Gun-Launched Aerial Precision Munition (G-L APM)

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

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Background

- Urban warfare targets can be effectively identified, targeted and neutralized by small Remote Armament System (RAS) capable of delivering warheads.

- This paper will cover the design such a system, how it is implemented in the Unmanned Aerial Vehicle (UAV) used as a prototype flight platform, and includes the results for its initial test flights.
Why Gun-Launched APM?

• Added lethality component to non-tactical small RAS
• Elimination of RAS capture
• Technology protection through self-destruction
• Added lethality to projectile (increase lethal range)
• Deterrence to terrorism activities
• Force protection
Unmanned Aircraft Vehicle

Length ~ 4.5’
Wingspan ~ 4.5’
Speed ~ 60-65 knots
Range ~ 12mi
System Weight ~ 10 lbs
Warhead Weight ~ 2 lbs

Launch method ~ Air Pressure Rail Launch
Power source ~ Lithium-Polymer rechargeable battery pack
Avionics ~ Piccolo lite autopilot and radio, 900 MHZ
Camera ~ Color Analog Video Transmitter, 2.4 GHZ
### Test of Warhead Effects Against Trucks

**Ford Ranger or F150**

<table>
<thead>
<tr>
<th>Truck A (0.5 lb C-4)</th>
<th>Truck B (1.0 lb C-4)</th>
<th>Truck C (1.0 lb Frag Whd)</th>
<th>Truck D (2.0 lb Frag Whd)</th>
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</thead>
<tbody>
<tr>
<td><img src="image1.jpg" alt="Image of Truck A" /></td>
<td><img src="image2.jpg" alt="Image of Truck B" /></td>
<td><img src="image3.jpg" alt="Image of Truck C" /></td>
<td><img src="image4.jpg" alt="Image of Truck D" /></td>
</tr>
</tbody>
</table>

- **Socorro, NM 3/26/2009**

**Images:**
- Images of trucks before and after the test.
- Measurements and damage assessments are shown.

**Note:**
- Truck A: 0.5 lb C-4
- Truck B: 1.0 lb C-4
- Truck C: 1.0 lb Frag Whd
- Truck D: 2.0 lb Frag Whd
Fuze Requirements/Design Approach

• Requirements:
  ▪ Must provide safety during handling & launch
  ▪ Meet Mil-STD-1316/MIL-STD-1901 type safety requirements
  ▪ Function on impact with the target
  ▪ Receive commands from the ground station to **arm, fire and disarm** in flight
  ▪ Radio Communicates fuze status back to the ground station

• Approach: An Electronic Safe and Arm (ESA) was selected
  ▪ Reliable
  ▪ Compatible with the system avionics functions and communications system
  ▪ Can be readily fire and disarmed in flight
  ▪ Impact or Remote Self-destruction mode
Fuze Flight Sequence

Operator or GPS controlled flight

Sense air pressure (30mph)

good flight signal from avionics

Receive arming cmd

Disarm command

Launch

Operator removes pull pin

Impact target & initiate warhead

(30mph)
G-L APM Demo Test Set up
Live Fired Flight Tests were conducted on Feb-23-2010 at Dugway Proving Ground, Utah.

Two UAV’s were programmed to autonomously fly a preset pattern and home in on stationary SUV’s used as demo targets with 100% success.

- Info transmitted from UAV validated all fuze safety features worked as designed
- Firing pulse 1,200V through LEEFI initiation warhead on target impact.
- Both stationary SUV targets were significant damage.

In Summary:

- Universal fuze functioned flawlessly, technology demonstrated.
- Multi-purpose warhead function demonstrated with low collateral damage.
- APM Flight Platform precision demonstrated.
• ARDEC was committed to developing Gun-Launched APM technology.
• Fuzing and Novel Warhead are key parts of ARDEC’s Gun Launched APM program.
• On-going effort to reduce size of fuze to fit into small APM airframe.

=> Areas/technologies for collaborative effort?
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