Combat Decision Aid Software (CDAS) For Network Centric Warfare/Effects Based Fires

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Effects C4I Nodes

Robotic Systems

Effects C2Vs

Mounted/Dismounted Operators
CDAS/ Networked Effects

Background

- CDAS was developed as an open architecture, embeddable combat decision aid SW tool suite under a completed ARDEC Armament Decision Aids STO.
- User tested in a series of 5 CEP experiments conducted at Ft. Sill and Ft. Knox as well as 1stApp/MATREX experiments as a UA/Bn effects management tool.
- CDAS/NE was extended under FFW Phase I to provide multi-echelon netted fires capability from individual FFW equipped dismounted soldier up to the Unit of Action Effects Control Cell.
- CDAS/NE allows coordination and effects based control of NLOS, BLOS, and LOS fires.
- CDAS/NE is extensible to support Joint Ops/Fires.
- CDAS/NE adopted by SBL to support follow-on Joint experiments such as JOUST.
- CDAS Networked Effects component capability being further extended under joint FC-NET STO for integration into the FFW architecture.
Combat Decision Aid Software Suite (CDAS)

A fully integrated and scalable decision support tool suite for the mounted/dismounted Warfighter/Commander

Knowledge Bases/Shared Data

Netted Effects Based Fires

Additional Battlefield Features
- User Defined Operational Picture
- Logistics Planning/Monitoring
- Open Scalable Architecture
- Dynamic weapon-target pairing/deconfliction
- Electronic White Board
- Shared, Synchronized Databases
- Sensor/asset tasking

CDAS Application Variants

UoA Effects Node

Leader/Tablet

Embedded

Soldier Variant

PDA
**CDAS Map Server and Map Services**

**Multiple maps with independent layer control.**

- NIMA ADRG, CADRG Maps, All Scales.
- NIMA 5- and 10-Meter Controlled Image Base.
- ArcView™ Shape Files and AutoCad™ DXF Files.
- Depth Rendered Elevation Map.

**Multiple Map Data Sources**

CDAS imports and displays digital map data from multiple NIMA, USGS, and commercial map formats.

- CADRG
- ADRG
- CIB 5-meter & 10-meter
- DTED 0-2
- VMAP 0-2
- Urban Vector Map
- DTOP
- ArcView™ Shape Files
- ArcInfo™ Exchange Files
- AutoCad™ DXF Files
- USGS DEM, DLG
- GeoTiff
- US Census Bureau Tiger Line

**Flexible Uses**

- Multiple maps with independent layer control.
- GPS interface and automatic map rotation for use in vehicle-mounted maps and palm-devices.
- ArcView™ and AutoCad™ Engineering Maps to support Urban Ops.

**Flexible Interfaces**

- Available with or without user interface.
- Map data remains in raw format to allow 3rd party developers to interface to map server and use data.
Terrain Analysis for Targeting, Mission Planning

- Cover & Concealment calculation to identify locations for camouflaged, hidden targets.
- Moving, platform centric, Aerial Line of Sight to determine visibility from any location along flight route during flight route planning.
- Slope, terrain feature, contour analysis to determine likely target locations.
- Determination of low visibility areas for low level flight route planning.
- Identification of aerial obstacles such as towers, power lines, etc.
- Mobility corridor analysis to identify likely enemy mobility routes for targeting.
Situational Awareness

- User Defined Operational Picture (UDOP)
  - Identical data shared in real-time to all systems
  - Users can tailor data view using filtering schema
  - Shared databases, newsgroups, chat to augment the COP
  - Up to 5,000 separate tactical entities can be tracked and displayed

- Alternative Visualization Techniques
  - Alternate Tactical Symbology Unit
  - Physical Footprints
  - Direct/Indirect Fire Footprints
  - Density of Fires Representation
  - Command Relationships
  - Combat Power
  - Movement History

- Total Asset Visibility
  - Optional Visual Indicators
  - Unit Logistics & Status Rollups
  - Rollups Ammunition Basic Load Tools
  - Fire Mission Status

COP Filtering & Log Visual Indicators

Fire Mission Status

Unit Logistics Rollups

Ammo Basic Loads

Logistics Monitor
CDAS Collaboration Tool

Platoon Leader Tablet—Initial Security Plan Sketch

Pit Ldr’s initial Security Plan shared in real time to Sqd Ldr, who then alters plan to reflect squad positions.
CDAS Collaboration

1st Squad Leader Tablet-Final Security Plan Sketch

All of Squad Ldr’s final alterations to Security Plan shared in real time to PL, who approved alterations.

Mines laid by Squad

Additional Squad OP Location

Team Ldr and OFW Soldier Locations
Plan Sharing

**Military Decision Making Process**

Plan developed by Plt Ldr and shared down to Sqd Ldrs, then to all soldiers.

Plt Ldr/Sqd Ldr Tablet

Preplanned Targets

Routes Developed with CDAS Terrain Analysis

FFW Soldier CDAS HMD (CDAS Combat View)

Plan developed by Plt Ldr and shared down to Sqd Ldrs, then to all soldiers.
Soldier Variant/Asset Tasking

Squad Leader Creating Move Order in Combat View for Robotic MULE

Current Location in Menu Structure

Current Task (Move)

Movement Route (Yellow)

Squad members

MULE

Current Location
Fires and Effects Control for Multi-Target, Multi-Weapon System Time Critical Targeting

- Shared attack guidance to select the right munitions and weapons mix, for single or large target arrays.
- Shared, distributed mission status informs all users of exact status of all fire missions.
- Total asset visibility on all available weapon systems and munitions, not just artillery.
- No client-server weaknesses. If fire control node goes down, all functionality and data at that node is preserved by other nodes via shared synchronized databases.
- LOS, BLOS & NLOS Weapons: Artillery, Mortars, Close Air Support, Attack Helicopters, MLRS, HIMARS, FCS, and other direct fire weapon systems.
- Fully automated, semi-automated, or manual fire mission processing.
CDAS Variants and SAL Target Designation

Decide
CDAS FFW and SAL Target Designation

Detect/Deliver
PDA Call for Fire

- Each soldier and leader given 1 hour training and practice on CDAS OFW PDA.
- Each soldier and leader given opportunity to send Call for Fire from CDAS OFW PDA in stand up simulators.

Initial Map Display  ➔  Soldier Entering Target  ➔  Soldier Monitoring Target Status  ➔  Target on Map Display
CDAS OFW and SAL Target Designation

Example of CDAS Fire Mission Tasking Applied to Designator

CDAS Future Force Warrior (FFW) Combat View (Head Mounted Display)
CDAS Variants Allow Full Information Connectivity for Networked Fires & Effects

Combat View Call for Fire

CDAS Netted Effects /Leader Node

PDA Call for Fire

Single or Multiple Target Call for Fire

CDAS Netted Effects /Leader Node

Fast Weapon Target Pairing

Army Aviation

Mortar

NGF

FCS PAM/LAM

PALADIN

LW155

FCS MCS

MLRS/HIMARS

FCS PAM/LAM

CAS

NGF
CDAS FFW User Evaluation Approach

- 4 hrs. training
- Short Vignettes based on snippets from FFW scenario developed by LTI.
- Key features addressed:
  - LOS, BLOS, NLOS Netted Effects
  - Collaboration for platoon/squad graphics
  - Logistics monitoring and visibility for all assets
  - Terrain Analysis for sensor placement
  - Issuing Digital Orders
  - Messaging
  - Situational Awareness Monitoring
- Vignettes conducted in SBL stand up SimStorm simulators.
- Each vignette between about 30-45 minutes long, followed by soldier evaluation of software capability used in vignette.
- Used slightly modified OTBSAF scenarios from February 2003 CDAS FFW exercise.
User Evaluation Layout

Network

- OFW Plt Ldr
  - Tablet PC
  - OFW CDAS HMD
- OFW Squad Ldr
  - Tablet PC
  - OFW CDAS HMD
- OFW Team Ldr
  - OFW CDAS PDA
  - OFW CDAS HMD
- OFW Soldier
  - OFW CDAS PDA
  - OFW CDAS HMD
- OFW Netted Effects
  - Desktop PC

Participants
- Plt Ldr-2LT
- Sgt Ldr-SGT
- Tm Ldr-PFC
- Soldiers-PVT-PFC
Summary

- CDAS is an open, extensible and scalable family of tools that support network centric warfare and can be configured for user experimentation in either virtual or field environment.
- Used extensively in CEP experiments at Ft. Sill, Ft. Knox and Ft. Benning and being integrated into MATREX v.7.
- CDAS component products extensively tested and Terrain Services component fielded in C2PC.
- Extensions of CDAS Netted Effects component under FC-NET will address all OFW NE component requirements.
  - Draft component requirements document generated and in review
  - Baseline CDAS architecture/design documentation posted to FFW IDE
  - Final architecture design in process in collaboration with SIT.
  - Packaging of CDAS NE component for insertion in FFW architecture in progress.