Next Generation Fire Control

Introduction
Next Generation Fire Control

Background

- GD-OTS saw the need to design and develop a new lower cost fire control as a replacement for the current Lightweight Video Sight (LVS) fielded with the MK47 MOD 0 40mm weapon system
  - Objective – reduced price, shorter delivery time and higher performance
  - Initially queried industry to see what capabilities currently existed.

- Unique Feature – Super Elevation Compensation
  - Fire Control must be capable of maintaining the target image in the field of view during super elevation
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Background
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Background

- Design starting point - baseline attributes:
  - Video based system
  - Ballistic Computer
  - Laser Range Finder
  - Super Elevation Mechanism
  - Display
  - Battery compartment
  - Vehicle Power Adapter
  - Picatinny rail for other accessories
  - Ballistics for all 40mm rounds currently in the US inventory
    - M430A1, M430, M383, M918, M385, MK281
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Enhancements

- Next Generation Fire Control – Requirements based on feedback from both domestic and international users:
  1) Replace I² with Thermal based night vision
  2) High Resolution Color Camera
  3) High Resolution Color Video Display
  4) 3X magnification (with 6X E-zoom capability)
  5) Improved super elevation compensation
  6) Electronic Range Card and Pre-designated Target functionality
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Enhancements

7) Single boresight operation covers both cameras
8) Vehicle Power Kit – without separate conditioning box
9) Battery Charging when operating from vehicle power
10) Open Architecture – Ballistic computer sized for growth
   ➤ Additional Round types
   ➤ Embedded Training capability
11) Upgradeable for use with new Air Burst technologies
12) Reduced Weight
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System Overview

- (1) Sight Module
- (2) Battery Box
- (3) Video Display
- (4) Display Arm
- (5) Cable Harness (Not Shown)
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Super-Elevating Sight Module

- Super-Elevation functionality is handled internal to the sight module
  - Inclinometer measures sight angle relative to gravity
  - Servo system uses inclinometer value to hold the sight fixed on target when Super-Elevation mode is activated
  - Non back-drivable gear train locks elevation angle so that sight tracks with weapon when Super-Elevation mode is disengaged
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Laser Range Finder

- 1550 nm wavelength laser
- Eye Safe per ANSI Z136.1 Class 1M
- Undetectable by night vision goggles (those based on image intensification)
- 10 meter to 5,000 meter total measuring range
- $\pm 1$ meter accuracy out to 2,590 meters
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Day Optics

- Full color, high resolution day video camera
- $5.19^\circ \times 3.89^\circ$ V Field of View
- Fixed 3X standard magnification
- 6X electronic zoom (image resolution is preserved)
- Adjustable continuous focus between 20 meters and infinity
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Night Optics

- 17μm, 640 x 512, 30 Hz thermal imager
- 5.19° H x 3.89° V Field of View
- Fixed 3X standard magnification
- 6X electronic zoom (electronic magnification)
- Adjustable continuous focus between 20 meters and infinity
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**Ballistics Processor Module**

- 1 GHz dual core digital signal processor with 2 Gigabytes of memory
  - Support all 40x53mm ammunition types currently in US Inventory
  - Ample allocation for future addition of new ballistic data and incorporation of other upgrades

- Two RS-232 serial port interfaces
  - Allow access to software for system interface & update
  - Utilize external devices or sensors (GPS, next gen airburst programmer, wind sensing…etc.)

- Auxiliary/External Video port
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Operator Controls

- Primary operator controls are mounted to weapon back plate/grips:

<table>
<thead>
<tr>
<th>Control</th>
<th>Marking</th>
<th>Description</th>
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<tbody>
<tr>
<td>Four-way Rocker switch</td>
<td>UP, LEFT, RIGHT, DOWN</td>
<td>The Rocker switch is a four-position switch located on the weapon backplate. It enables navigation through the GUI and selection and entry of data items contained within the GUI menu structure.</td>
</tr>
<tr>
<td>LRF push button</td>
<td>Red Button</td>
<td>The LRF button, on the weapon backplate, initiates the Laser Range Finder when depressed.</td>
</tr>
<tr>
<td>Reset push button</td>
<td>Blue Button</td>
<td>The Reset button, on the weapon backplate, returns the operator to the main combat screen when depressed.</td>
</tr>
<tr>
<td>SEL push button</td>
<td>Black Button</td>
<td>The SEL button, on the weapon backplate, places the system into Super-Elevation Mode while depressed, so that the weapon's elevation can be changed relative to the TABS line-of-sight.</td>
</tr>
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**Power**

- **Internal Battery**
  - Powered by a single BA-5590 or BB-2590 battery
  - >8 hours battery life

- **External Power**
  - Accept external 28 volt DC power per MIL-STD-1275
  - Power conditioning is performed internal to unit

- **Battery Charging**
  - Capable of charging the BB-2590 rechargeable battery while operating on external power
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Graphical User Interface

- Main Combat screen:
  - Adjusted Aim Point reticle
  - Laser Range Finder Aim Point reticle
  - Ammunition Type/Mode
  - Sensor Selection
  - Range to Target
  - Cross Wind
  - Range Wind
  - Azimuth Bearing
  - Fault Messages
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Graphical User Interface

- Electronic Boresight
  - Need to only boresight one imaging channel
  - Ability to recall boresight for verification without having to repeat the operation

- Electronic Range Card
  - Set Azimuth bearing
  - Set Left and Right lateral limits
  - Pre-designate and store up to 8 targets
  - Range Card Zero function

- Electronic Ladder Sight
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Upgrade Potential

- Designed with a focus on embedding appropriate hooks for implementation of future upgrades:
  - Interface with external wind sensing technology
  - Interface with external GPS
  - Interface with external digital compass
  - Embedded training modes
  - Sensor fusion
  - Target designation capability using GPS technology
  - Indirect fire capability using GPS technology
  - Image / video capture mode
  - Interface with vehicle and battle field networks

- Integration with Other Weapons – MK19 & M2A1
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Questions?
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