PROBLEM / OBJECTIVE

There is a growing need in the DoD for very large transparent ceramic windows for reconnaissance applications and transparent armor. Current programs require windows in excess of 18” x 35”, with future requirements anticipated up to 36” x 36” and larger. Of the materials being considered, ALON® Optical Ceramic has a unique combination of properties and producibility. It is currently manufactured routinely in sizes up to 15” x 27”, and is now available in sizes as large as 18” x 36”. This program will improve ALON production processes so that large monolithic panels meeting requirements can be produced.

APPROACH/ BENEFITS

Approach

• Identify and manage risks associated with scaling up windows from the current size capability to 36” x 36”
• Modify existing processing equipment so that it has sufficient temperature capabilities to manufacture large ALON windows, with a goal of producing windows with finished dimensions of 36” x 36” or larger. This modification can be done for a fraction of the cost of purchasing new equipment.
• Evaluate new and lower cost forming techniques to determine the best method for producing very large green plates
• Develop the ability to form, heat treat, and polish large ALON windows
• Gradually scale up the process for large monolithic ALON sheets. 36” x 36” x 0.5” windows will be demonstrated at the conclusion of the program (June 2014)

Benefit

• Capability
  • Increase, by two fold, the producible size of reconnaissance windows and transparent armor applications
    • Larger monolithic windows enable better sensor performance
  • Increase throughput capacity by >100% for ALON® Optical Ceramic products
  • Establish capability for ALON reconnaissance windows, which are 2 times lighter and 10 times more durable than the current state of the art (Cleartran)
    • Stronger window material affords better crew protection
    • More durable window material increases operational time
• Benefits to acquisition and sustainment communities
  • Lower life-cycle costs vs. currently available window materials
    • Initial acquisition cost will be competitive with Cleartran

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Based on environmental testing, ALON will last ten times longer
- Transparent armor solution at half the weight and thickness of conventional glass laminates
- Shorten delivery time for ALON products by 25%

Benefits to the Defense Industrial Base
- Establish a stable, scalable, and state-of-the-art domestic industrial manufacturing base to ensure production readiness for current and future reconnaissance and transparent armor requirements
- Increase manufacturing capacity and throughput for multiple ALON products
  - Reconnaissance and IR windows
  - Transparent armor
  - Missile domes

Defense Systems Impacted
- Transparent armor kits for Blackhawk and Chinook helicopters
- Common Infrared Countermeasures system
- Joint Air to Ground Missile
- Joint Light Tactical Vehicle
- Mine Resistant Ambush Protected vehicle

Progress/Recent Accomplishments
- Delivered three 18” x 35” x 0.5” windows in Jan/Feb 2013.
- Received an order for five 18” x 35” windows from a DOD customer.
  - One window delivered in May 2013. Additional four to be delivered in September 2014
- Windows as large as 24” x 36” are in process
- Completed evaluation of forming techniques and completed scale up of lower-cost forming laboratory, for windows up to 36” x 36”.
- Heat treatment equipment for 36” x 36” in place with qualification studies underway.

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