Transparent Armor Cost Benefit Study

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## Transparent Armor Cost Benefit Study

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Transparent Armor Cost Benefit Study

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Agenda

- Background
- Current Demand Data
- Government Cost/Benefit Analysis
- Timeline
Recent History

Early OIF

2004-2005 - GPK

Curb Wt: 10,300lbs
GVW: 12,100lbs

2006
“Iraqi Pope Glass”
Future Transparent Gun Shields

- Requirement: Upgrade GPKS with transparent armor for enhanced situational awareness while maintaining soldier cover within armor envelope.

Baseline

Initial

Interim

Objective

AHI GS & GPK

Upgraded Gunner Shield – Transparent Armored Gun Shield (TAGS)

Field Modified GS & APK

Interim Solution – Marine Corps TAGS (MCTAGS)

Future Solution – Modified Solution based upon theater recommendations
HMMWV M1114 Glass Demand

- Over $5.2 Million was spent per month in FY05 for the Up-Armored HMMWV windshields and door windows.

- Demand for both right and left windshields increased 133% and 101% respectively from FY05 to FY06.

- Demand for door windows increased 658% from FY05 to FY06.

Bottom Line: Army needs an improved Transparent Armor solution!
Increase In Door Glass Demand

- Soldiers are adding another piece of glass to each door for added protection.
- Adds additional weight to an already overweight vehicle and reduces payload capacity!
Causes Of Current Glass Failures

- Insurgent Attacks
  (with a wide range of threats)
- Sandstorm Damage
- Rock Strikes
- Improper removal and installation
- Clouding
  - Delamination caused by environmental degradation
  - Improper curing process
  - Improper cleaning techniques
Other Problems with Current Glass

- **Weight**
  - Weight of current glass solution adds significant weight to vehicle.

- **Visibility**
  - Thickness of glass can cause distortion and glare
# Future Transparent Armor Solutions

<table>
<thead>
<tr>
<th>Failure Causes</th>
<th>Potential for Improvement over Current Laminate Technology</th>
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</thead>
<tbody>
<tr>
<td>Insurgent Attacks</td>
<td>Yes/No</td>
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<tr>
<td>(with a wide range of threats)</td>
<td>(Depends on Threat)</td>
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<tr>
<td>Sandstorm Damage</td>
<td>Yes</td>
</tr>
<tr>
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<td>Yes</td>
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</tbody>
</table>
Future Transparent Armor Solutions

Cost for 3’ x 3’ piece ranges from $500 - $3000 depending on desired thickness and treatments.

ARL – Army Research Lab
Basic Research Effort

- GE Global Research and Nanocerox partnership
- Goal is to develop nano-structured ceramic bodies with a combination of high optical transmission and exceptional mechanical properties and capable of effective performance in an outstanding transparent armor system.
- Two Funding Opportunities of Effort:
  - **FY05**: Develop design rules from the system level armor requirements to the mechanical and optical properties of the ceramic body and then into the properties of the nanopowder. Objective is for a process to be in place for the fabrication of 2” x 2” x 0.375” samples.
  - **FY06**: Scale up the materials systems to a final dimension of 4” x 4” x 0.375”. Characterize and deliver samples for ballistic testing.
Government Cost Benefit Study

Purpose: Determine break-even cost for new transparent armor solution based on expected reliability improvement and required investment.

- Use current fleet of Up-Armored HMMWV as the study platform for initial look.
- Approximately 11,000+ vehicles in Army inventory.
- NSN 2510-01-435-9693
  - Right Windshield $2,759 (FY06$)
- NSN 2510-01-435-9690
  - Left Windshield $2,759 (FY06$)
- NSN 2510-01-435-9692
  - Door Window $1,025 (FY06$)
- Expand analysis to include rest of TWV fleet.
Cost-Benefit Methodology

- Obtain current demand data and cost data to determine operations cost for status quo. [Completed]
- Obtain investment costs for new transparent armor.
- Determine operations cost for transparent armor solution.
- Determine savings between status quo and transparent armor alternative.
- Calculate Net Present Value and Savings to Investment Ratio.
- Contractor provides reliability improvement factor estimate and estimated cost for transparent armor Material at end of Phase I.
Cost Benefit Parametric Analysis
Up-Armored HMMWV Glass

Curves Based on the FY05 Demand Data
Other Potential Benefits of a New Transparent Armor Solution

- Vehicle Weight
- Logistics Footprint
- Crew Survivability
- Platform Operational Availability
- Safety related accidents
## Timeframe

<table>
<thead>
<tr>
<th>FY05</th>
<th>FY06</th>
<th>FY07</th>
<th>FY08</th>
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<tr>
<td>DRAFT RFP</td>
<td>Final Solicitation Released</td>
<td>FY 05 Congressional</td>
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