

# **Gas Metal Arc Pulse Robotic Welding of s Titanium Ballistic Hull for the US Army Composite Armored Vehicle Integrated Hybrid Structure Program**

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## **Introduction/Background**

The US Army is transforming its weapon systems to meet the vision of an Objective Force—a responsive, deployable, agile, maneuverable, lethal, and survivable force. Titanium is playing a significant role in this revolutionary change by meeting new system performance characteristics while achieving a significantly lower weight. A number of Army systems are currently using titanium, but this presentation highlights the welding development effort and prototype manufacture of the Army's first titanium-intensive ground vehicle.

The Composite Armored Vehicle Integrated Hybrid Structure Program is a joint effort between United Defense, LP (UDLP), the US Army Tank Automotive and Armaments Command (TACOM), Concurrent Technologies Corporation, and the University of Delaware. The vehicle was designed by UDLP to meet the Army's Objective Force requirements. The vehicle uses titanium, advanced aluminum alloys, and composites to achieve a total vehicle weight of less than 18 tons. The vehicle uses Grade 5 titanium for the lower and upper hull. Much of the titanium used in the upper hull is made by single plasma arc melting and direct casting into rectangular ingots. This presentation will highlight the technical challenges experienced by the US Army in the fabrication of a titanium-intensive ground vehicle using Gas Metal Arc Pulse Welding. Emphasis will be on welding process parameters, qualification testing of welds, weld joint design, and welding equipment hardware additions required to successfully weld titanium.

## **Conclusion**

A qualified gas metal arc pulse welding process was successfully applied to build a prototype titanium structure for a US Army vehicle application. Upon review of the welding process parameters, qualification test results, and welding hardware additions, the audience will have an appreciation for advances made in the gas metal arc welding of titanium. This demonstrator prototype shows the progress being made in titanium welding and will give the audience insight into future titanium applications—both within the military and in commercial applications.