS: TECHNOLOGY CHALLENGES AND OPPORTUNITIES

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Keywords: lightweight materials, manufacturing processes, systems engineering principles

Today's land, sea and air transportation industries – as a business necessity – are focused on technology solutions that will make vehicles more sustainable in terms of energy, the environment, safety and affordability. Reducing vehicle weight is a key enabler for meeting these challenges as well as increasing payload and improving performance. The potential weight reductions from substituting lightweight metals (advanced high-strength steels, aluminum, magnesium and titanium alloys) are well established. For magnesium castings, weight savings of 60% have been reported [1]. The value of weight reduction depends on the transportation sector and ranges from about \$5/kg saved for automobiles to over \$500/kg saved for aircraft [2]. The challenge is to optimize the material properties and develop robust, high volume, manufacturing technologies and the associated supply chain to fabricate components and subsystems at the appropriate cost for each application.

The American Lightweight Materials Manufacturing Innovation Institute (ALMMII) was established as a public-private partnership to accelerate the adoption of these materials. ALMMII is one of four new institutes that are part of the growing National Network of Manufacturing Institutes and serves as the nation's essential bridge between basic research and final product commercialization for lightweight metals [3].

The institute will take advantage of opportunities to drive synergies across the various industries serving both commercial and defense transportation needs. Advanced manufacturing processes will be developed through projects executed by our industry partners in collaboration with an extensive network of universities and the national and federal laboratories. Commercialization of the resulting technologies is enabled by the early integration of the capabilities of the full production supply chain from material producers and metal formers to OEM's.

Improved manufacturing processes for magnesium in both cast and wrought forms are required to expand the alloy utilization. Our industry and government partners have identified a number of focus areas including higher integrity and larger thin-walled castings, overcasting of magnesium on aluminum and steel substrates, and joining of mixed-material components with particular emphasis on mitigation of galvanic corrosion.

The projects will employ systems engineering principles as shown in Figure 1. The industry members will select the particular alloy and an associated component and platform. In developing the new manufacturing process, the project team will employ ICME enabled models that can support both the design and certification/validation phases of the work.

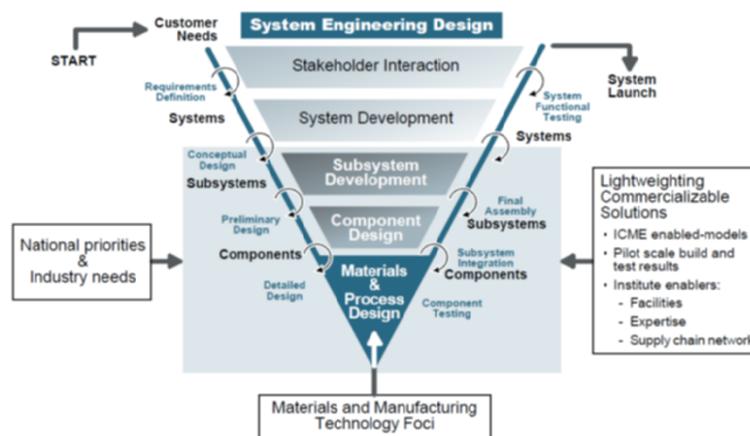


Figure 1: Each ALMMII project will utilize systems engineering principles to deliver innovative manufacturing processes integrated with product design modeling

### References

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