TerraBase II, Version 3.0

Supporting the Terrain Visualization Expert

By Mark Adams and Lieutenant Colonel Earl Hooper

The U.S. Army Engineer School continues its efforts to develop TerraBase II as an easy-to-use, low-cost, PC-based terrain evaluation tool for the engineer force. This software assists in training engineers to be terrain visualization experts and provides a personal software tool to evaluate and view digital terrain data products. TerraBase II is tailored specifically for military applications and requires minimal training. This article reviews the capabilities provided by version 2.2 and describes improvements available in the new 3.0 release.

"Terrain visualization is the responsibility of commanders and staffs across the spectrum of today's Army. To effectively see the impact that terrain has on units conducting and supporting military operations, all commanders and their staffs must be aware of the effects of terrain. The terrain expert is the engineer."

Major General Robert B. Flowers
Commandant, U.S. Army Engineer School

Version 2.2 Capabilities

TerraBase II has been the instructional standard for the Engineer School since the summer of 1997. The Engineer School distributed the original 2.04 version of TerraBase II on a Terrain Visualization Training CD-ROM (see *Engineer*, August 1997, pages 38-39). The 2.2 version of the software was distributed via the web in April 1998. TerraBase II quickly reached the field with our graduating students and through the Terrain Visualization Center web site.

With TerraBase II, version 2.2, engineers can produce a variety of tactical decision aids (TDAs) to assist with terrain visualization. These include line-of-site displays, weapons fans and range circles, visible area plots, oblique and perspective views, elevation and slope tints, contour and reflectance plots, point elevations, and fly-throughs. TerraBase II also performs coordinate datum transformations and calculates sunrise-sunset day length, moonrise-moonset, and over-the-ground distance.

TerraBase II, version 2.2, a users' guide, and a set of battle drills are available from the Terrain Visualization Center web site at *htttp://www.wood.army.mil/TVC*. Each battle drill contains an abstract and step-by-step procedures to help new users develop basic TDAs.

The primary data requirements are imagery and elevation data products from the National Imagery and Mapping Agency (NIMA - formerly the Defense Mapping Agency), U.S. Geological Survey (USGS) and a variety of commercial products. The 2.2 version uses—

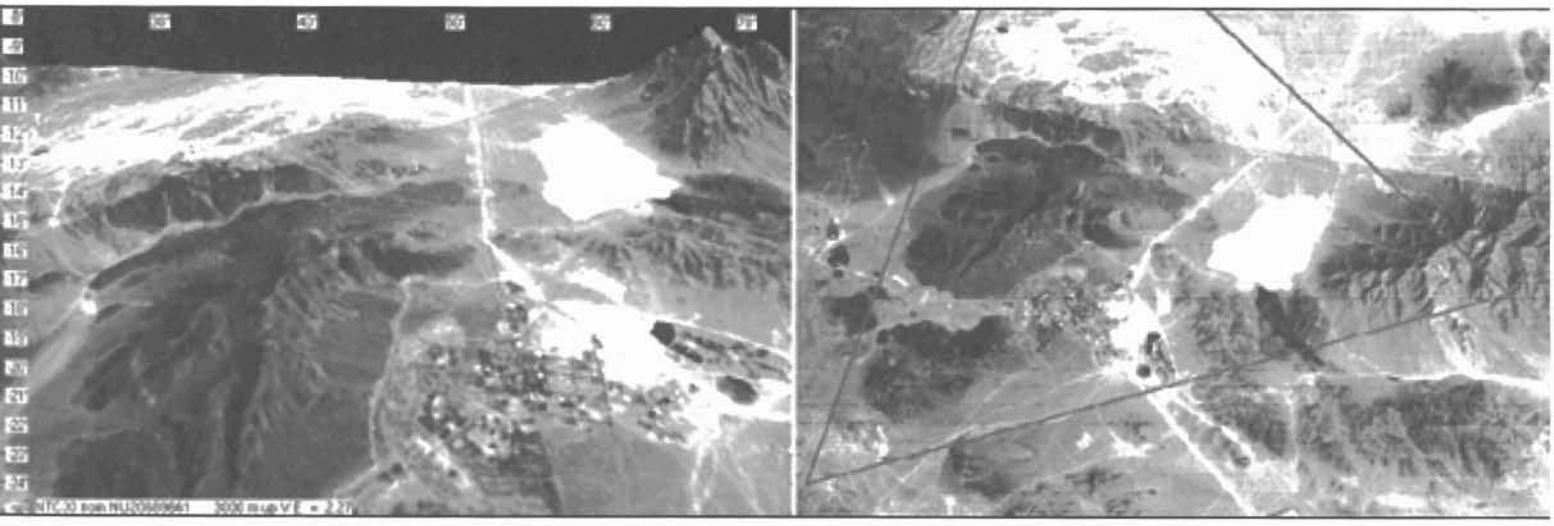
- NIMA digital terrain elevation data (DTED).
- USGS digital elevation models (DEM).
- NIMA controlled-image base (CIB).
- USGS digital orthophoto quads (DOQ).
- LANDSAT (land satellite) multispectral imagery (MSI).
- SPOT (Systeme Probatoire d' Observation de la Terre) satellite imagery.
- Indian reconnaissance satellite (IRS) imagery.

Version 3.0 Updates

Since the release of versions 2.04 and 2.2, a steady stream of questions, requests for assistance, recommended improvements, and bug reports flowed into the Terrain Visualization Center. The most useful information consistently came from users in the field, who add tactical significance to the TDAs produced with TerraBase II. The result of this input is TerraBase II, version 3.0. From the users' perspective, most of the improvements are evolutionary. Although many processes are simplified, the look and feel of TerraBase II remains unchanged. The following paragraphs summarize the most significant updates in version 3.0.

New Formats

Field users frequently requested map-based product formats. The 3.0 version adds digital map formats from NIMA and USGS that can be used to create TDAs, including perspective and fly-through products. New formats available in release 3.0 are—



An NTC fly-through (left view) with a corresponding two-dimensional track (right view).

- ***NIMA standard data types:*** Arc Digitized Raster Graphics (ADRG) maps, Compressed Arc Digitized Raster Graphics (CADRG) maps, and Compressed Digitized Raster Graphics (CDRG) maps.
- ***USGS standard data type:*** Digitized Raster Graphics (DRG) maps.
- New commercial and allied imagery in GeoTiff georeferenced formats.

Revised User Interface

Version 3.0 includes an expanded and simplified user "options" interface, improved pull-down menus, and a Graphics User Interface (GUI) for the most popular TDAs. This version also includes an updated coordinate conversion module and a "hot key" to execute the Topographic Engineering Center GEOTRANS software. The GEOTRANS software adds a Universal Polar Stereographic capability for the coordinates in polar regions, a few minor secondary grids, and the ability to batch-process coordinate conversions.

Improved TDA Presentation

Version 3.0 allows users to drape any of the tactical overlays (weapons fans, point elevations, annotations, custom grids, etc.) on elevation data, imagery, or maps to create two-dimensional, perspective, and oblique views. A curved-path fly-through is now possible with automatic smoothing of directional changes. The new fly-through interface simultaneously displays, frame by frame, both the fly-through three-dimensional view and the two-dimensional map track (see figure). Resolution restrictions on three-dimensional perspectives and fly-throughs are relaxed to take advantage of high-end PC capabilities.

GPS Connectivity

Military and commercial Global Positioning Systems (GPS) now can be connected to laptop computers and—in real time—display track, bearing, and speed, with updates every two seconds. The track can display over elevation data, imagery, and maps. Way points recorded using a military precise lightweight GPS receiver (PLGR) now can be downloaded and displayed in TerraBase II over elevation data, imagery, or maps. In a reverse role, routes planned with TerraBase II can be uploaded as way points to a PLGR for navigation.

Other Improvements

The help files in version 3.0 are greatly expanded and contain an automatic help feature for new users. Major changes in data retrieval and manipulation are embedded in the software that allow NIMA, USGS, and GeoTiff products to display in their native formats. Although TerraBase II still uses an internal.idx format for some products, most products load directly without the need for conversion. This capability greatly enhances the speed of creating TDAs and reduces file-storage requirements. Most importantly, it takes advantage of the geocontrol embedded in products from primary data providers.

Availability

TerraBase II, version 3.0 beta, may be downloaded from the new Terrain Visualization Center web site at *http://www.wood.army.mil/TVC/index.htm.* A revised users' guide and an updated set of battle drills are planned for release by the end of 1998. A new two-CD-ROM set is projected for completion early in 1999. The first CD-ROM will contain a self-paced interactive training program, while the second one will contain the TerraBase II software and an expanded set of training data. The Engineer School continues to support earlier TerraBase II releases, battle drills, and users' guides until version 3.0 is available on CD-ROM and the Terrain Visualization Center web site.

Sample digital elevation and satellite imagery data coverage for several CONUS training posts is available from the Terrain Visualization Center web site. The key source of data for training and operations continues to be the NIMA. Units

can use their Department of Defense Activity Address Code (DODAAC) to order digital and hard-copy products from NIMA on a 30-day turnaround cycle. As of 1 April 1998, NIMA products are ordered and delivered through the Defense Logistics Agency and requested by national stock number using the Standard Army Retail Supply System. Department of the Army Deputy Chief of Staff for Logistics message (DALO-SMP, DTG 140858Z April 97) provides instructions. Map stock and issue procedures follow AR 710-2, *Inventory Management Supply Policy Below the Wholesale Level*. Mapping, charting, and geodesy products are stocked at Class II, IV, and VII supply points at Corps and the Theater Army Area Command. The Defense Supply Center web site at *http://www.dscr.dla.mil/PC9/dscr_maps.htm* provides information on the new ordering and distribution process. All NIMA products are provided at no cost to support military requirements.

Joint Venture

The TerraBase II developmental effort continues as a joint venture between the Engineer School's Department of Training and Doctrine Development (responsible for all training, instructional materials, and training support), the Terrain Visualization Center (responsible for software development management, priorities, and field technical support), and the U.S. Naval Academy (responsible for programming and software development).

Engineer School personnel are grateful to Dr. Peter Guth of the U.S. Naval Academy for his extraordinary skill and dedication to this project and to the U.S. Naval Academy for its flexibility and support of Dr. Guth's efforts This relationship allows TerraBase II to develop and respond quickly to user feedback. TerraBase II, version 3.0, is indicative of this cooperative relationship.

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continue to improve. That the defense has never been compromised, despite occasionally fierce posturing throughout nearly four decades, is testament to the resolve and skill of its defenders. Gitmo's tangible, unique defensive preparations, which showcase the competence and ingenuity of Marine engineers and Seabees, have shown that combat engineering is essential to mission success.

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