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Moving-Map Composer – Personal Computer (MMCPC) Version 1.0 for the Finland Air Force: Software User's Manual

Stephanie A. Myrick
Michael E. Trenchard
Geary J. Layne
Marlin L. Gendron
Maura C. Lohrenz

Mapping, Charting, and Geodesy Branch
Marine Geosciences Division

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14. ABSTRACT

This report documents a substantial revision of the Moving-Map Composer (MMC) system designed and developed by scientists at the Naval Research Laboratory (NRL) Geospatial Processing and Analysis (GeoPAL) Team (Code 7440.1). This version of MMC has been extended for use on personal computers (PCs) and is referred to as MMCPC. This is the first edition of the MMCPC Software User's Manual, to be distributed with MMCPC software release 1.0. MMCPC is specifically designed and configured to support Finland Air Force (FiAF) F/A-18 mission planners and pilots in the field.

MMCPC is a software application developed for installation on a Windows XP computer configured with a standard 16-bit PCMCIA drive, or PC card drive, for reading and writing Tactical Aircraft Moving-Map Capability (TAMMAC) mission and theater map data loads. MMCPC enables users to perform the following functions: process FiAF source Geo-referenced Tagged Image File Format (GeoTIFF) files into a Compressed Arc Digitized Raster Graphics (CADRG)-compatible format; process FiAF or National Geospatial-Intelligence Agency (NGA) source Digital Terrain Elevation Data (DTED) into a TAMMAC-compatible regridded DTED format (RDTED); define and save regions of interest (ROIs) for mission and theater map data loads as a series of bitmap representations; populate these regions of interest with data from user-specified FiAF GeoTIFF files (converted to CADRG-like files via MMCPC), NGA CADRG, FiAF and/or NGA RDTED, and NGA Controlled Image Base (CIB) databases; import and convert non-georeferenced images into TAMMAC-compatible data frames; write completed TAMMAC theater map data loads to PC cards for aircraft loading; and build Mission Planning loads from user-specified CADRG, RDTED, CIB, and data frames.

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MOVING-MAP COMPOSER–PERSONAL COMPUTER (MMCPC) VERSION 1.0 FOR THE FINLAND AIR FORCE: SOFTWARE USER'S MANUAL

1. INTRODUCTION

This report documents a substantial revision of the Moving-Map Composer (MMC) system designed and developed by scientists at the Naval Research Laboratory (NRL) Geospatial Processing and Analysis (GeoPAL) Team (Code 7440.1). This version of MMC has been extended for use on personal computers (PCs) and is referred to as MMCPC. This is the first edition of the MMCPC Software User's Manual, to be distributed with MMCPC software release 1.0. MMCPC is specifically designed and configured to support Finland Air Force (FiAF) F/A-18 mission planners and pilots in the field.

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- Import and convert non-georeferenced images into TAMMAC-compatible data frames;
- Write completed TAMMAC theater map data loads to PC cards for aircraft loading;
- Build Mission Planning loads from user-specified CADRG, RDTED, CIB, and data frames;
- Print final compositions, CADRG images, data frames, and map load summaries.

2. SYSTEM CONFIGURATION

Figure 1 illustrates the FiAF MMCPC operational components, the data flow between each of these components, and the principal MMCPC software operations: defining geographic regions of interest, inputting data sources, and building mission and theater map data loads from the resulting map compositions.

Map compositions are user-defined regions of interest based on logged sources for CADRG, CIB, and RDTED map data, as well as combinations of existing user-defined compositions and data frames. Figure 2 outlines how to create a new map composition.

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The main body of this manual provides detailed information on the MMCPC software. Section 3 describes the graphical user interface (GUI), including the world-map workspace, tool bars, and all associated utilities. Section 4 provides step-by-step instructions on how to perform the most common operations. Acronyms and terms are defined in Appendix A.

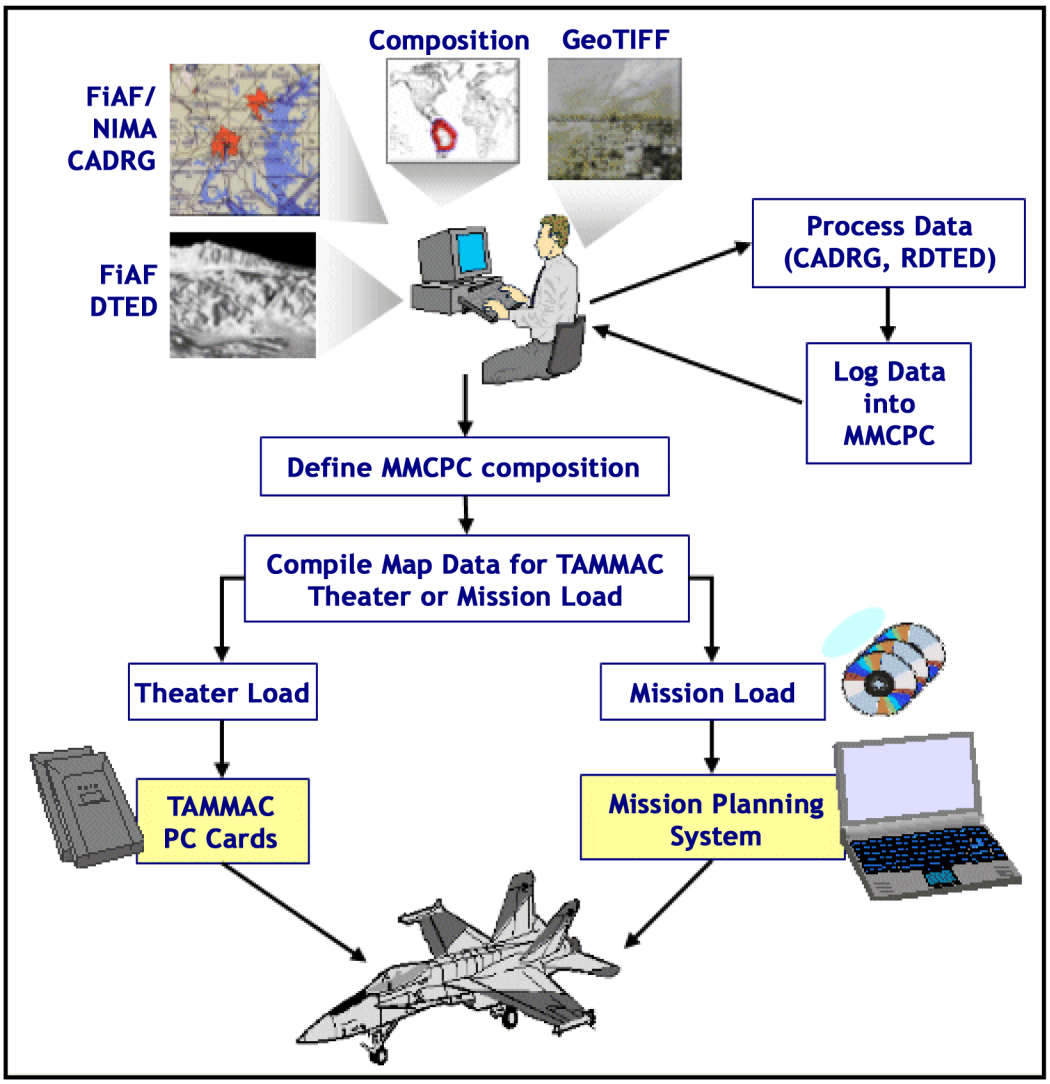


Fig. 1 — FiAF MMCPC operational components

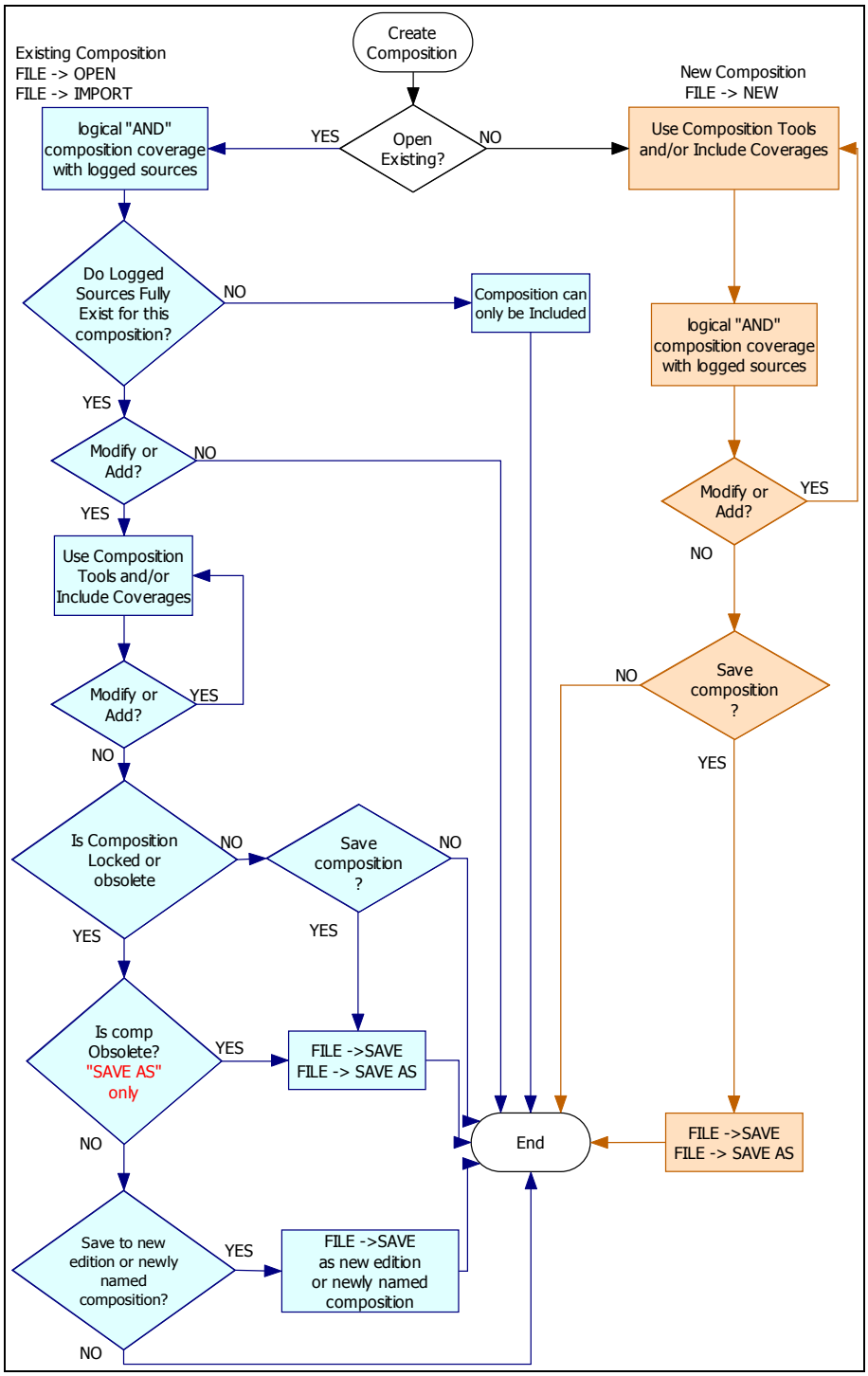


Fig. 2 — Building a user-defined mission or theater composition

3. GRAPHICAL USER INTERFACE

3.1 Starting MMCPC

MMCPC is invoked by double-clicking its application icon on the PC desktop or through the Start > Programs menu. This brings up the main MMCPC window (Fig. 3).

Section 3.2 provides detailed descriptions and illustrations of the workspace, menus, tools, and title bar. Section 3.3 provides detailed descriptions of operations accessed from the main menu.

3.2 Toolbars and Workspace Definitions

3.2.1 World-map Workspace

Figure 3 depicts the main MMCPC window, primarily consisting of a world base map, in Mercator projection, on which to design mission and theater compositions. The currently open composition file name (e.g., "FINLAND 1 Edition 1" in Fig. 3) is displayed in the title bar of the main MMCPC window.

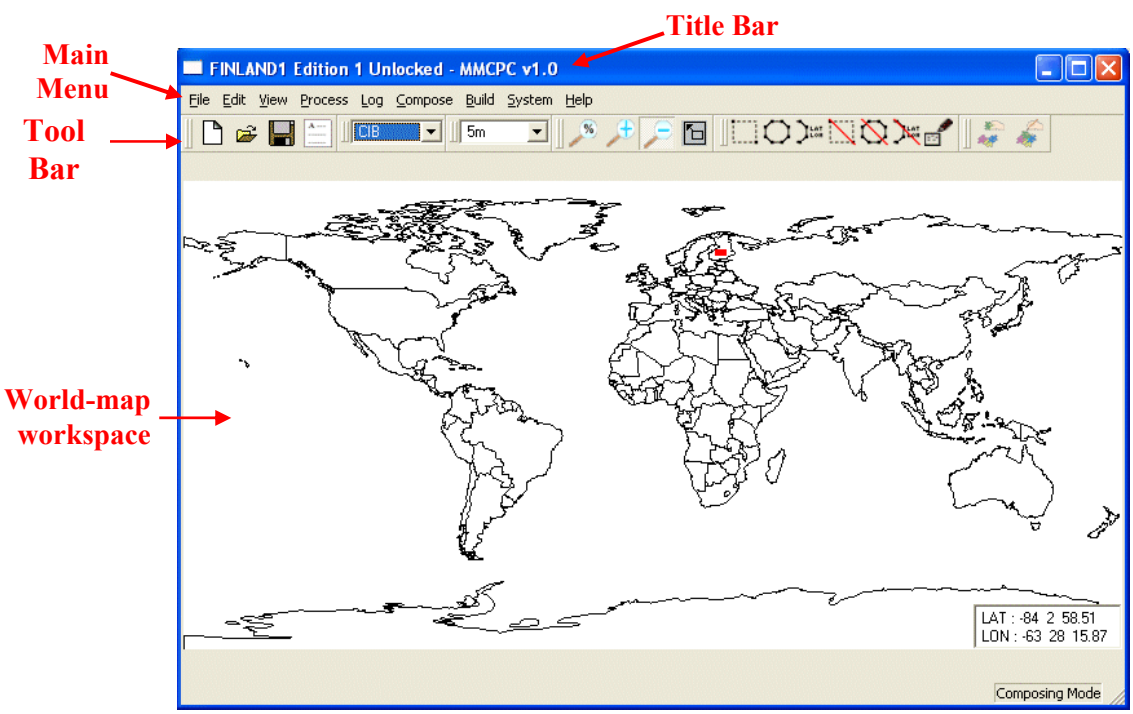


Fig. 3 — Main MMCPC window

The cursor latitude/longitude position box (located in the lower right corner of the workspace) shows the current geographic position of the cursor over the MMCPC base map. Position is shown in degrees, minutes and seconds [default] or in decimal degrees of latitude and longitude.

Shortcuts for common base map operations are available by clicking the right mouse button over the map to invoke the shortcut selection window (Fig. 4):

Full View to restore the world base map to full view (e.g., following a zoom operation).
Zoom by Stretch Box to zoom into a region of interest using the "stretch-box" tool (Section 3.2.2.3).
View RPF Data to display geographic areas of coverage for Raster Product Format (RPF) data, including CADRG, CIB, or RDTED.
Hide Lat/Lon Display to toggle on/off the cursor latitude/longitude position box.

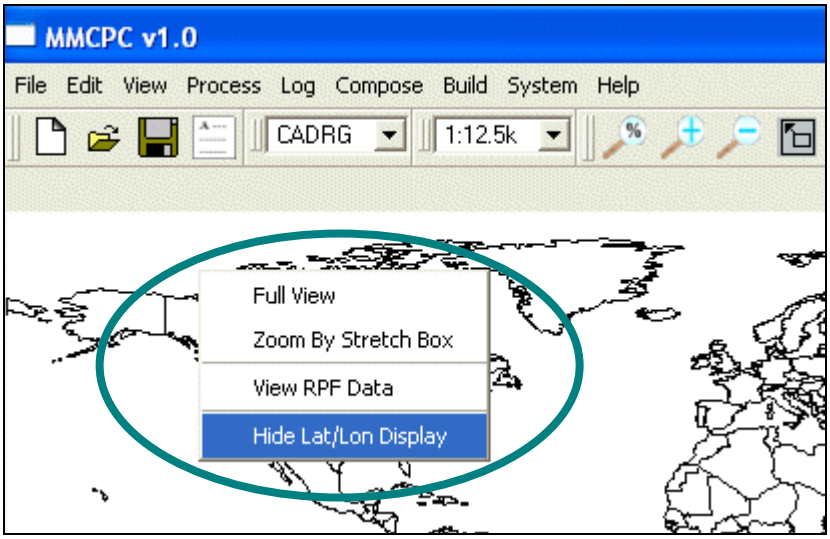


Fig. 4 — Base map shortcuts (access by clicking right mouse button anywhere on map)

3.2.2 Tool Bar

MMCPC provides tools to quickly access common operations, also available through main menu options. This section describes the functionality of each tool group. The descriptions that follow are keyed to the tool bar illustrated in Fig. 5:

1. File buttons (Section 3.2.2.1)
2. Data type and scale boxes (Section 3.2.2.2)
3. Zoom buttons (Section 3.2.2.3)
4. Coverage definition buttons (Section 3.2.2.4)
5. Mission and theater buttons (Section 3.2.2.5)
6. Associated data frames (Section 3.2.2.6)

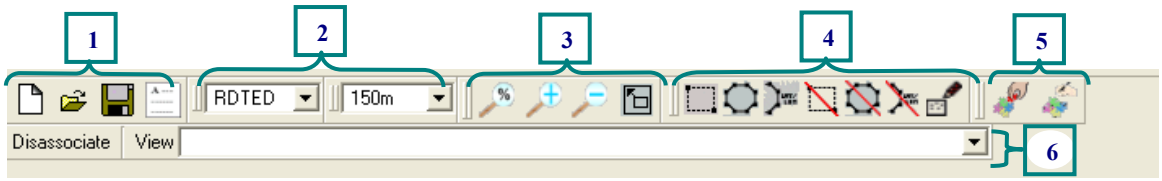


Fig. 5 — MMCPC tool bar with all selectable options displayed

MMCPC displays the name of a toolbar button in a screen tip when the mouse pointer rests on the button. Tool bar fields may be selectively included or removed from view in the main window. Place the mouse cursor within any of the toolbars and click the right mouse button to invoke the tool bar view selection window (Fig. 6). Select a viewing preference by placing a check mark next to the desired tool bars.

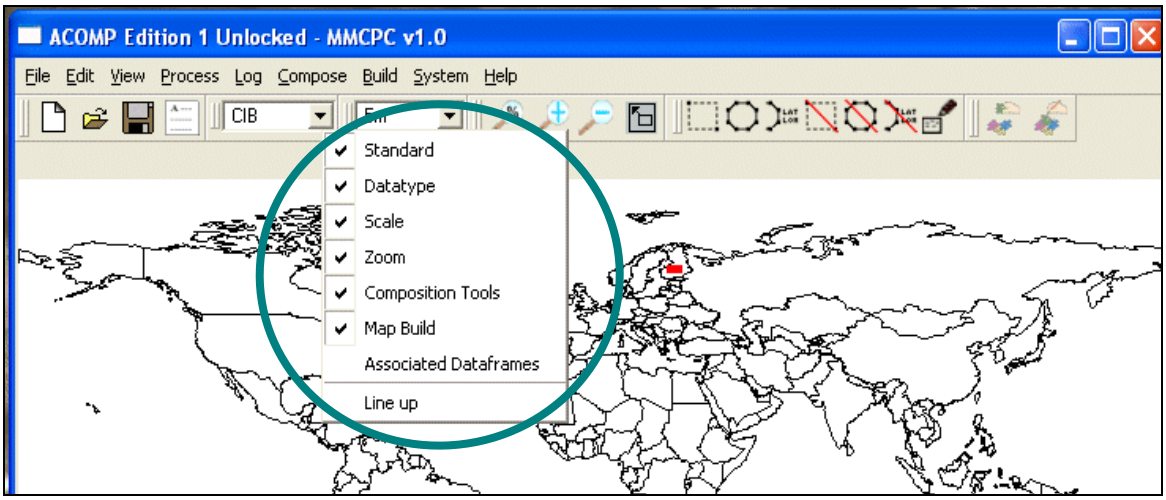


Fig. 6 — MMCPC tool bar view selection

3.2.2.1 File Buttons

The *File* buttons (Fig. 7) are shortcuts for common operations also available via the *File* menu (Section 3.3.1), including opening new or existing files and performing save operations. File buttons may be selectively included or removed from the tool bar by clicking the mouse right-button and toggling the Standard tool button on/off (adding or removing the check mark; see Fig. 6).

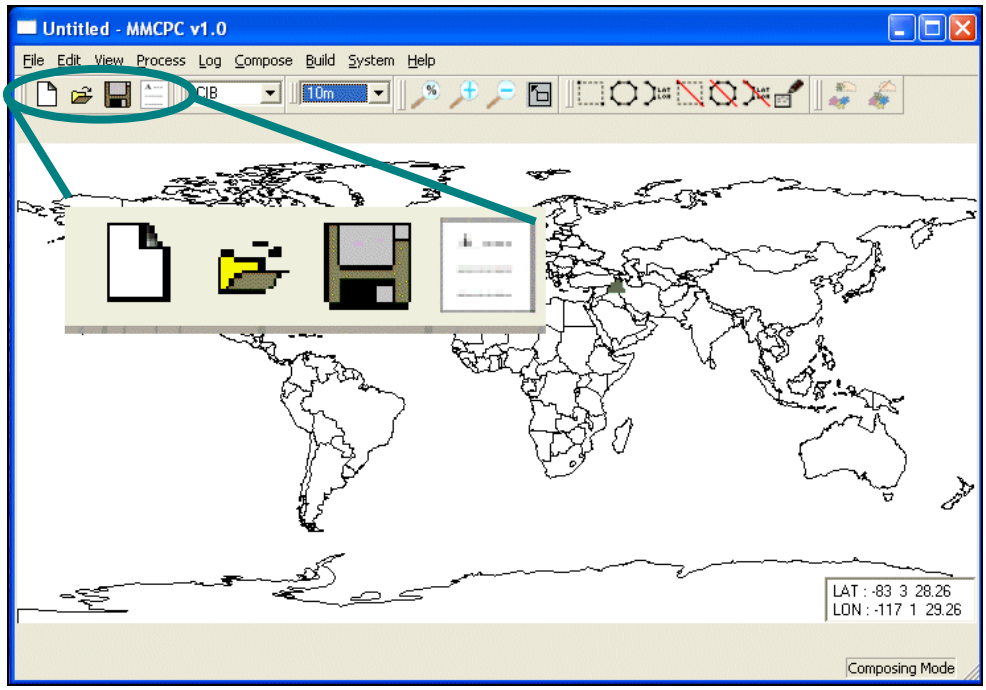
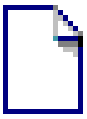


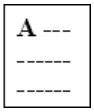
Fig. 7 — File buttons: Create composition, Open file, Save file, Import/Export



The *Create a New Composition* button creates and opens a new file in preparation for building a new mission or theater composition (see Section 3.3.1.1).

The *Open an Existing File* button opens an existing composition file (see Section 3.3.1.2).

The *Save File* button saves an open composition file (see Section 3.3.1.4).



The *Import/Export* button imports mission compositions in ASCII file format (see Section 3.3.1.6).

3.2.2.2 Data Type and Scale Boxes

Select the *map data type* and *map scale* from these drop-down lists (Fig. 8). Users can define coverages in one series and switch to another series without losing what they defined in the first. Users can also cut or copy coverages from one series and paste them into another (see *Edit* menu options *Cut*, *Copy*, and *Paste* in Section 3.3.2).

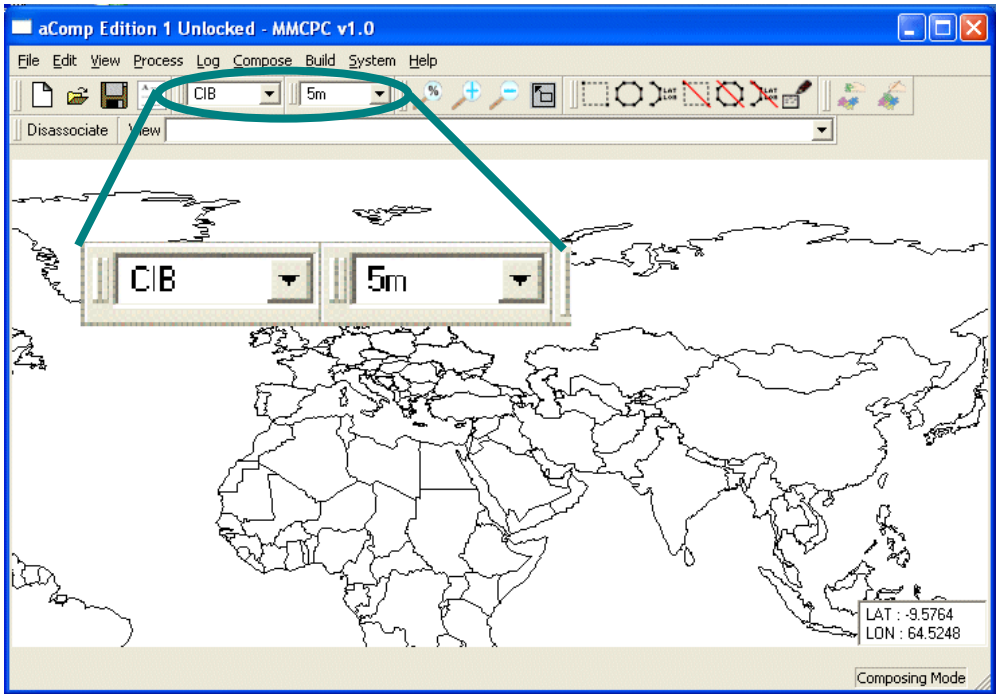
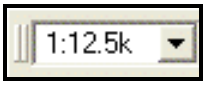


Fig. 8 — Map data type and scale boxes

Choose a map *Data Type* from this drop-down list: CADRG [default], RDTED, and CIB (including NGA data frames, and FiAF GeoTIFF).



Choose the map *Data Scale* from this drop-down list: for CADRG data select one of the following scales: 1:5M, 1:2M, 1:1M, 1:500k, 1:250k, 1:100k, 1:50k, and 1:12.5k [default]; for RDTED data select 150m [default] or 750m; for CIB data select 5m [default] or 10m.

3.2.2.3 Zoom Buttons

To optimize performance, the user is advised to zoom-in to a region of interest before designing a composition or adding overlays. The *Zoom* buttons (Fig. 9) allow the user to zoom into (or out from) an area of interest on the MMCPC base map. Zooming can be done via a stretch-box or by selecting a zoom factor and then zooming in or out by that factor. **Note: when a button's icon is gray, it is not available for use.** For instance, the *Zoom-out* button will be unavailable until the user has zoomed in.

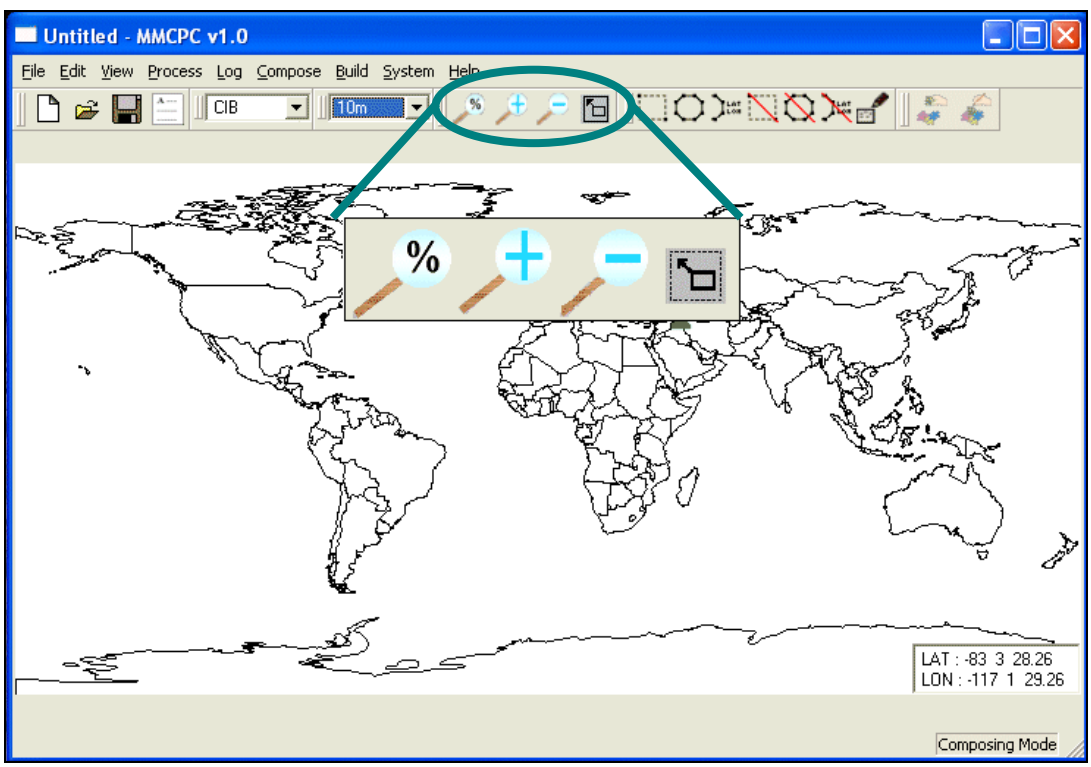


Fig. 9 — Zoom buttons

The *Zoom-in to ROI via factor box* button adjusts the zoom factor with the pop-up magnification selection box (Fig. 10). The default magnification (100%) displays the entire world base map. Factor values of 75% or less will zoom-in centered to the point selected.

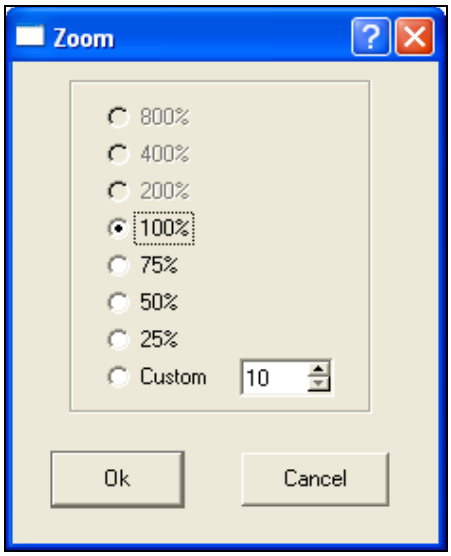
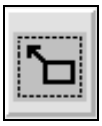


Fig. 10 — Zoom factor selection box

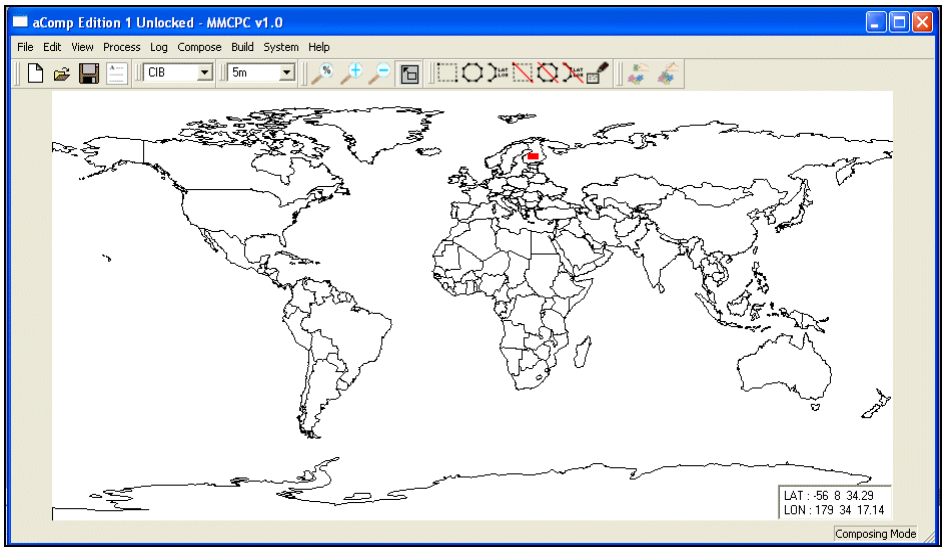
The *Zoom-in on a Point* button zooms in to the MMCPC base map. Click on this button, adjust the zoom factor, and then click on the map to zoom-in (the map will center on the selected point). This button will turn light gray when the maximum zoom-in has been reached.

The *Zoom-out from a Point* button zooms out from the MMCPC base map. Click on this button, and then click on the map to zoom-out (the map will center on the selected point). This button will appear light gray when it is unavailable (i.e., if the user has not yet zoomed in).



The *Zoom-in on a Stretch-Box* button zooms in to an area of interest with a stretch-box. Click on this button, then click on the upper left corner of the area of interest with the left mouse button, holding the mouse button down and dragging the resulting stretch-box to the lower right corner of the area of interest. As long as the mouse button is held down, the stretch-box may be adjusted. The box maintains a constant aspect ratio identical to the display screen. As soon as the box is satisfactory, release the mouse button, and then click again with the left mouse button to perform the zoom (Fig. 11).

(a)



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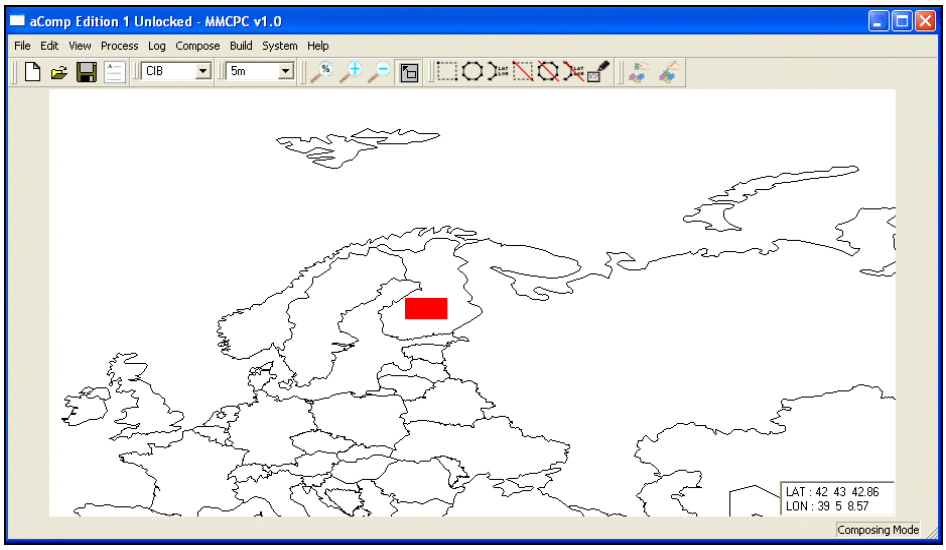


Fig. 11 — Zooming in to an area of interest: (a) before zoom, (b) after zoom.

3.2.2.4 Coverage Definition Buttons

The *Coverage Definition* buttons (Fig. 12) allow a user to define coverage areas in three main ways: 1) using the mouse to draw a stretch-box around a coverage; 2) entering a series of lat/lon points to define a polygon; and 3) picking individual data segments.

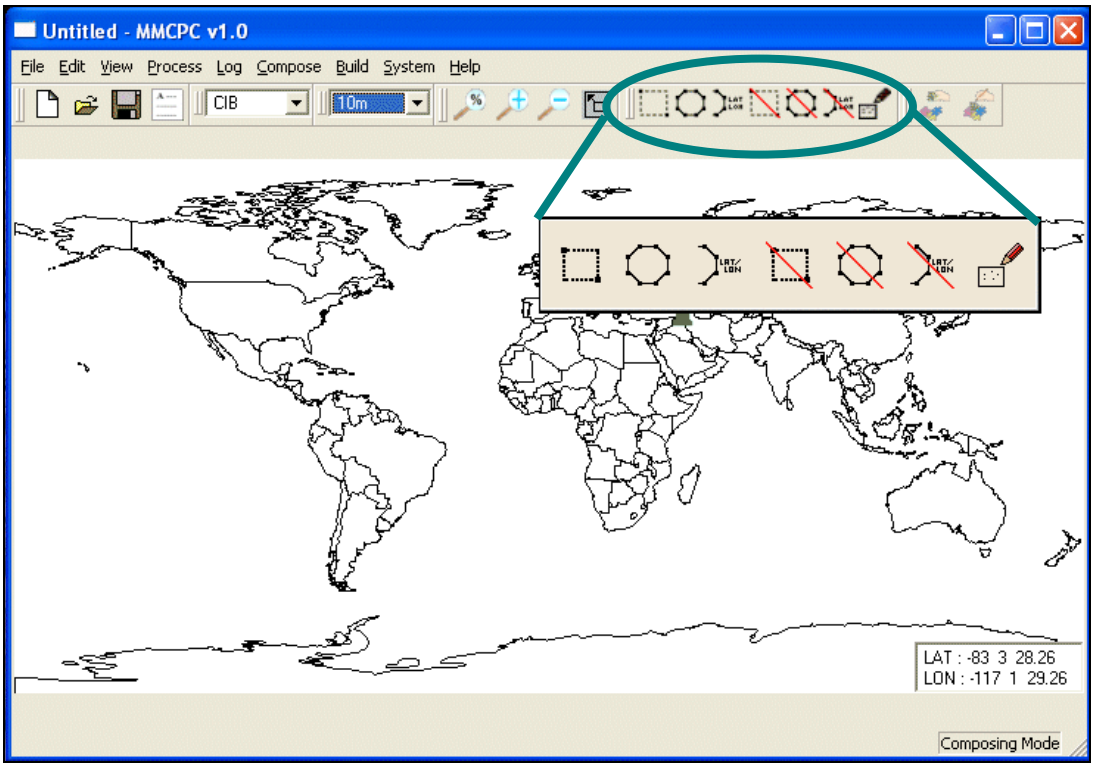
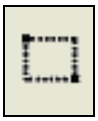


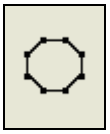
Fig. 12 — Coverage definition buttons

3.2.2.4.1 Define Area of Coverage

Use any combination of these three buttons to define an area or areas of map coverage for inclusion in a theater or mission composition.



The *Define Coverage by a Stretch-Box* button defines a rectangular area of coverage using a stretch-box. Click this button, then click on the upper left corner of the area to be defined with the left mouse button. Hold the mouse button down and drag the resulting stretch-box to define the desired area. As long as the mouse button is depressed, the stretch-box is adjustable. Release the mouse button when the box is satisfactory. Click again (anywhere on the map) with the left mouse button to accept the coverage and fill the box with segments.



The *Define Coverage by Clicking Polygon Vertices* button defines an irregularly shaped area. Click this button, and then click a series of points (with the left mouse button) on the world map to define the vertices of a polygon, which in turn defines the coverage area. To close the polygon and fill the defined area with segments, double-click with the left mouse button.

The *Define Coverage by Latitude/Longitude Coordinates* button defines an area bounded by specific latitude and longitude points. When a user clicks this button, a Latitude/Longitude Entry window (Fig. 13) pops up. Enter each geographic coordinate pair (latitude, longitude), then click *Add LAT/LON*. As each pair is added, MMCPC will list it in the Latitude/Longitude Entry window. The user can edit the entries as follows before accepting the coverage area:

- To edit a record, select the entry in the list (the *Add LAT/LON* button will automatically rename to *Change LAT/LON*), edit the latitude and/or longitude value(s) and click *Change LAT/LON*.
- To delete a record, select the entry in the list and click *Remove LAT/LON*.
- When all coordinates are listed correctly, click *OK*. The main MMCPC window will return, and the defined composition will appear on the world map.
- To exit from the Latitude/Longitude Entry window and not save the points as a composition, click *Cancel*. The main MMCPC window will return.

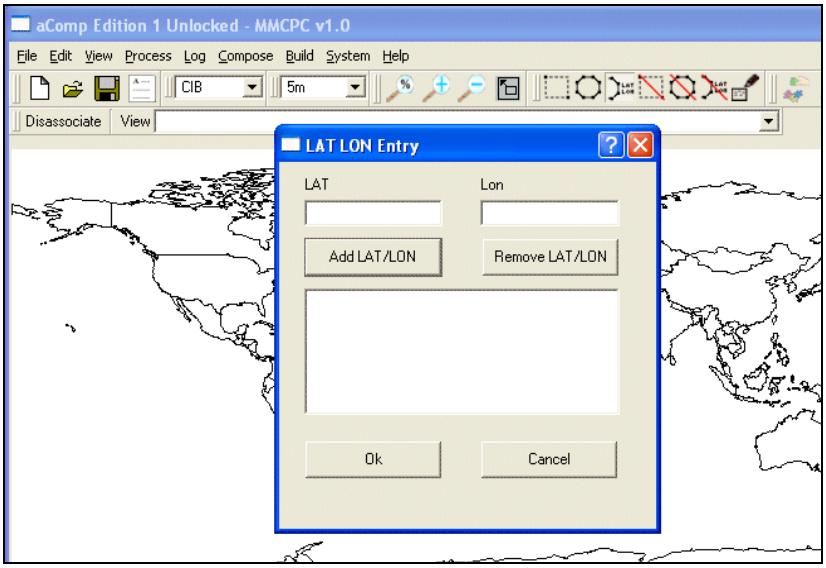
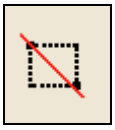


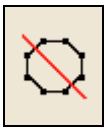
Fig. 13 — Latitude/Longitude entry window

3.2.2.4.2 Erase an Area of Coverage

These buttons are deactivated until the user has defined at least one area of coverage with one or more of the *Define Coverage* buttons (Section 3.2.2.4.1). Use any combination of the following three buttons to erase areas of map coverage (i.e., remove coverage from a theater or mission composition).



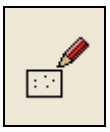
The *Erase Coverage by a Stretch-Box* button erases a rectangular area of coverage in the same way that the *Define Coverage by a Stretch-Box* button works (Section 3.2.2.4.1).



The *Erase Coverage by Clicking Polygon Vertices* button erases an irregularly shaped area in the same way that the *Define Coverage* equivalent works (Section 3.2.2.4.1).

The *Erase Coverage By Latitude/Longitude Coordinates* button erases an area bounded by specific latitude and longitude points in the same way that the *Define Coverage* equivalent works, using the Latitude/Longitude Entry window (Section 3.2.2.4.1).

3.2.2.4.3 Set/Clear Individual Segments



The *Set/Clear* button individually selects segments to be added to—or deleted from—a composition. In other words, this button acts as a toggle to select and deselect individual segments.

3.2.2.5 Mission/Theater Buttons

The *Mission/Theater* buttons (Fig. 14) are shortcuts for common operations also available via the *Build* menu (Section 3.3.7), including building map loads and writing them to PC card(s).

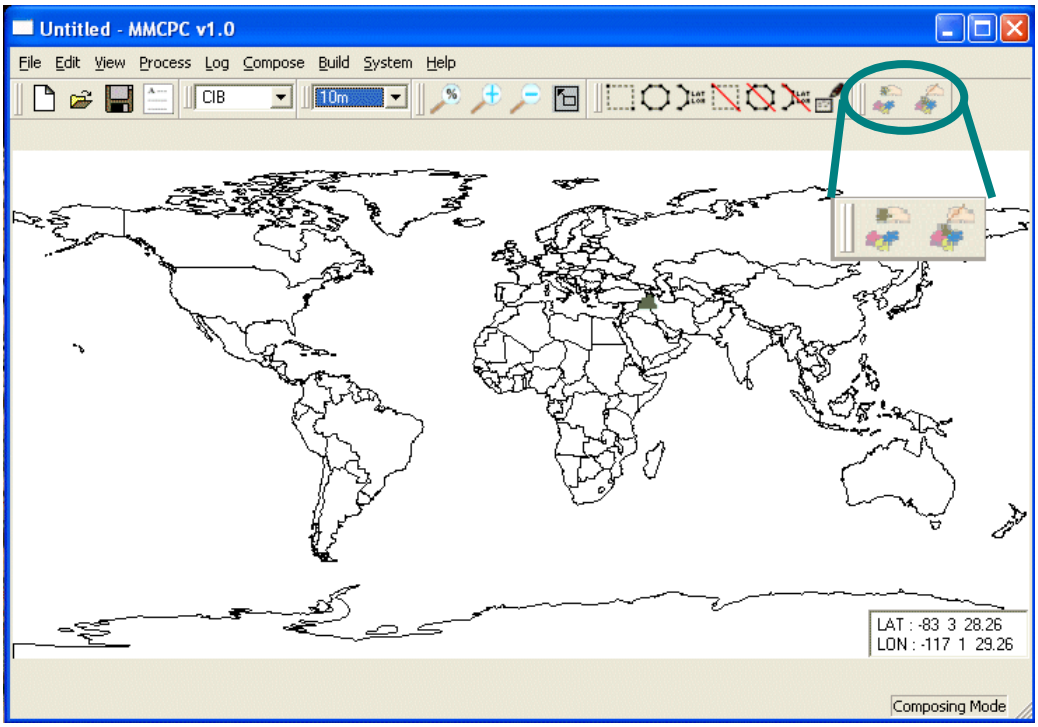
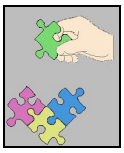
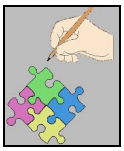


Fig. 14 — Mission/Theater buttons



The *Build a Map* button builds a theater or mission map load (see Section 3.3.7.1).



The *Write a Theater Map* button writes a mission/theater load to a PC card (see Section 3.3.7.2).

3.2.2.6 Associated Data Frames

This tool displays a drop-down menu that lists every data frame associated with the current composition (Fig. 15). See Section 3.3.6.2 for information regarding how to associate data frames with the current composition. Use this tool to verify the data frames have been properly associated with a composition. To view a data frame, select it from this menu, and click the *View* button to the left of the data frame list. Click the *Disassociate* button to remove an entry from the list.

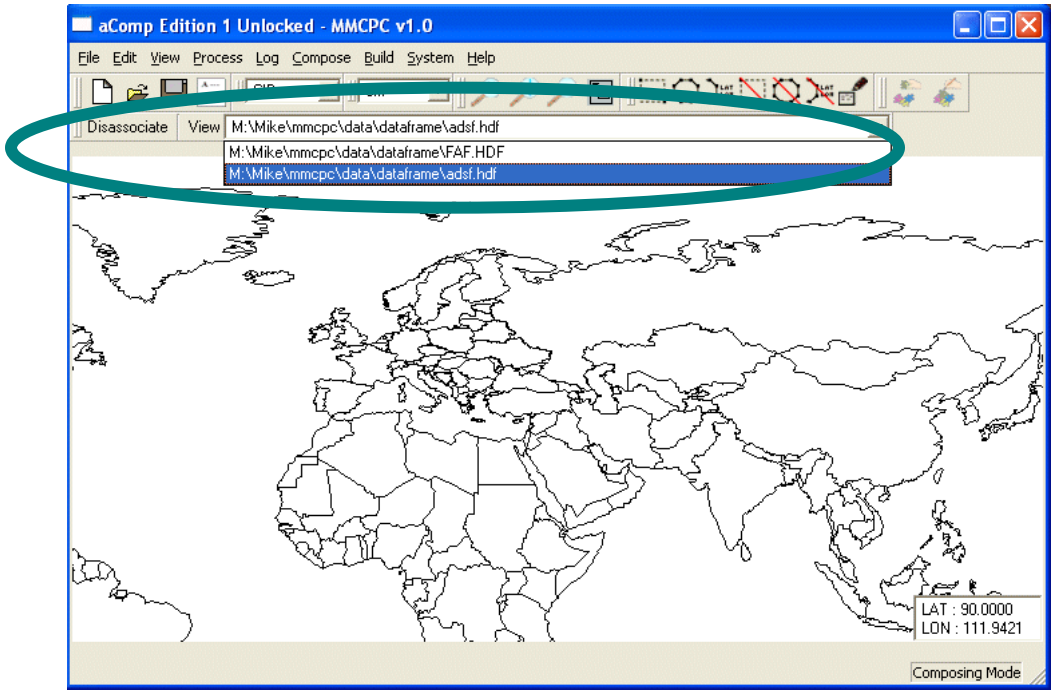


Fig. 15 — Data frame tool showing associated data frames

3.3 Main Menu

The top menu bar (main menu) provides drop-down menus for the main operations of MMCPC.

3.3.1 File

The *File* menu (Fig. 16) lets a user create, open, and save a composition, and exit from MMCPC.

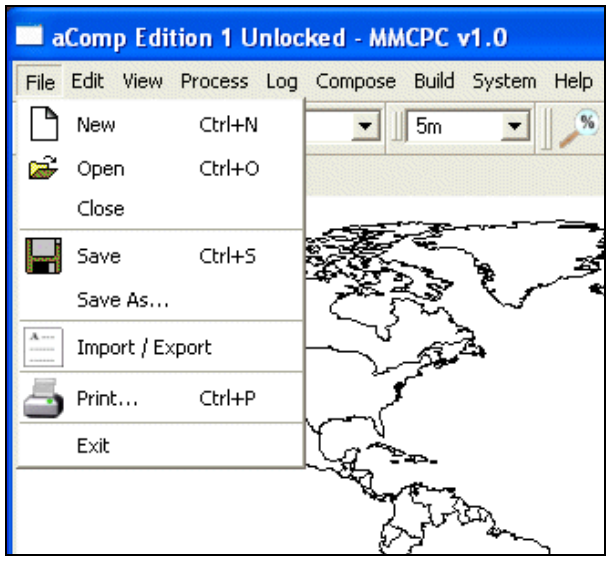


Fig. 16 — File menu

3.3.1.1 New (*Ctrl-N* or *Alt-FN*)

This option—also available via the *Create a New Composition* button on the tool bar (Section 3.2.2.1)—creates a new file in preparation for building a mission or theater build. See the *Open* option (below) for alternatives to *New*. If a user designs a composition and does not save it before selecting *New*, MMCPC will issue a warning to save the work prior to starting a new file.

3.3.1.2 Open (*Ctrl-O* or *Alt-FO*)

This option—also available via the *Open an Existing File* button on the tool bar (Section 3.2.2.1)—opens a file containing a mission or theater build composition. When the user selects *Open*, MMCPC displays a list of compositions from which to choose (Fig. 17), after which MMCPC returns to the base map and displays the selected composition (Fig. 18). At this point, the user can view the map data defined by the composition (via the *View RPF Data* selection from the right mouse button menu) or modify the composition.

3.3.1.3 Close (*Alt-FC*)

This option closes the current composition and refreshes the main MMCPC window. If the user has made unsaved changes, MMCPC will issue a warning and provide an opportunity to save the work prior to closing.

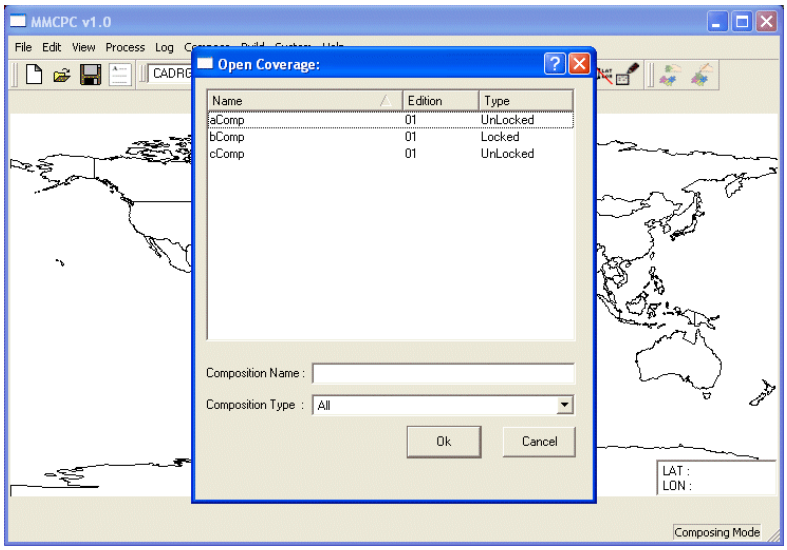


Fig. 17 — Sample list of compositions

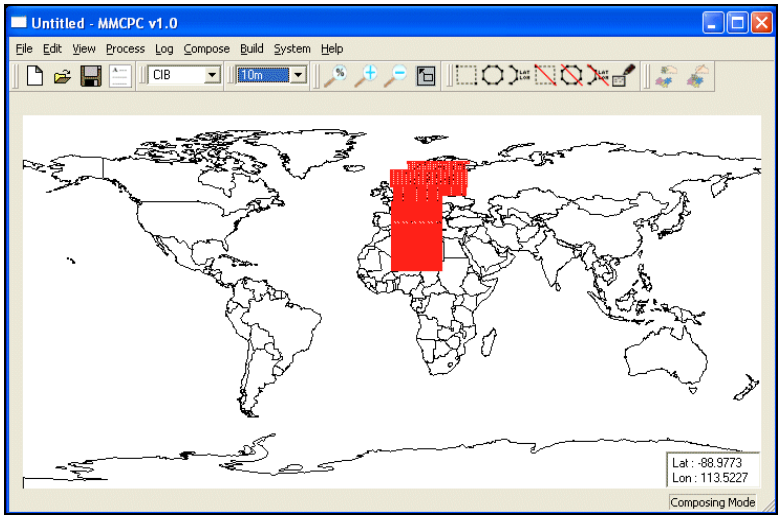


Fig. 18 — Sample composition displayed on the MMCPC base map

3.3.1.4 Save (*Ctrl-S* or *Alt-FS*)

This option—also available via the *Save File* button (Section 3.2.2.1)—saves the current composition as a working file, with no associated mission or theater specifics. MMCPC does not place any size restrictions on these files, so the user may save a large "master" composition as a working file, and then break it into smaller compositions for final files.

MMCPC prompts the user for the final filename, which must be 10 characters or less with only Modified ASCII (MASCII) alphanumeric characters (i.e., A–Z, 0–9). The full MASCII symbol set is provided in Appendix B. Note that if the status of the file is *locked*, it cannot be overwritten and must be saved as a new edition or given a different name. A composition is always saved in an *unlocked* state, which indicates the composition has neither been used to create a TAMMAC theater or mission map load, nor has it been defined as either a mission or theater map build. Once a composition has been successfully used to create a TAMMAC map load, MMCPC automatically changes the state of the composition to

locked, after which no changes can be made to that edition of the composition. This process enables the MMCPC user to exactly replicate a TAMMAC map based on its corresponding locked composition. When map sources are removed from MMCPC, any *locked* compositions referencing those sources will automatically be marked *obsolete*, indicating a TAMMAC map build may no longer be exactly replicated because one or more map sources are no longer available. If the user tries to save a composition with an unlocked composition filename that already exists, MMCPC will ask if the user wants to overwrite the preexisting file.

3.3.1.5 Save As (*Alt-FA*)

This option saves the current composition with a new filename in an unlocked state. MMCPC does not place any size restrictions on these compositions, so the user may save a large "master" composition and later break it into smaller compositions for TAMMAC map builds. Filename restrictions are described in Section 3.3.1.4.

3.3.1.6 Import/Export (*Alt-FI*)

This option—also available via the *Import/Export* button (Section 3.2.2.1)—imports mission compositions in ASCII format. The default directory for import files is C:\MMCPC\IMPORT. The export portion of this function is not supported in MMCPC v1.0.

3.3.1.7 Print (*Ctrl-P* or *Alt-FP*)

This option print the contents of the screen.

3.3.1.8 Exit (*Alt-FX*)

This option closes the current composition and exits from MMCPC. If the user has made unsaved changes, MMCPC will issue a warning and provide an opportunity to save the work prior to closing.

3.3.2 Edit

The *Edit* menu (Fig. 19) provides utilities to select, cut, copy, and paste coverages between scales. These options can also be invoked via shortcuts and/or hot keys.

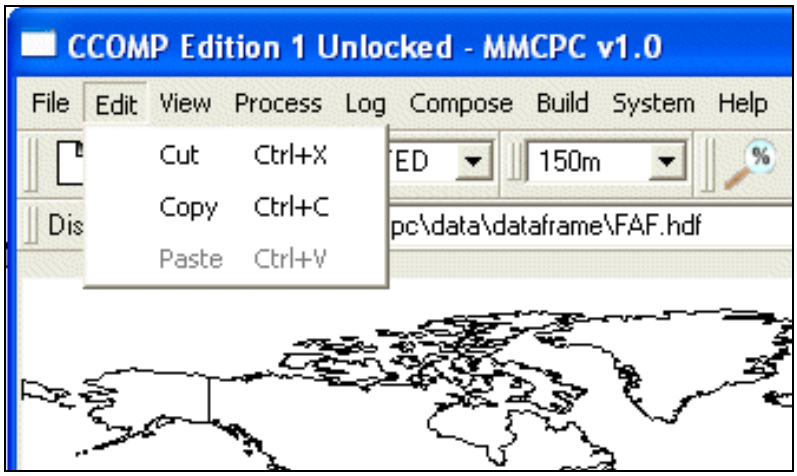


Fig. 19 — Edit menu

3.3.2.1 Cut (*Ctrl-X* or *Alt-ET*) / Copy (*Ctrl-C* or *Alt-EC*) / Paste (*Ctrl-V* or *Alt-EP*)

Cut removes the selected coverage from the current chart series and temporarily stores it in memory (to be pasted in another series, if desired). *Copy* makes a copy of the selected coverage and stores it in memory. *Paste* adds the most recently cut or copied coverage from memory onto the current coverage.

To select one or more coverages to cut or copy, double-click on each area and they will turn yellow. Then choose *Cut* or *Copy*. Warning: only the most recent *Cut* or *Copy* operation stays in memory. If the user cuts one coverage and then cuts or copies another coverage—before pasting the first—the first coverage will be overwritten in memory.

3.3.3 View

The *View* menu (Fig. 20) includes options to refresh the display and overlay shorelines, latitude and longitude grid, user-defined coverage polygons, available data coverages, and zoom. Some options are selected with a toggle button that shows a check mark when chosen. These options can also be invoked via hot keys.

3.3.3.1 World Map (*Alt-VW*)

World Map is the base map for MMCPC and a standard product from the National Imagery and Mapping Agency (NIMA). This overlay draws the shorelines of the world and is ON by default (Fig. 21). When this option is toggled off, MMCPC will not draw the World Map.

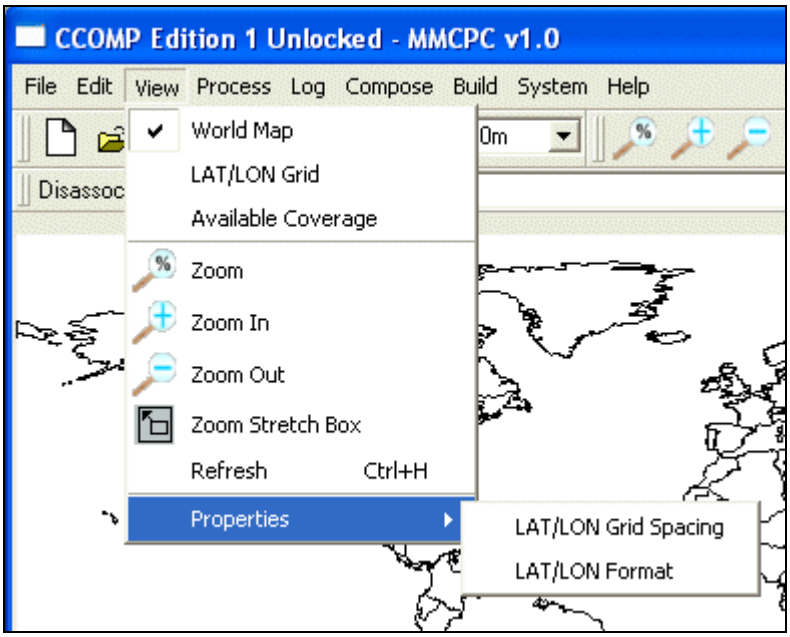


Fig. 20 — View menu

Fig. 21 — MMCPC base world map

3.3.3.2 LAT/LON Grid (*Alt-VG*)

This option displays a user-defined grid of latitude and longitude lines (OFF by default). When the user turns this overlay ON, MMCPC will overlay the grid on the World Map. Default grid spacing is 45° (latitude and longitude), but the user can change this (see Section 3.3.3.6). Fig. 22 shows the *LAT/LON Grid* ON with a 20° grid.

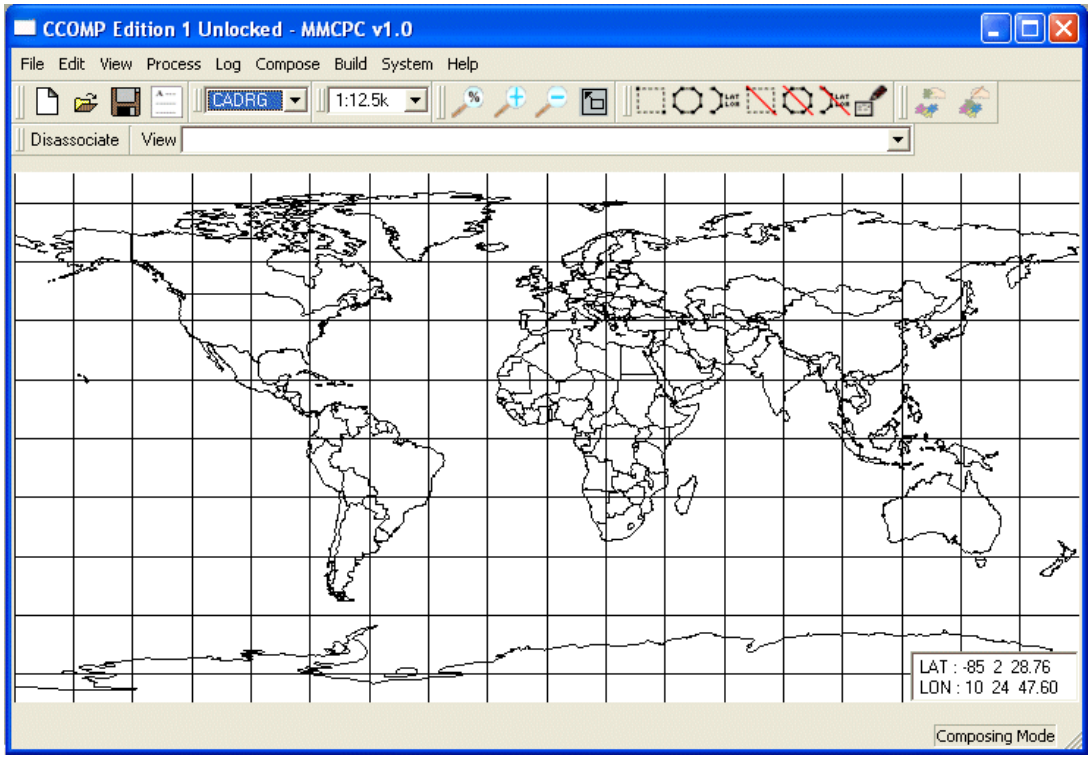


Fig. 22 — MMCPC base map with latitude/longitude grid overlay ON

3.3.3.3 Available Coverage (*Alt-VC*)

This option displays all logged data coverage for the current map type and scale. All available coverage is shown in green (Fig. 23). The user may click through the data type and map scale drop-down boxes (Fig. 8) to see the available coverage at each data type and scale. This overlay is OFF by default.

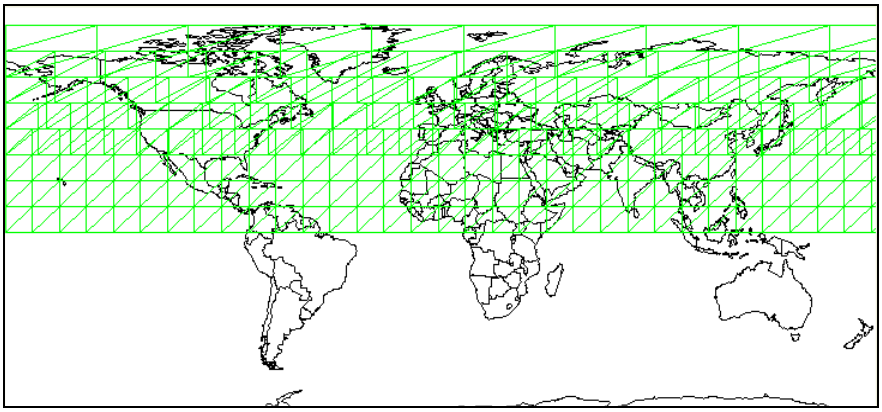


Fig. 23 — Available coverage of data sources overlay

3.3.3.4 Zoom Options (*Alt-VZ*)

These options allow a user to zoom into (or out from) an area of interest on the world base map with zoom tool buttons (Fig. 9). Zooming can also be performed by clicking on one of the zoom icons on the tool bar (see Section 3.2.2.3).

3.3.3.5 Refresh (*Ctrl-H* or *Alt-VR*)

This option redraws the current map information in the MMCPC window.

3.3.3.6 Properties

The Properties option allows adjustment of geospatial coordinate grid spacing and display format.

LAT/LON Grid Spacing: This window (Fig. 24) allows the user to adjust the grid spacing of geospatial coordinates (the default is 45° in latitude and longitude).

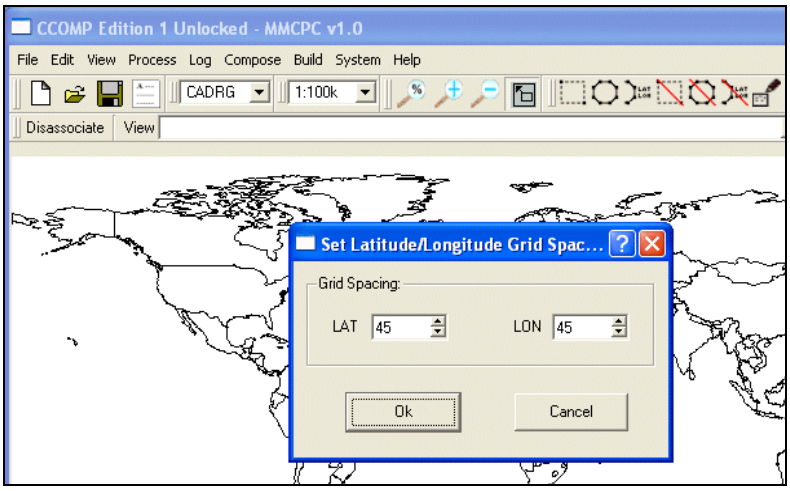


Fig. 24 — Space adjustment of latitude and longitude grid lines

LAT/LON Format: This window (Fig. 25) allows the user to change the default latitude and longitude format from degrees, minutes, and seconds to decimal degrees for display of the cursor's geospatial position on the MMCPC base map.

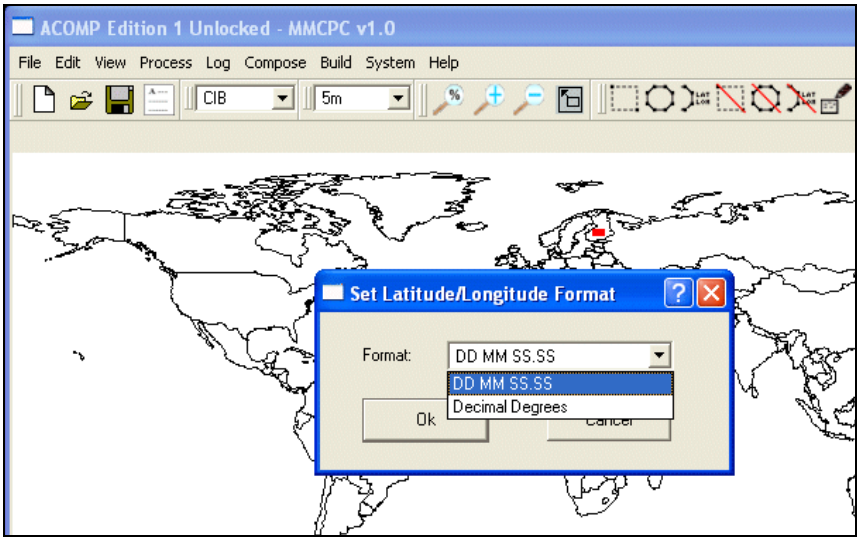


Fig. 25 — Adjustment of latitude and longitude coordinate format

3.3.4 Process

The *Process* menu (Fig. 26) provides utilities to create CADRG, RDTED, and Data Frames from FiAF source data. These options can also be invoked via shortcuts and/or hot keys.

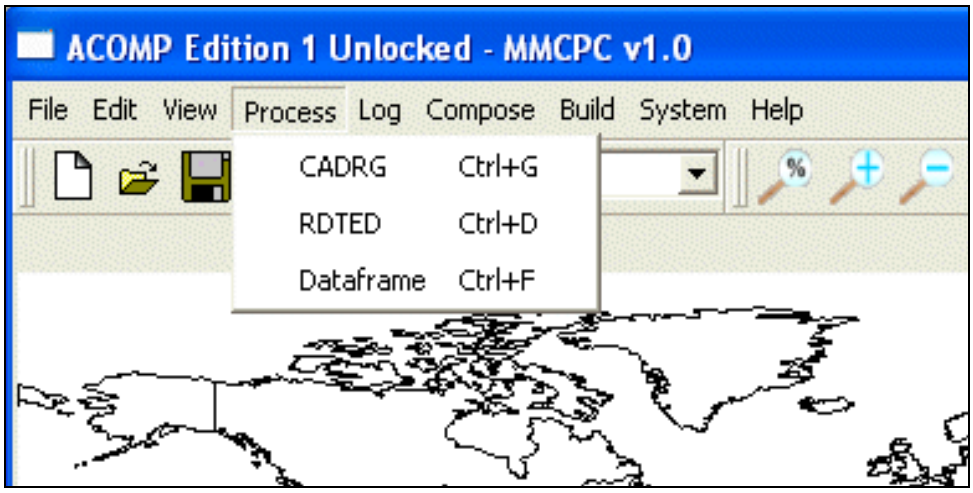


Fig. 26 — Process menu

3.3.4.1 CADRG (*Ctrl-G* or *Alt-PC*)

This selection provides options for CADRG data processing. CADRG data is processed from source FiAF GeoTIFF data and formatted for use in creating TAMMAC theater and mission loads. Once processed, this data is available for future use with other compositions. See Section 4.3.2 for more details concerning CADRG data processing.

3.3.4.2 RDTED (*Ctrl-D* or *Alt-PR*)

This selection provides options for RDTED data processing. DTED data is processed into RDTED at 750m (1:5M) and 150m (1:1M) resolutions and both scales are automatically included when defined in a composition. See Section 4.3.1 for more details concerning DTED data processing.

3.3.4.3 Dataframe (*Ctrl-F* or *Alt-PD*)

This selection provides options for data frame processing. Data frames are non-georeferenced images that must be converted to Harris Data Frame (HDF) format. Like CADRG and RDTED data, they can be included as part of mission and theater loads. See Section 4.3.3 for more details concerning data frame processing.

3.3.5 Log

The *Log* menu (Fig. 27) provides utilities to catalog data in the MMCPC source database. These options can also be invoked via shortcuts and/or hot keys.

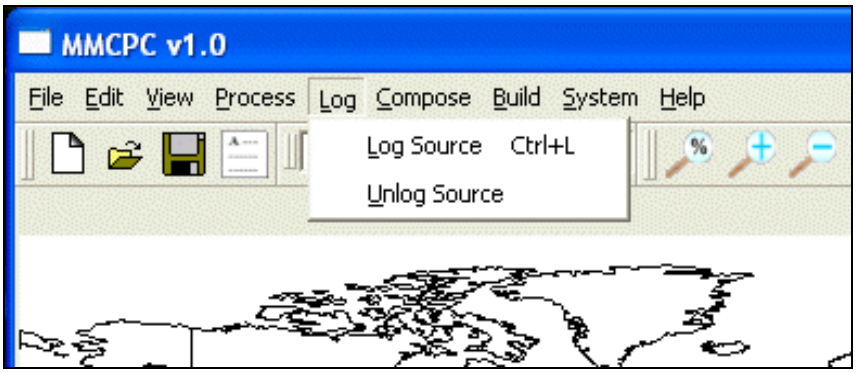


Fig. 27 — Log menu

3.3.5.1 Log Source (*Ctrl-L* or *Alt-LL*)

This option logs new sources in the MMCPC source database. A browser allows data to be logged from CD-ROM, the hard disk, or networked sources (Fig. 28). Processed data on the hard disk is automatically logged; all other data must be logged via the *Log* function. While logging in a new data source, MMCPC will build a bitmap of the source to calculate and overlay available coverages. (See Section 4.2 for more information on loading, selecting, and reading source data).

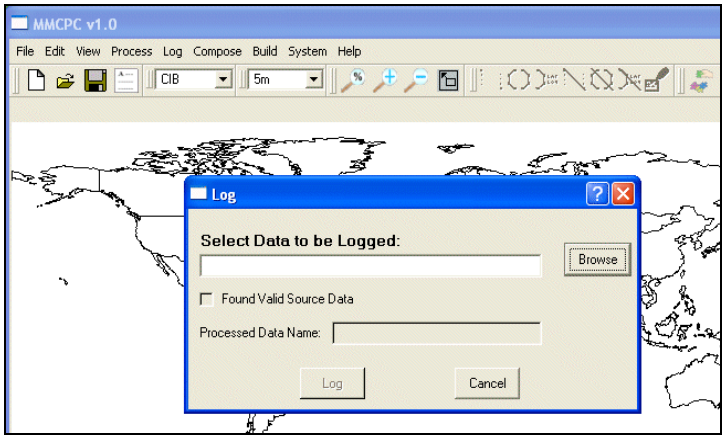


Fig. 28 — Log source data window

3.3.5.2 Unlog Source (*Alt-LU*)

This option removes references to source data from the MMCPC log file (Fig. 29), if (for example) a previously logged source is found to be bad (e.g., an unreadable CD-ROM) or when older map data becomes obsolete. Un-logging map data will render obsolete any compositions that included that data. The unlog function should be used primarily to manage the obsolescence of map data. This will, in turn, allow MMCPC to automatically manage the state of MMCPC compositions.

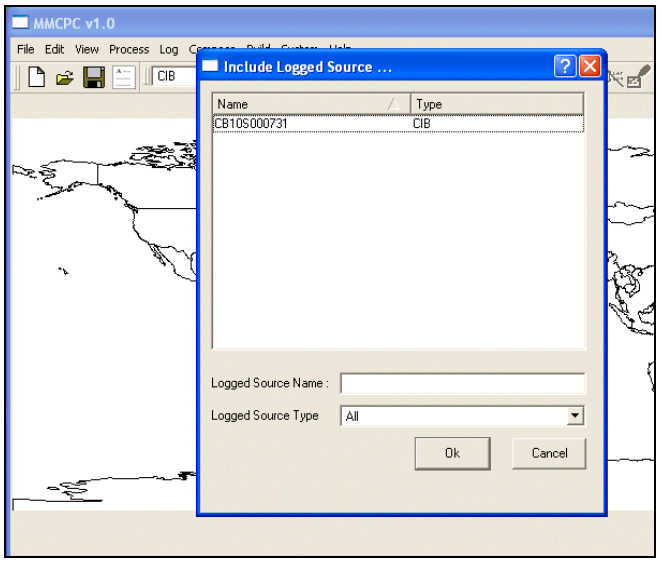


Fig. 29 — Unlog source data window

3.3.6 Compose

The *Compose* menu (Fig. 30) provides utilities to create and modify compositions.

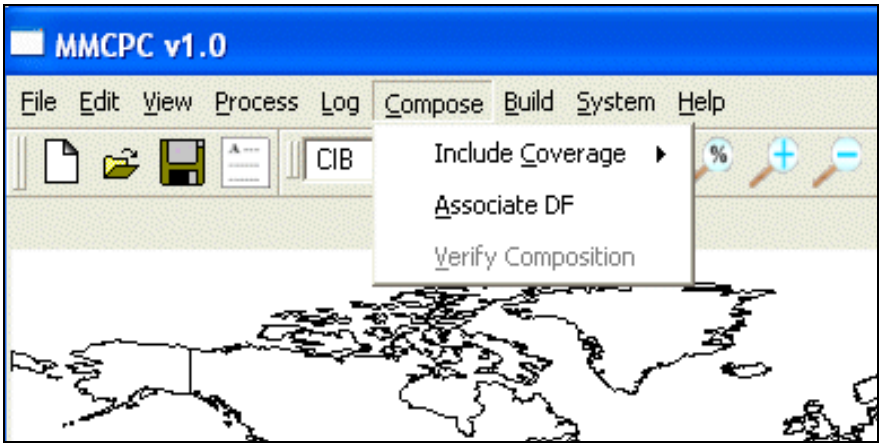


Fig. 30 — Compose menu

3.3.6.1 Include Coverage (*Alt-CC*)

This option allows the user to include logged sources or other compositions in the construction of a composition (Fig. 31).

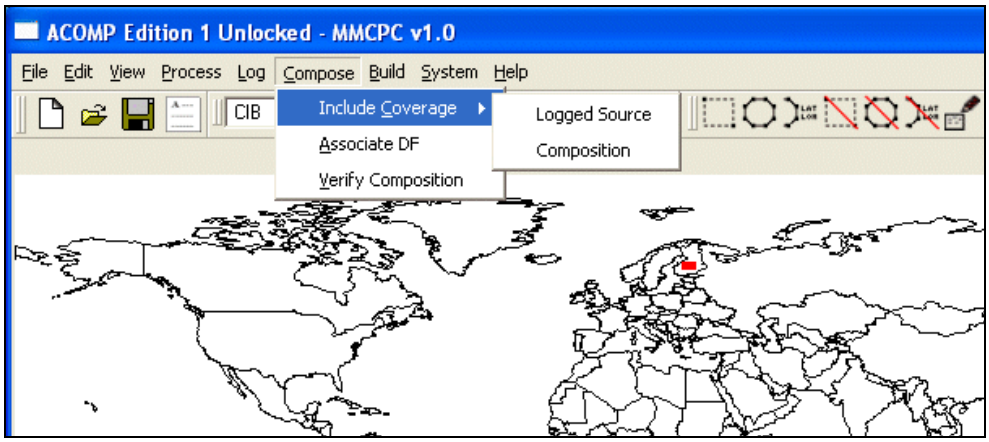


Fig. 31 — Compose menu, Include Coverage option

3.3.6.1.1 Logged Source

This option provides the capability to include logged sources in the construction of a composition. Valid source coverages include CADRG, RDTED, and CIB data that have been previously logged into MMCPC. All processed map data is automatically logged upon completion of processing and are valid sources for selection. MMCPC will present a lit of logged sources available for selection. To select multiple logged sources at once, click one logged source, then depress the CTRL or SHIFT key while clicking on others.

3.3.6.1.2 Composition

This option provides the capability to include other compositions in the creation of a new composition. MMCPC will present a list of available compositions for user selection. Valid composition file types are locked, unlocked, and obsolete; users may select any of these files. To select multiple compositions at once, click one composition, then depress the CTRL or SHIFT key while clicking on others.

3.3.6.2 Associate DF (*Alt-CA*)

This option associates data frame files with the active composition. The default directory for data frames is C:\MMCPC\DATA\DATAFRAME. A maximum of 100 files may be associated with a composition. To select multiple data frames at once, click one data frame, then depress the CTRL or SHIFT key while clicking on others. The order in which the data frames are stored on the TAMMAC map load may be changed during the mission/theater build.

3.3.6.3 Verify Composition (*Alt-CV*)

This option verifies that the active composition is within the proper size constraints for a TAMMAC map load. The user chooses by radial button whether to verify the composition as a theater map build or as a mission map build. The PC cards are different for mission loads and for theater loads. Currently, mission loads have a maximum capacity of 256 MB (single card), and theater loads have a maximum capacity of 3 GB (maximum of 7 cards). If the composition is within the maximum size constraints, the user can continue and use it for a map build. If the composition exceeds the required limits, the user must make modifications (e.g., delete data) until it is within size constraints for the selected map load type prior to building the TAMMAC map load.

Note: MMCPC performs a final verification of the selected composition as part of the map build. Therefore, this size verification procedure is not required but is provided as an informational tool for use in constructing a composition.

3.3.7 Build

The *Build* menu (Fig. 32) provides utilities to create TAMMAC mission and theater loads. Some of these options can also be invoked via shortcuts and/or hot keys.

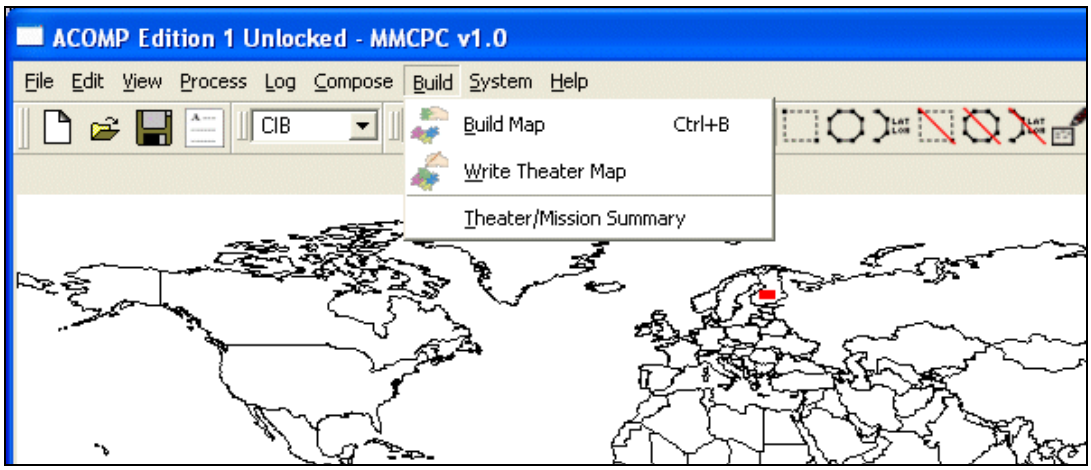


Fig. 32 — Build menu

3.3.7.1 Build Map (*Ctrl-B* or *Alt-BB*)

This function—also available via the *Build a Map* button (Section 3.2.2.5)—acquires the necessary map data represented by the selected composition and writes that data into its TAMMAC-ready format. If the current composition has not been saved, a prompt will appear to save and name the composition before proceeding. A locked or unlocked composition may be selected to create a TAMMAC map load via the browse button, and the map build type (theater or mission) must be selected. See Section 4.5 for additional information on building and writing map data.

3.3.7.2 Write Theater Map (*Alt-BW*)

This function—also available via the *Write a Theater Map* button (Section 3.2.2.5)—is used to transfer any theater load from the MMCPC-reserved directory for theater loads to TAMMAC Theater PC cards. Once a map load resides in the MMCPC-reserved directory, it may be written to PC cards as many times as needed. See Section 4.5 for additional information on building and writing map data.

3.3.7.3 Theater/Mission Summary (*Alt-BT*)

This option provides an information window that summarizes all theater and mission loads currently residing on hard disk.

3.3.8 System

The *System* menu (Fig. 33) provides options for restoring color palettes to the original palettes delivered as part of MMCPC and deleting partially processed CADRG and RDTED data.

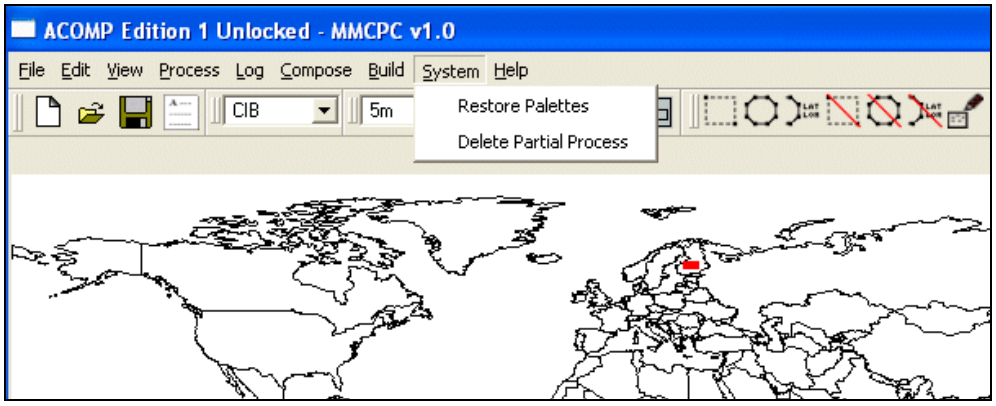


Fig. 33 — System menu

3.3.8.1 Restore Palettes

This option provides the capability to restore the original set of MMCPC color palettes that were derived from NGA source data and provided at installation. Color palettes are used to process FiAF source GeoTIFF data into CADRG.

3.3.8.2 Delete Partial Process

This option deletes map files that were partially processed into CADRG or RDTED (Fig. 34). Deleting partially processed map files is needed only when all of the following conditions are met:

- Source map data has been processed into CADRG or RDTED;
- The user disabled the Finalize Automatically option during processing;
- The user does not wish to append more data;
- The user does not wish to keep edge files partially filled with map data (Fig. 35).

Note: A user may wish to delete partially processed map files when, for example, FiAF processed CADRG data will be combined with NGA CADRG for adjoining regions (Fig. 36). By deleting the edge map files, no unfilled gap between edge files will exist between the two different sources such as FiAF and NGA.

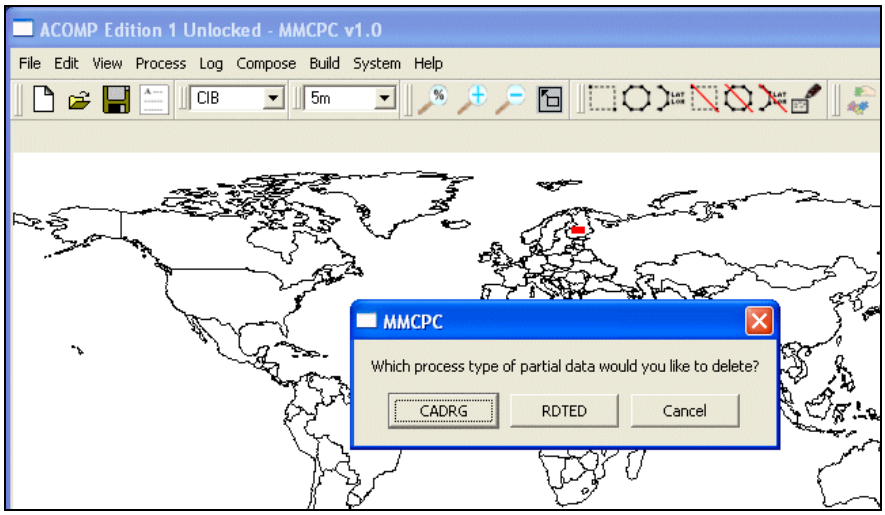


Fig. 34 — Deletion of partially processed data files

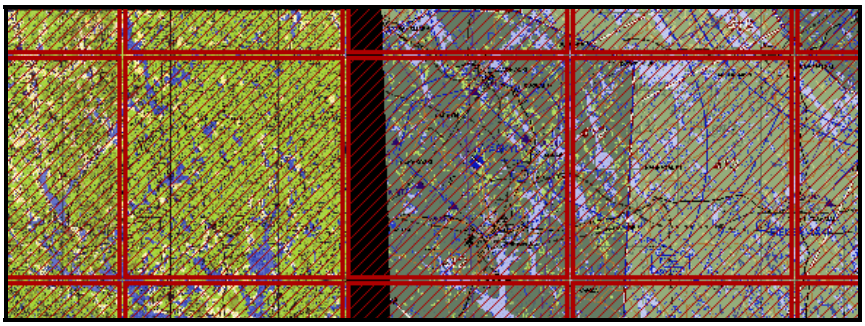


Fig. 35 — Two adjoining CADRG regions (from the same source provider) with partially filled map files. The overlay grid represents extents of individual map files.

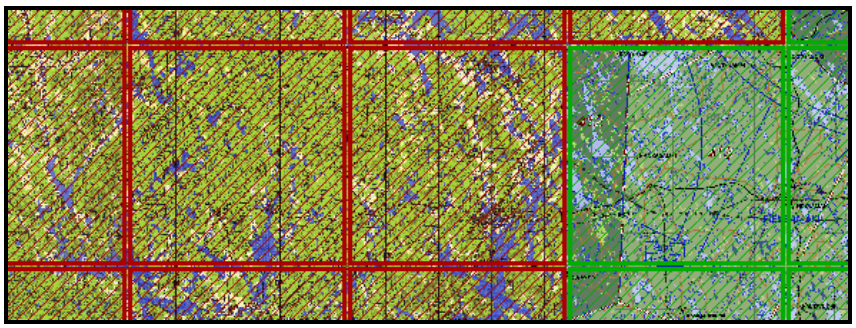


Fig. 36 — Two adjoining CADRG regions (from different source providers) with no partially filled map files. The overlay grid represents extents of individual map files.

3.3.9 Help

The *Help* menu (Fig. 37) provides information about errors, warnings, and other messages issued by MMCPC, and general information about MMCPC.

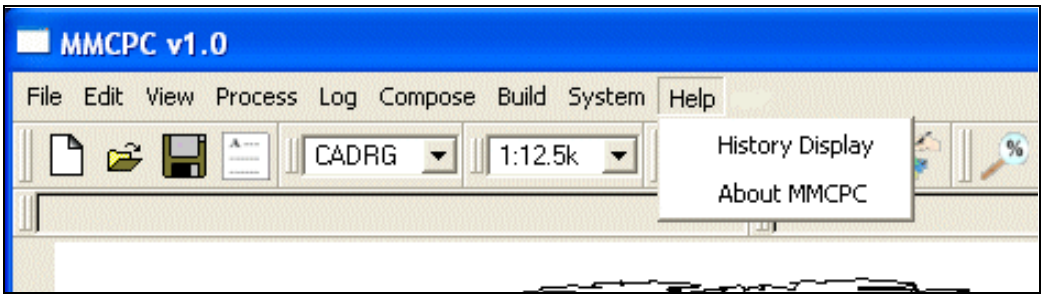


Fig. 37 — Help menu

3.3.9.1 History Display

This option displays the MMCPC history log file (Fig. 38), which includes all errors, warnings, and other messages issued by MMCPC. To print this file (while it is displayed in the History Log window), go to the *File* menu and click on *Print* (Section 3.3.1.7), or type *Ctrl-P* or *Alt-FP*.

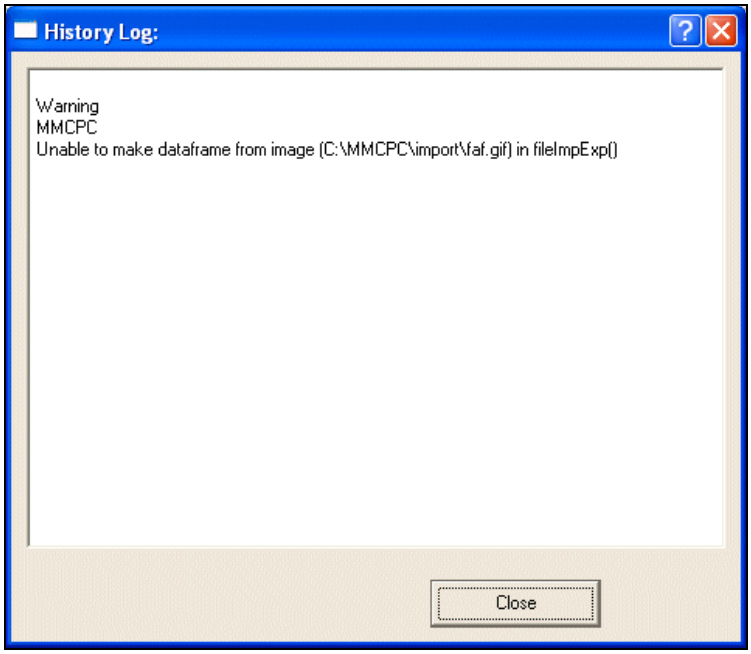


Fig. 38 — MMCPC history processing log file

3.3.9.2 About MMCPC

This option displays technical point of contact information and the MMCPC release statement (MMCPC version 1.0.1 only).

4. COMMON OPERATIONS

4.1 Common Operations Overview

Most MMCPC users will be concerned primarily with using the composition functions to develop TAMMAC theater or mission map loads based on a particular region of interest. A smaller community of users will also utilize the map data processing functions to generate the map data required to develop TAMMAC map loads. The following sections step through frequently used key operations. Sections 4.2 and 4.3 cover administrative functions of logging map data and generating map data in MMCPC. Common mission planning operations are addressed in Sections 4.4 through 4.7. Note: this is not a comprehensive list of all functions supported by MMCPC.

4.2 Logging Map Data

This section lists steps for logging map data. See Section 3.3.5 for additional information on Log menu options. All map data sources (except data frames) must be logged (Fig. 39) before any mission or theater compositions can be built. Map data sources are logged in one of two ways:

- Automatically: after processed map data is finalized, MMCPC logs all finalized and processed map data residing on the hard disk.

- Manually: through a function call, MMCPC provides the capability to log map data sources that do not reside on hard disk via the *Log* menu.

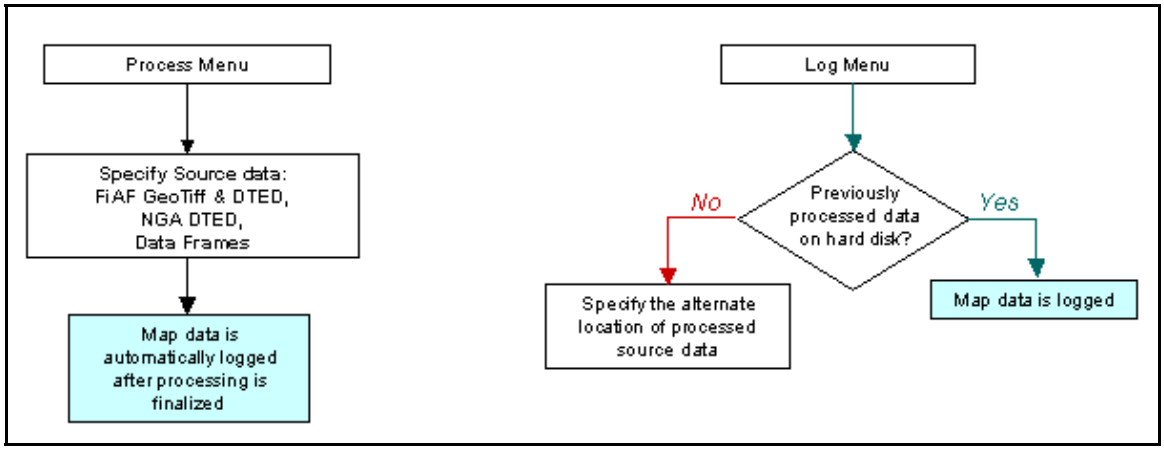


Fig. 39 — Logging data sources

Perform the following steps to log data into MMCPC:

1. Insert a valid NGA CADRG / NGA CIB / RDTED CD-ROM into the CD-ROM drive. Note: MMCPC can log valid map data from any location accessible via the standard Windows browse function.

2. From the main menu, click *Log*, then *Log Source*, or type *Ctrl-L* or *Alt-L* (Section 3.3.5.1). MMCPC will display a browser for defining the directory path to the data. For example, when using CIB data from a CD-ROM drive (Fig. 40), use the browser to locate the CD-ROM drive.

3. Verify that a checkmark appears next to the *Found Valid Source Data* box and that the correct label name appears.

4. Click the *Log* button to log the data. Logged data sources will be named by their volume identifier (e.g., CDRGXGNCJNCN_9). For automatically logged processed map data, MMCPC assigns an identifier once the map data has been processed and finalized (e.g., CDRGFIAF0001_A).

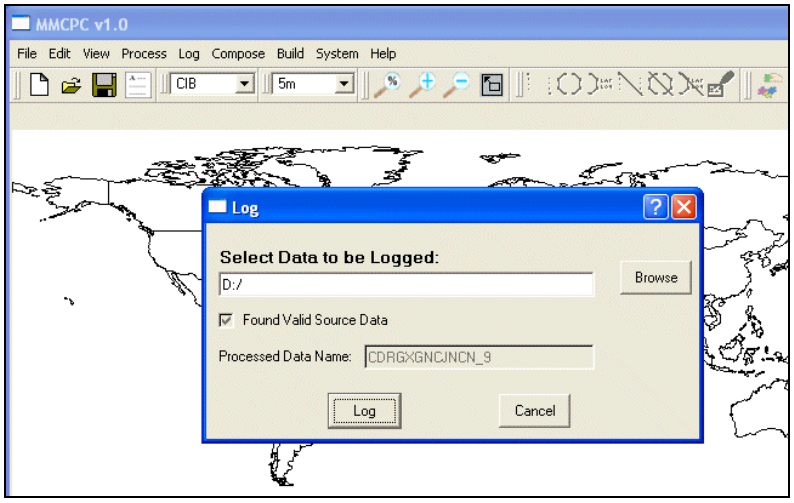


Fig. 40 — Log data browser

4.3 Data Processing

This section lists the steps for processing DTED and FiAF GeoTIFF data into TAMMAC-ready RDTED and CADRG formats.

4.3.1 Process DTED into RDTED

Perform the following steps to process DTED into the TAMMAC-ready RDTED format:

1. Load a DTED CD-ROM in the CD-ROM drive of the computer.
2. Click *Process*, then *RDTED* (or type *Ctrl-D*).
3. A window appears prompting the user to select the source and destination directories for processing (Fig. 41). Use the top *Browse* button to navigate to the CD-ROM drive. Verify that a checkmark is displayed next to *Found Valid Source Data*.
4. Select a destination directory (the default is C:\MMCPC\DATA\RDTD) for the processed RDTED, and click on *Open*.
5. An RDTED Processing window is displayed (Fig. 42a). Note the listing of source DTED files under both the 150m and 750m tabs. The same DTED files are used to create both resolutions (150m and 750m) of RDTED. Click *View Coverage* to show the approximate RDTED coverage that will result from processing this DTED source (Fig. 42b). NOTE: The user can zoom into the area of interest via right-mouse click, then clicking on *Zoom by Stretch Box* (Fig. 4).
6. Click *View Text* to return to the previous view.

7. If the user plans to append more DTED data for processing, unclick *Finalize Automatically*. If not, verify that *Finalize Automatically* is selected, and determine whether to keep or remove unfilled (partial) map segments (Figs. 35 and 36).

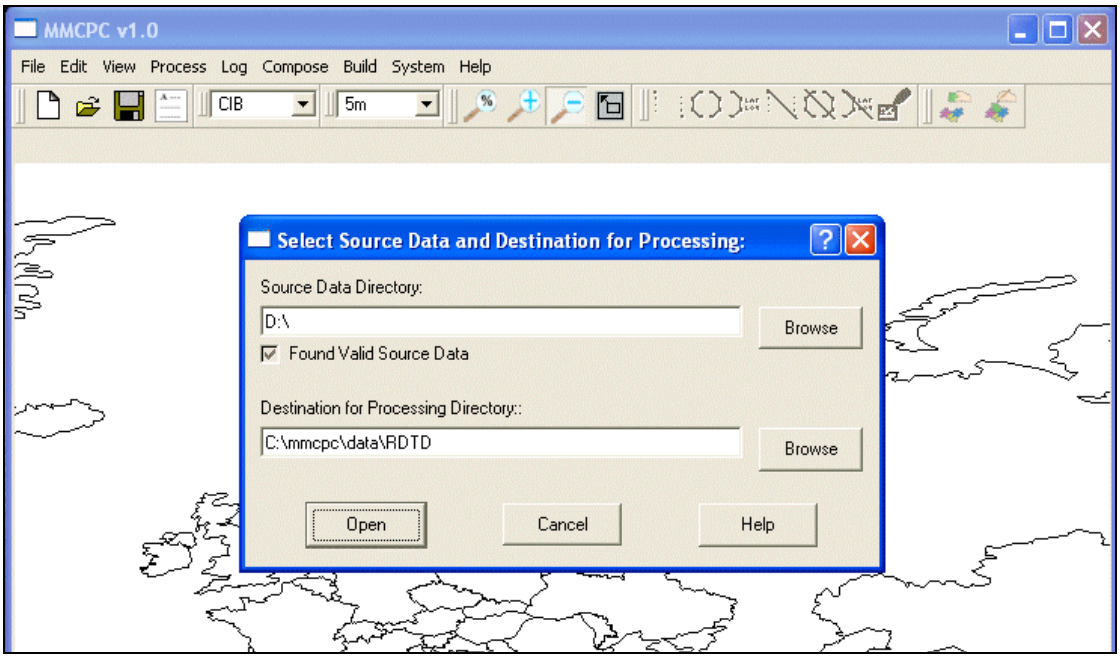


Fig. 41 — Process DTED data browser

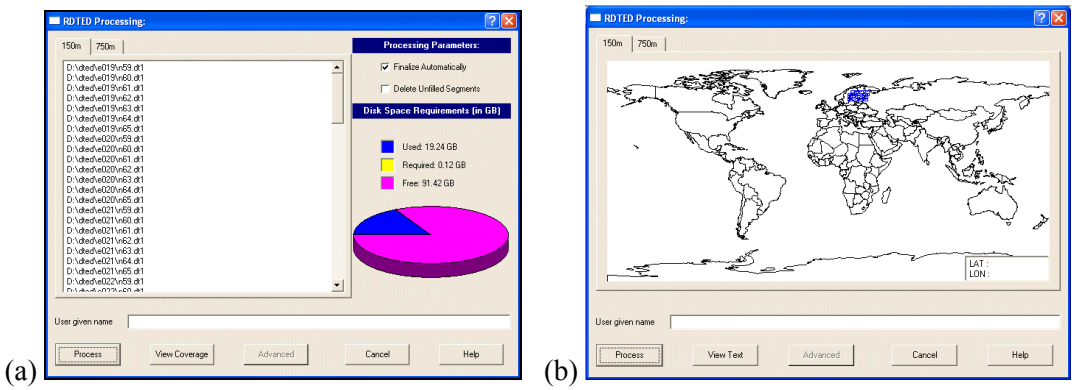


Fig. 42 — RDTED Processing windows: (a) Text information; (b) View coverage.

8. Click *Process* (Fig. 42a) to begin processing the DTED into RDTED files.

9. When a message is displayed stating the RDTED processing has completed, click *OK*. If *Finalize Automatically* was checked, the RDTED that has just been processed is automatically logged in MMCPC and is available for use in composition development. RDTED data must be finalized before the data can be used by any other function in MMCPC. RDTED can be finalized in any of the following ways:

a. Select *Finalize Automatically* in the RDTED Processing window.

b. If unfinalized RDTED exists on MMCPC and the user wishes to keep partial RDTED map files and finalize, click *Process*, then *RDTED*, then *Finalize* (Fig. 43).

c. If unfinalized RDTED exists on MMCPC and the user wishes to delete partial RDTED map files and finalize, click *System*, then *Delete Partial Process*, then *RDTED* (see Section 3.3.8.2).

d. If unfinalized RDTED exists on MMCPC and the user wishes to process more DTED data, click *Process*, then *RDTED*, then *Append* (Fig. 43). Verify the *Finalize Automatically* button is selected when processing the last set of DTED data.

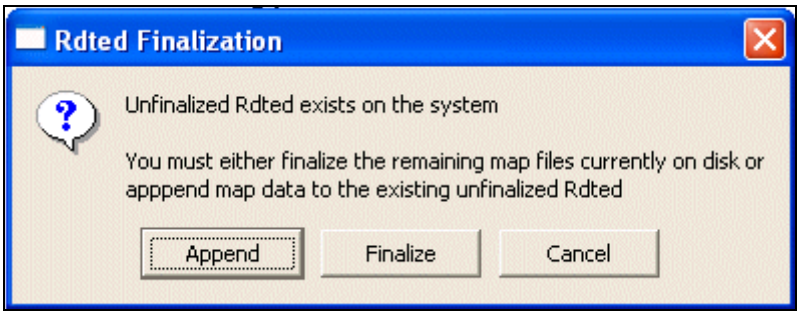


Fig. 43 — RDTED Finalization window

4.3.2 FiAF Geotiff Processing

This section describes the procedure for processing FiAF GeoTIFF images into the TAMMAC-ready CADRG format.

1. Insert a CD-ROM containing FiAF source GeoTIFF data in the CD-ROM drive. In MMCPC, click *Process*, then *CADRG* (or type *Ctrl-G*).

2. A window appears (Fig. 44) prompting the user to select the source and destination directories for processing. Use the top *Browse* button to navigate to the CD-ROM drive of the computer. Verify that a checkmark is displayed next to *Found Valid Source Data*.

3. The default destination directory for processing CADRG data is C:\MMCPC\DATA\CDRG. Click *Open*. Wait a few moments while MMCPC reads the FiAF GeoTIFF data from the CD-ROM.

4. If the source map data contains custom color palettes, a message is displayed to inform the user that new color palettes were detected for the appropriate map scales and note the possible repercussions of installing new color palettes (Fig. 45). Note: MMCPC does not unlog or remove obsolete map data from the system. This message informs the user that if the new data to be processed is meant to replace another set of processed CADRG, then the user should remove the obsolete data via the *Unlog* function. Click *Continue* to use the modified color palettes.

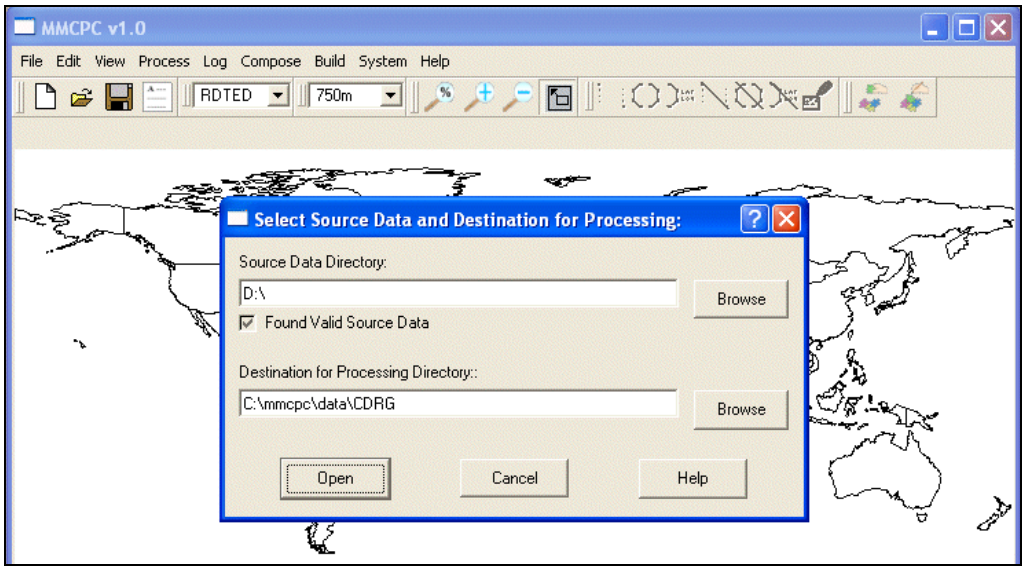


Fig. 44 — Process CADRG data browser

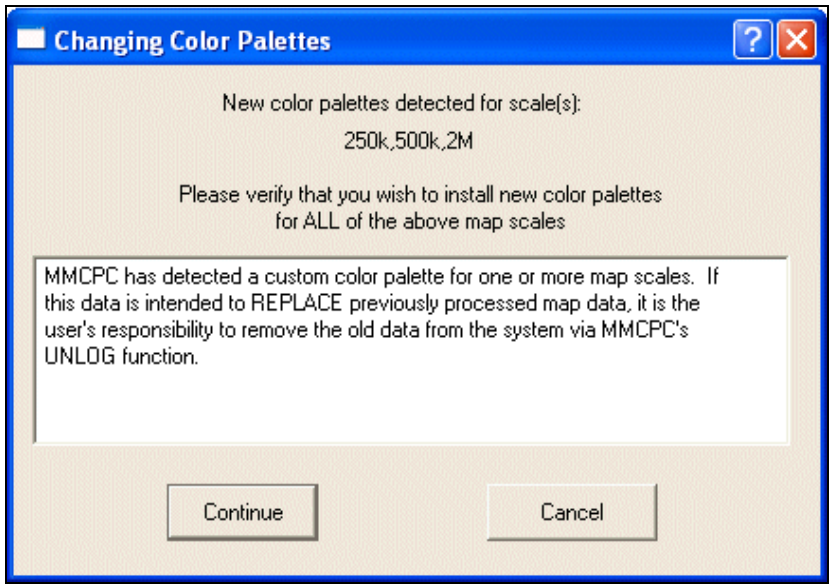
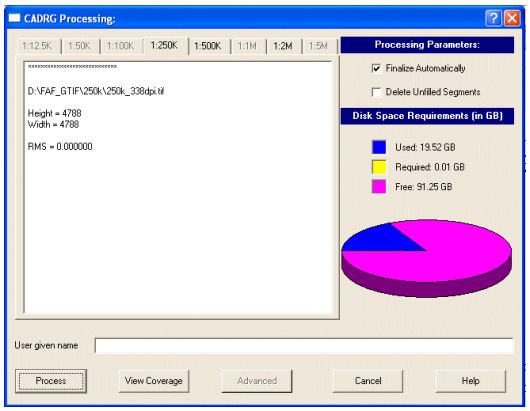


Fig. 45 — Color palette informational message

5. A CADRG Processing window is displayed (Fig. 46). Note the listing under each map scale tab contains GeoTIFF files specifically for those map scales. For CADRG processing, each GeoTIFF file is processed for only the scale for which it is associated. Click *View Coverage* to show the approximate CADRG coverage that will result from processing these FiAF GeoTIFF source files. Click through each of the scale tabs to see the coverage for each scale.

(a) 

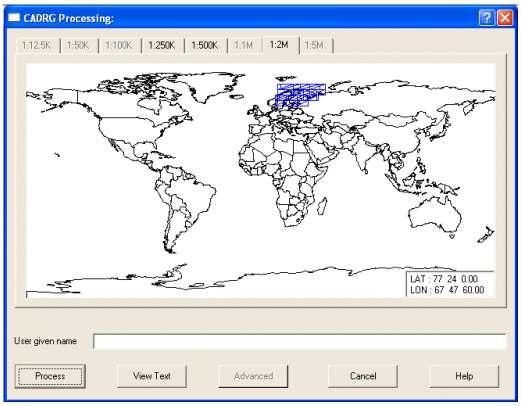
(b) 

Fig. 46 — CADRG processing windows: (a) Text information; (b) View Coverage.

6. Click *View Text* to return to the previous view. If only one FiAF GeoTIFF source CD-ROM will be used for processing, verify that *Finalize Automatically* is checked. Enter the *User Given Name* (a descriptive title provided by the user). Note: The same processing rules apply as listed in Section 4.3.1, step 9, for finalizing RDTED map data.

7. Click *Process* to begin processing the FiAF GeoTIFF files into TAMMAC-ready CADRG-like files. This is a CPU-intensive process because of spatial and color compression techniques that must be used to create CADRG files.

8. When a message is displayed that states the CADRG processing has completed, click *OK* (Fig. 47). MMCPC automatically assigns an identification number for this data set and displays this identifier in the completion message. Make note of this identification number since all references to this processed map data throughout MMCPC will be made by its identification number.

9. To verify all the required map data has been logged and properly processed, perform the following steps:

   a. From the MMCPC main window, click *Compose*, then *Include Coverage*, then *Logged Source*.

   b. Verify the logged source listing includes all sources that have been logged and processed (Fig. 48).

10. View the map data by double-clicking on a record in the list. Set the MMCPC *Data Type* and *Scale* to appropriate settings (Fig. 49a) and move the cursor over an area of processed coverage. Right click and select *View RPF Data* (Fig. 49b). Close the review window.

11. Once each source has been verified, by repeating steps (1) through (3), click *File* and then *New* on the main MMCPC window. When prompted to save the current composition, click *No* to restore MMCPC to its initial state.

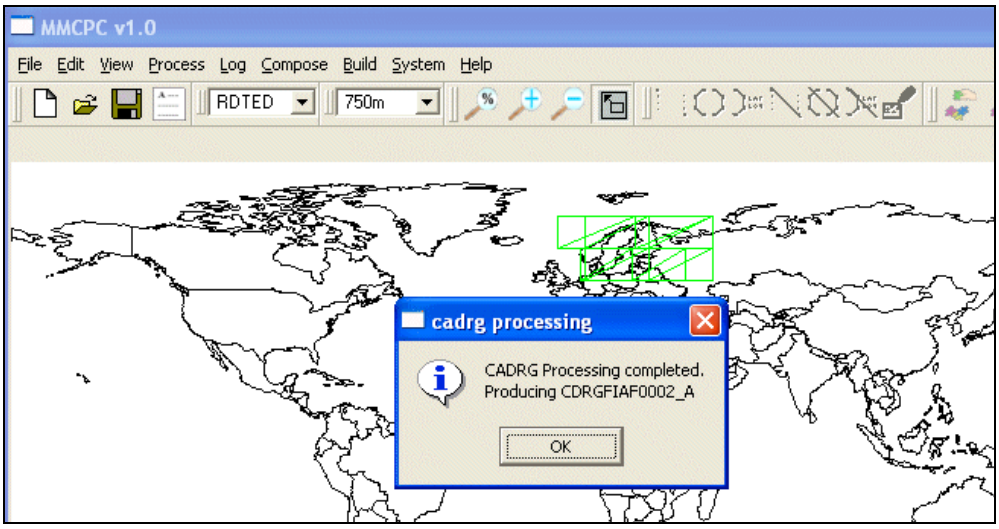


Fig. 47 — CADRG data processing completion notification

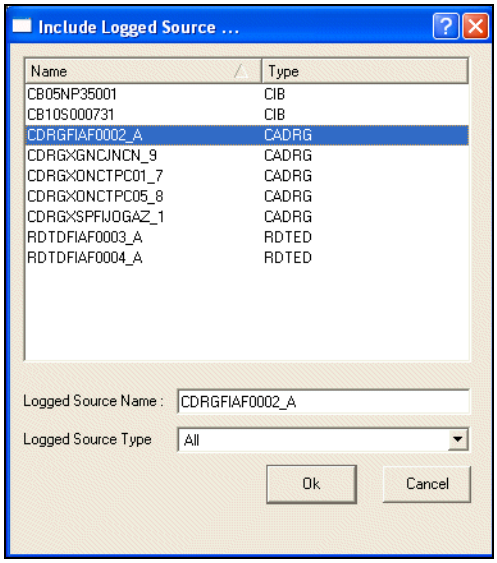
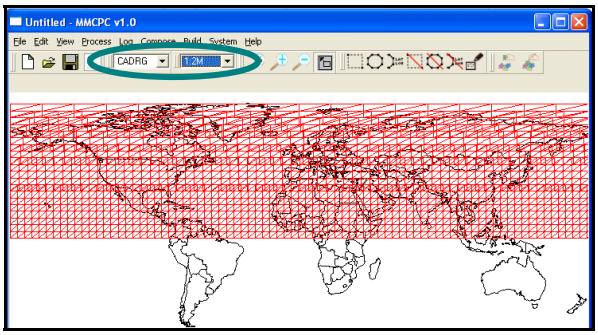


Fig. 48 — Listing of all logged and processed source data

(a) 

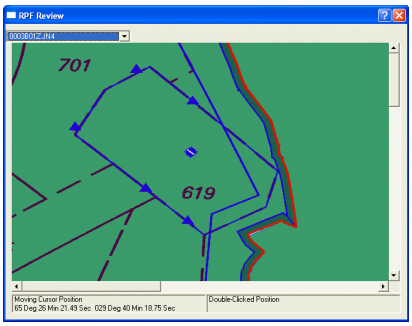
(b) 

Fig. 49 — Data logging and processing verification: (a) Showing coverage for CADRG data at the 1:2M scale; (b) Viewing processed CADRG data for this scale.

4.3.3 Data Frame Processing

This section describes the procedure for processing data frames.

1. From the MMCPC main window, click *Process*, then *Dataframe*.
2. On the Dataframe Viewer window (Fig. 50a), click *File*, then *Open Image File*. Image files may be located in the default directory (C:\MMCPC\IMPORT) or the user can browse to the required directory for the source image files. Source image file types supported in MMCPC are: gif, bmp, jpg, png, and hdf (TAMMAC format). Double click an image file to open it in the Dataframe Viewer window. If the image file was opened and is displayed properly, it may be converted to a data frame. Note: Source image files must be cropped to a size of exactly 768 × 768 pixels to be converted into a valid TAMMAC data frame.
3. From the viewer window, click *File*, then *Save As Dataframe*. In the Save As window (Fig. 50b), save the data frame with an appropriate file name. This will save the file as a TAMMAC-ready data frame file. The default location to save data frames is C:\MMCPC\DATA\DATAFRAME.
4. Repeat steps (2) and (3) for each image file.
5. Verify that the data frames were properly saved by opening each one in the viewer: From the Dataframe Viewer menu, click *File*, then *Open Image File*. Browse to the directory where the data frames were saved (C:\MMCPC\DATA\DATAFRAME if the default was used). Double click on a saved data frame and verify that it is correct in the viewer window.

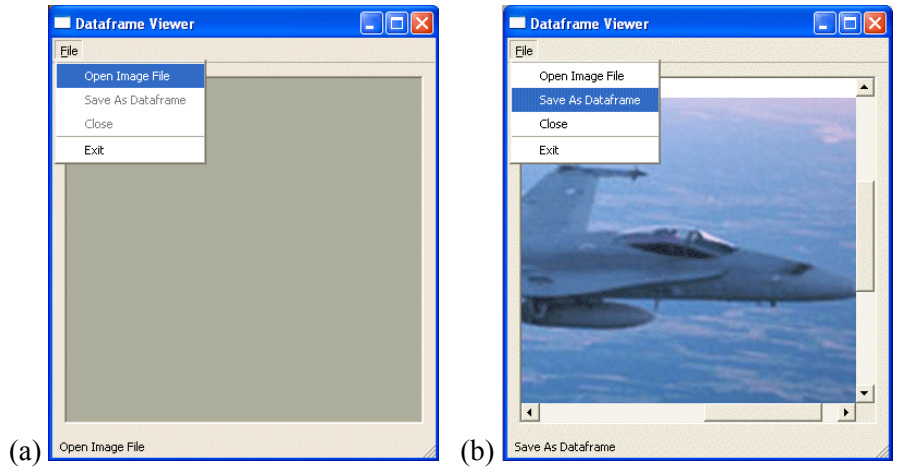


Fig. 50 — Data frame processing: (a) Opening an image for viewing and processing; (b) Saving the image as a data frame.

4.4 Map Composition and Development

This section describes several methods to design and create map compositions. A map composition defines all geo-referenced map data to exist on its corresponding TAMMAC theater or mission map load. Each map composition is a set of user-defined regions of interest that may span multiple data types (CADRG, RDTED, CIB) and map scales. The methods described below may also be used in combination to create a composition.

4.4.1 Define a Composition Using Logged Sources

1. From the MMCPC main menu, click *Compose*, then *Include Coverage*, then *Logged Source* (Fig. 48).
2. Verify the map coverage:
   a. Double click on a source (e.g., CADRG) and verify that map coverage over the appropriate geographic area is displayed (Figs. 49a and 49b). Note: A logged source will contain only a single data type (CADRG, RDTED, or CIB) but may contain multiple map scales for that data type (e.g., CADRG: 1:250k, 1:500k, and 1:2M). If RDTED is included in a composition, both map scales (150m and 750m) must coexist for the region of interest selected. In other words, the user cannot choose to include only 150m RDTED without 750m RDTED.
   b. Repeat for each source data type and scale. Note that the user may need to adjust settings in the MMCPC *Data Type* and *Scale* boxes (Section 3.2.2.2).
3. From the MMCPC main window, click *File*, then *Save*. Enter a composition name. The composition will be saved as an unlocked composition. Click *OK*.
4. From the main window, click *File*, then *Close*.
5. From the main window, click *File*, then *Open*. Double-click on the newly saved composition and verify that all map data (of all types and scales) included in the composition was properly saved.
6. From the main window, click *Compose*, then *Verify Composition* (Section 3.3.6). Click the radial button for *Theater* (Fig. 51). Verify that the current composition is a valid theater map for TAMMAC and the number of map cards needed.

   NOTE: The calculation used to determine maximum theater/mission size, theater card size, and mission card size are defined in a configuration file that may be modified as PC card sizes change. The current maximum capacity setting for theater map cards is 1.0 GB. The current maximum capacity setting for mission map cards is 256 MB.
7. Once verified, click *File*, then *Close*.

Fig. 51 — Verification of current theater composition

4.4.2 Define a Composition Using Another Composition

1. From the MMCPC main window, click *Compose*, then *Include Coverage*, and then *Composition*. Double-click a composition name.
2. From the MMCPC main window, click *File*, then *Save*. Enter a composition name. The new composition will be saved as an unlocked composition. Click *OK*.
3. From the main window, click *File*, then *Close*. Verify the composition has been closed.
4. From the main window, click *File*, then *Open*. Double click on the newly saved composition. Verify that all of the map data included in the composition was properly saved. This new composition should contain exactly the same map coverage as the composition that was included.
5. From the main window, click *Compose*, then *Verify Composition* (Section 3.3.6). Click the radial button for *Theater* (Fig. 51). Verify that the current composition is a valid theater map for TAMMAC and the number of map cards needed. If the composition is too large, the user may remove coverage via the *Erase an Area of Coverage* function (Section 3.2.2.4.2).
6. Once verified, click *File*, then *Close*.

4.4.3 Define a Composition Using the MMCPC Composition Toolbar

1. From the MMCPC main window, click *File*, then *New*.
2. Show all available map coverage by clicking *View* from the main menu, then *Available Coverage*. A checkmark will then be displayed next to this selection showing that it has been toggled on (Section 3.3.3.3). Using the *Data Type* and *Scale* drop-down menus (Section 3.2.2.2), click through each data type and map scale selection. Note that the color of the map coverages shown is green (Fig. 52). This indicates that the coverage shown is available but not part of the current composition (map segments are displayed in red for compositions).
3. Use the *Zoom-in on a Stretch-Box* tool (Section 3.2.2.3) to zoom into a region of interest. Once the button has been clicked, the cursor should change from an arrow to a cross (+). Depress the left mouse button at the upper left corner of the region of interest and drag to the lower right corner of the area to create the desired zoom box.
4. Click the *Zoom-in on a Stretch-Box* tool again to return the cursor to an arrow.
5. Select a *Data Type* and *Scale* (e.g., CADRG data at 1:5M scale). Green map segments should be displayed for the entire areas of existing available coverage.
6. Use the *Define Coverage by a Stretch-Box* tool (Section 3.2.2.4) to select an area. Depress the button to activate the function, hold down the left mouse button at the upper left corner of the region of interest and drag to the lower right corner of the desired coverage. A purple box will be displayed showing the extents of the stretch-box, and the color of the map segments within the intersecting box should now be red (indicating that these map segments are part of the current composition, Fig. 53a).
7. The map scale can be changed to include additional data at other scales by repeating step (2) for each scale.
8. The data type can also be changed to include additional data types (e.g., RDTED). If needed, use the *Zoom Out* tool to see all of the available coverage.
9. Use the *Erase Coverage by a Stretch-Box* tool to remove unwanted coverage (Section 3.2.2.4.2). Depress the button to activate the function, hold down the left mouse button in the upper left corner of the region of interest and drag to the lower right corner of the desired coverage. A purple box should

be displayed showing the extents of the stretch-box, and the map segments within the box will now be removed (Fig. 53b).

Note regarding different scales within each data type: Actions taken at one scale are not automatically applied to the others. Verify that any changes on one scale do not adversely affect the coverages of another. The one exception is RDTED. All actions (adding or deleting RDTED map coverage) always apply to both scales (150m and 750m).

10. To associate data frames with a composition:

    a. From the main window, click *Compose*, then *Associate DF*.

    b. A Select Dataframes window will be displayed. Data frames residing in the default directory (C:\MMCPC\DATA\DATAFRAME) will be listed.

    c. Select a data frame(s) by clicking on the file name(s). Click *Open* to associate the data frames. A list of associated data frames (Fig. 54) can be viewed from the tool bar (Section 3.2.2.6).

    d. From the MMCPC main window, click *File*, then *Save*. Enter a composition name. The composition will be saved as an unlocked composition. Click *OK*.

    e. From the main window, click *File*, then *Close*.

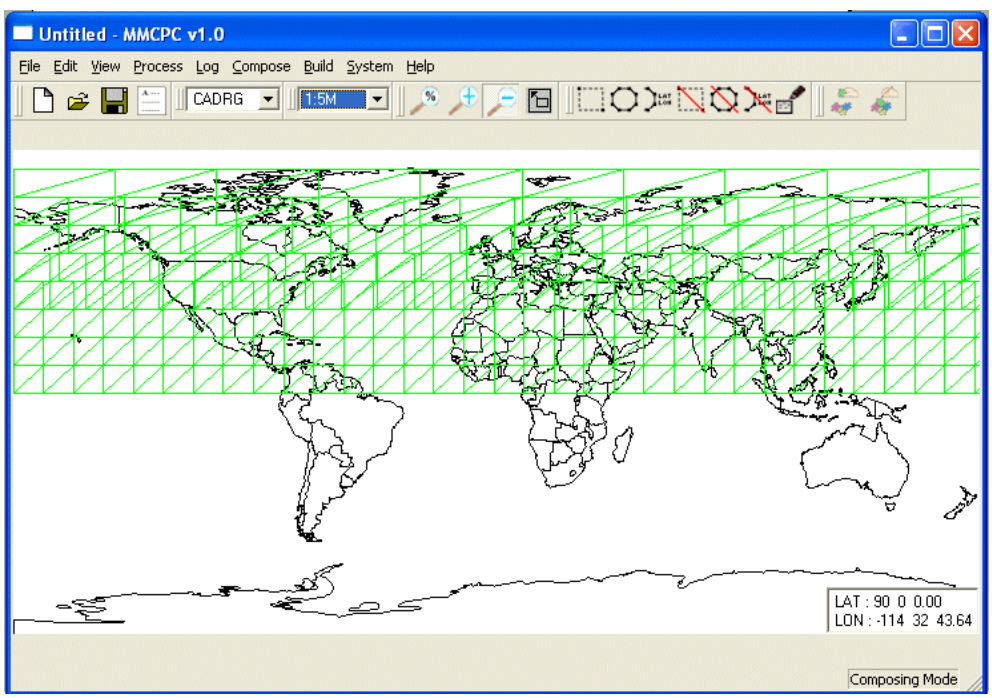


Fig. 52 — Area of available coverage for a new composition. The green-colored grid indicates that the coverage is available but is not yet part of the current composition.

(a) (b)

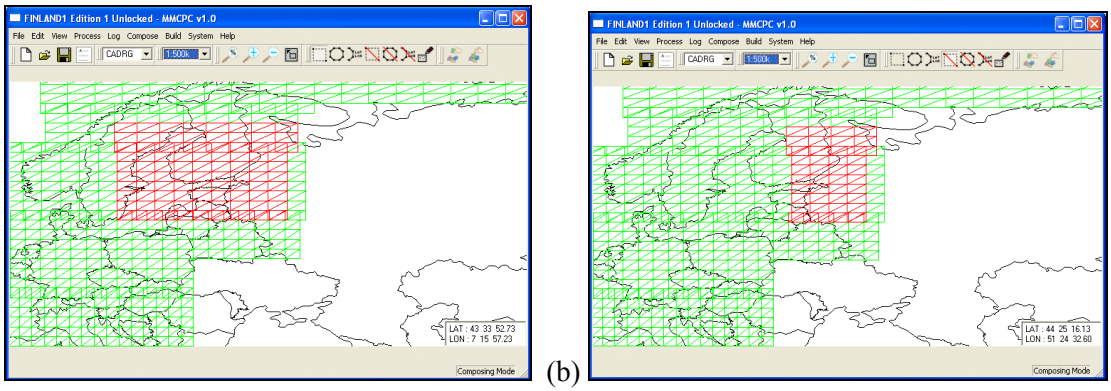


Fig. 53 — Defining a composition area of coverage. (a) Defined coverage area is red, available data is green; (b) a portion of coverage is erased to redefine the composition area.

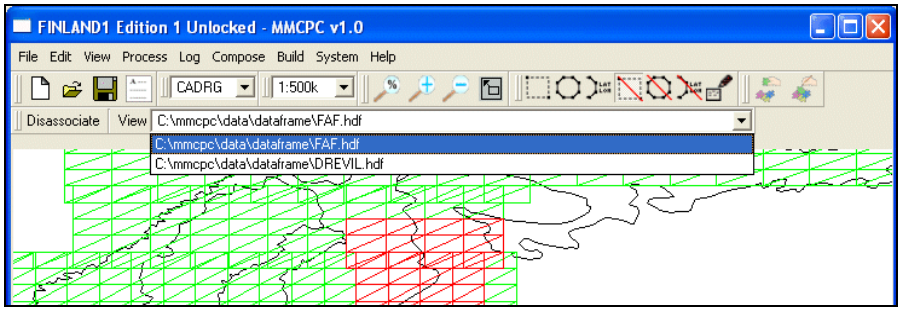


Fig. 54 — List of associated data frames

4.4.4 Create a Mission Composition via MPS File

The Mission Planning System (MPS) import is an ASCII file that serves as an interface between the MPS system and MMCPC. The MPS import can be used to create a composition and process data frames in MMCPC based on the contents of the MPS-ASCII file.

1. From the MMCPC main window, click *View*, then *Available Coverage* (toggle on) to view all logged map coverages. Then, from the main window, click *File*, then *Import*.
2. A window is displayed to select an import file (Fig. 55). Click *Import from MPS*.
3. A window is displayed to select the MPS file for import (Fig. 56). The default import directory is C:\MMCPC\IMPORT. However, the user may browse to another directory to locate the import file. Double click on the file name to select it. Import files must contain a ".mps" suffix for the filename.
4. MMCPC will create a composition based on the data types, map scales, and extents that are listed in the newly imported MPS file.

   NOTE: The resultant composition will contain only the MPS-requested map coverage that is available in the existing logged sources. Consequently, some of the data that has been requested in an MPS file may not actually exist and so cannot be included in the composition. To check if this is the case, compare the available coverage (shown in green) to the MPS coverage (shown in red). If an MPS composition is not generated, this indicates that MMCPC does not have corresponding logged data sources.

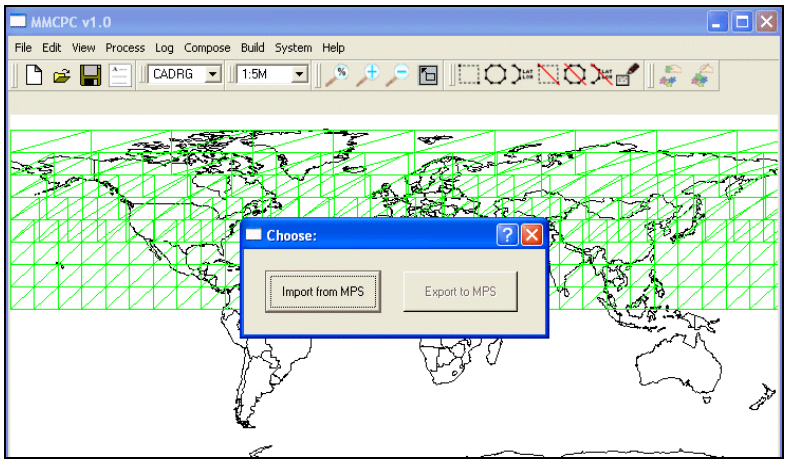


Fig. 55 — File import/export MPS window

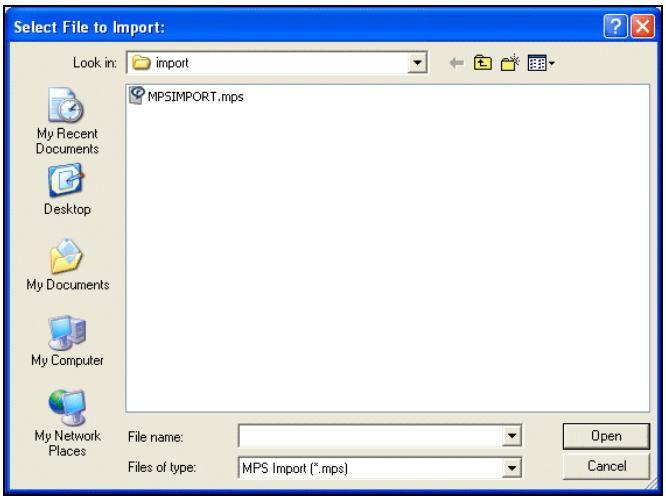


Fig. 56 — MPS import file browser

5. Verify the data frame(s) listed in the MPS have been processed and associated with the current composition by reviewing the list of data frames in the *Associated Dataframes* tool bar (Fig. 57).
6. From the main window, click *Compose*, then *Verify Composition*. Click the radial button for *Mission*. Verify the current composition is a valid mission map for TAMMAC (Fig. 58). If the composition is too large, the user may remove coverage via the erase coverage functions on the tool bar (Section 3.2.2.4).
7. When verified, click *File* from the main menu, then *Save*. The name of the composition is provided in the MPS file and will be displayed as the default name to save. Click *OK*.
8. Click *File*, then *Close*.

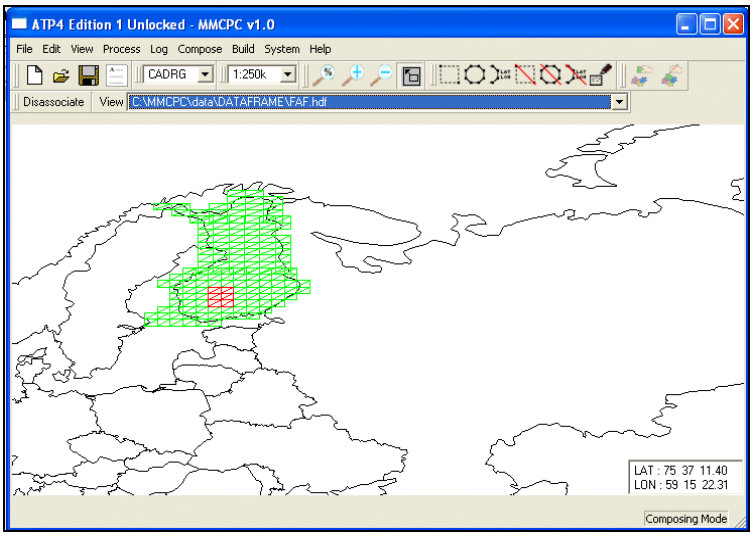


Fig. 57 — Composition with data frame created from an import MPS file

Fig. 58 — Verification of current mission composition

4.5 Map Theater and Mission Build

This section includes methods to build and write TAMMAC-ready theater data loads and to build mission data loads from compositions (Section 3.3.7). The TAMMAC-ready theater data loads include the FiAF-released TAMMAC files containing configurable parameters and symbol set files.

In MMCPC, all data loads are first written to hard disk. Theater loads may then be written to TAMMAC Theater PC cards. Mission loads require an additional file that is provided by the MPS system—MMCPC assumes that the MPS system will read mission loads from the hard disk, apply the additional file needed and then write the mission load to a TAMMAC Mission PC card.

The theater map–specific files include an ARC.DAT file, a TIF.DAT header file, which is associated with each ARC.DAT (if spanned over multiple PC cards), a DIR.DAT directory list file associated with each ARC.DAT file, and a CONFIG.HRS F/A-18 configuration file. The mission map load does not use ARC.DAT. Individual map files are written to the PC card and, since mission loads are very small, they will always be contained on a single PC card. The mission-specific files include individual map data files

(CADRG, CIB, RDTED, data frames), DIR.DAT and TIF.DAT. This build does not include MF.DAT, which must be built by the MPS system to create a valid mission load to PC card.

The PC card size for map cards is significant because a theater load may span multiple cards. When this is the case, the data structure containing map files for a theater load must be sized to fit each card. MMCPC reads a parameter file that specifies the card size. Should the card size increase in the future, this parameter file will require modification.

4.5.1 Build TAMMAC Map Loads

1. From the MMCPC main menu, click *Build*, then *Build Map* (Fig. 32). A Build Map window is displayed (Fig. 59). If a composition is open, the user will be prompted to save it before the Build Map window is displayed. The open composition will be the default composition shown in the Build Map window. However, the user may click *Browse* and choose any other non-obsolete composition that exists within MMCPC (Fig. 60).

2. Click either the *Theater* or *Mission* radial button on the Build Map window to indicate which map build type is required (maximum of 3 GB for theater or 256 MB for mission). Once the map build is complete, the corresponding composition will be locked for that build type (theater or mission).

3. The Build Map window then closes and the Data Sources window is displayed (Fig. 61). This window shows all possible map sources for the selected composition. Click *OK* to accept the default order of sources.

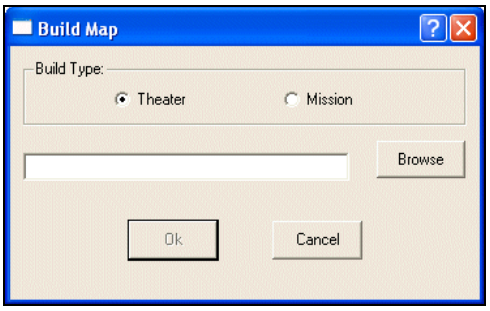


Fig. 59 — Build Map window

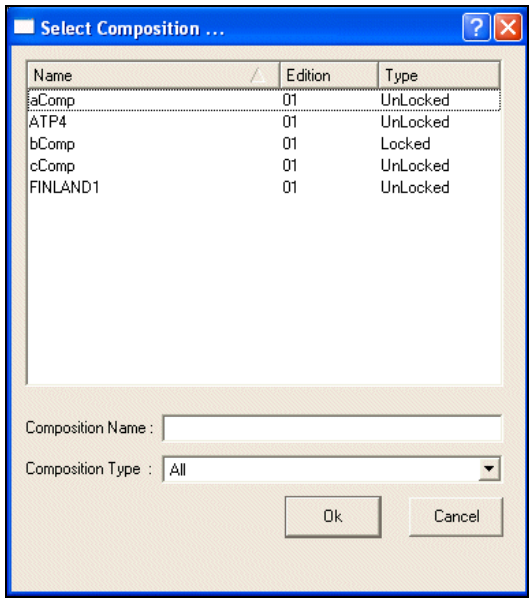


Fig. 60 — Build map composition browser

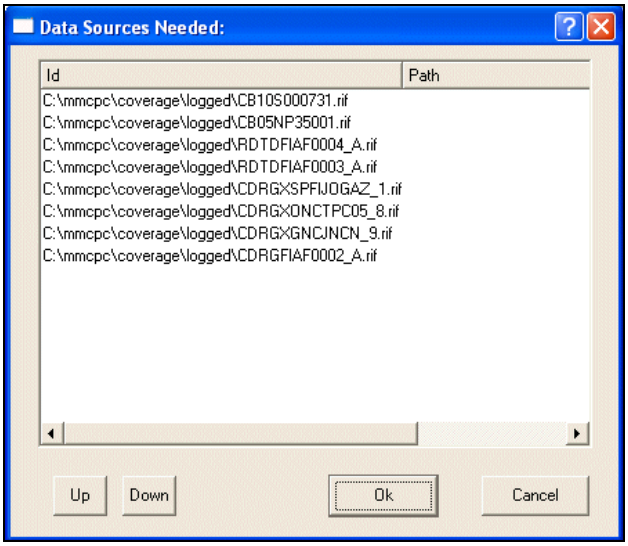


Fig. 61 — Build map data sources window

NOTE: Map data sources may have overlapping coverage. The Data Sources window allows the user to set the order of precedence of the data sources that will be used to construct the map build (top is highest priority). Order of precedence may be important when newer map data overlaps older data or when prioritizing the source provider (e.g., use FiAF data before NGA data). The user may change the order of precedence by clicking (i.e., selecting) a particular source and using the *Up* and *Down* buttons to set the order.

4. If data frames are associated with the composition, another window will be displayed showing the list of data frames (Fig. 62). As noted above, the order of precedence may be changed via the *Up* and

Down buttons. The order of precedence for data frames will determine the order in which the data frames are displayed in the aircraft (top is displayed first). Click *OK*.

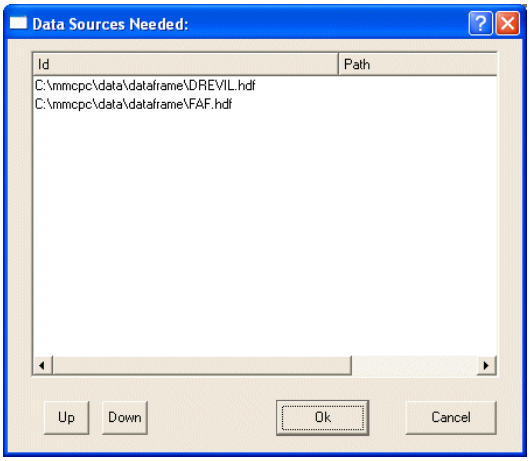


Fig. 62 — Build map data frame sources window

5. The build process will begin. For sources on CD-ROM, MMCPC requests the user to insert the CD-ROM or to locate an alternate location (Fig. 63) and click *OK* to continue. When the window appears indicating the build is complete, click *OK* (Fig. 64). All TAMMAC theater map loads are saved to C:\MMCPC\TAMMAC\THEATER and all TAMMAC mission map loads are saved to C:\MMCPC\TAMMAC\MISSION. The Mission Planning System is expected to read and/or copy the appropriate mission load from the MMCPC mission directory. MMCPC will write TAMMAC theater loads as discussed in the following section.

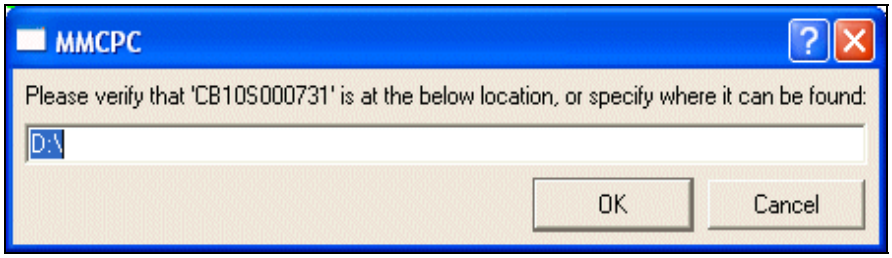


Fig. 63 — Build map data source locator

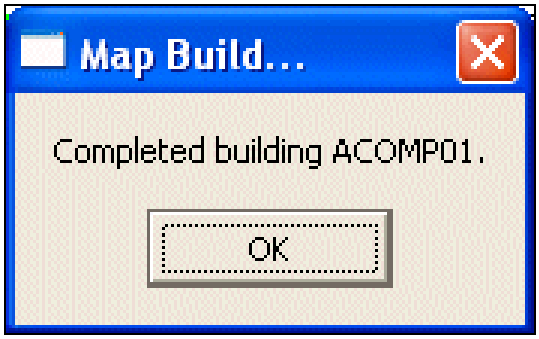


Fig. 64 — Build map completion message

4.5.2 Write TAMMAC Theater Loads to PC Card

1. From the MMCPC main window, click *Build*, then *Write Theater Map* (Fig. 32). Double click on the name of theater map to be written (Fig. 65). Note that the map load name is the same as its corresponding composition, including its two-digit edition number.

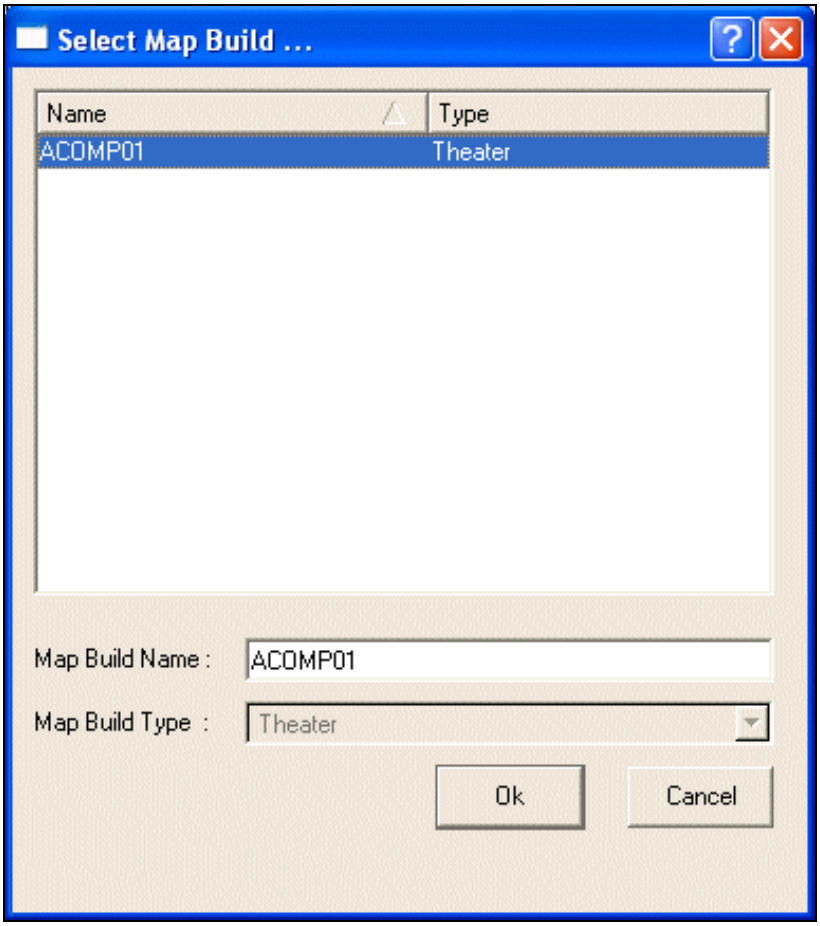


Fig. 65 — Write theater map browser

2. A window is displayed that asks the user to enter the serial number of the first PC card (Fig. 66). Enter the serial number, insert this card into the PC card drive, and click *OK*. The PC card drive (e.g., drive E:) is pre-configured at MMCPC installation.

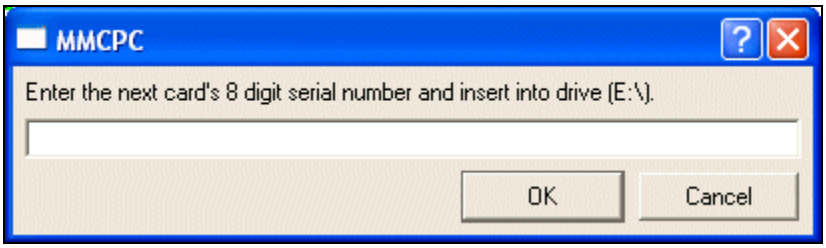


Fig. 66 — PC card window

3. When the write operation requires a single card load, click *OK* after the write has completed. Eject the card from the PC card drive and label this card with a descriptive title.

4. When the write operation spans multiple cards, the user will be prompted after the first card has completed to enter the second card's serial number and to insert the next card. Eject the first card and label it with a descriptive title, enter the serial number of the next card, and insert it into the PC card drive. Repeat for each additional card.

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Appendix A

ACRONYMS AND TERMS

ASCII	American Standard Code for Information Exchange
ATP	Acceptance Test Procedures
CADRG	Compressed Arc Digitized Raster Graphics
CIB	Controlled Image Base
DF	Data Frame
DTED	Digital Terrain Elevation Data
FiAF	Finland Air Force
GB	Gigabytes
GEOTIFF	Geo-referenced Tagged Image File Format
GTIF	Geo-referenced Tagged Image File Format (as used in Fig. C1)
HDF	Harris Data Frame
MASCII	Modified American Standard Code for Information Exchange
MMCPC	Moving-Map Composer–Personal Computer
MPS	Mission Planning System
NAVAIR	Naval Air Systems Command
NGA	National Geospatial-Intelligence Agency
NRL	Naval Research Laboratory
PCMCIA	Personal Computer Memory Card International Association
RDTED	Regridded Digital Terrain Elevation Data
RPF	Raster Product Format
TAMMAC	Tactical Aircraft Moving-Map Capability

Appendix B

MODIFIED ASCII SYMBOL SET

Code (Decimal)	Character	Code (Decimal)	Character	Code (Decimal)	Character
0	Space	43	%	87	reserved
1	A	44	,	88	reserved
2	B	45	°	89	reserved
3	C	46	.	90	reserved
4	D	47	/	91	reserved
5	E	48	0	92	reserved
6	F	49	1	93	reserved
7	G	50	2	94	reserved
8	H	51	3	95	reserved
9	I	52	4	96	reserved
10	J	53	5	97	reserved
11	K	54	6	98	reserved
12	L	55	7	99	reserved
13	M	56	8	100	reserved
14	N	57	9	101	reserved
15	O	58	=	102	reserved
16	P	59	reserved	103	reserved
17	Q	60	reserved	104	reserved
18	R	61	reserved	105	reserved
19	S	62	reserved	106	reserved
20	T	63	reserved	107	reserved
21	U	64	reserved	108	reserved
22	V	65	reserved	109	reserved
23	W	66	reserved	110	reserved
24	X	67	reserved	111	reserved
25	Y	68	reserved	112	reserved
26	Z	69	reserved	113	reserved
27	\	70	reserved	114	reserved
28	reserved	71	reserved	115	reserved
29	reserved	72	reserved	116	reserved
30	reserved	73	reserved	117	reserved
31	reserved	74	reserved	118	reserved
32	reserved	75	reserved	119	reserved
33	“	76	reserved	120	reserved
34	?	78	reserved	121	reserved
35	:	79	reserved	122	reserved
36	#	80	reserved	123	reserved
37	-	81	reserved	124	reserved
38	+	82	reserved	125	reserved
39	‘	83	reserved	126	reserved
40	(	84	reserved	127	reserved
41	)	85	reserved	N/A	N/A
42	*	86	reserved	N/A	N/A

Appendix C

SOURCE MAP DATA AND DIRECTORY STRUCTURE FORMAT

C1. FiAF GEOTIFF FILE FORMAT AND DIRECTORY STRUCTURE

MMCPC 1.0 supports GeoTIFF files that conform to the GeoTIFF Format Specification version 1.8.1. For Finnish GeoTIFF map data, MMCPC supports both Model Transformation Tag and Model Pixel Scale / Model Tiepoint Tag geocoding.

For MMCPC to identify and process source media, all FiAF GeoTIFF CD-ROMs must have a volume identification of FAF_GTIF. Otherwise, MMCPC will not process the map data. The producer of GeoTIFF source data is responsible for providing the CD-ROM volume identification.

A FiAF GeoTIFF CD-ROM may contain any number of GeoTIFF files for multiple map scales and one optional custom color palette file for each map scale that contains GeoTIFF files. All GeoTIFF files must contain a TIF suffix (e.g., ABCDEFGH.TIF) and all files must conform to the directory structure shown in Fig. C1.

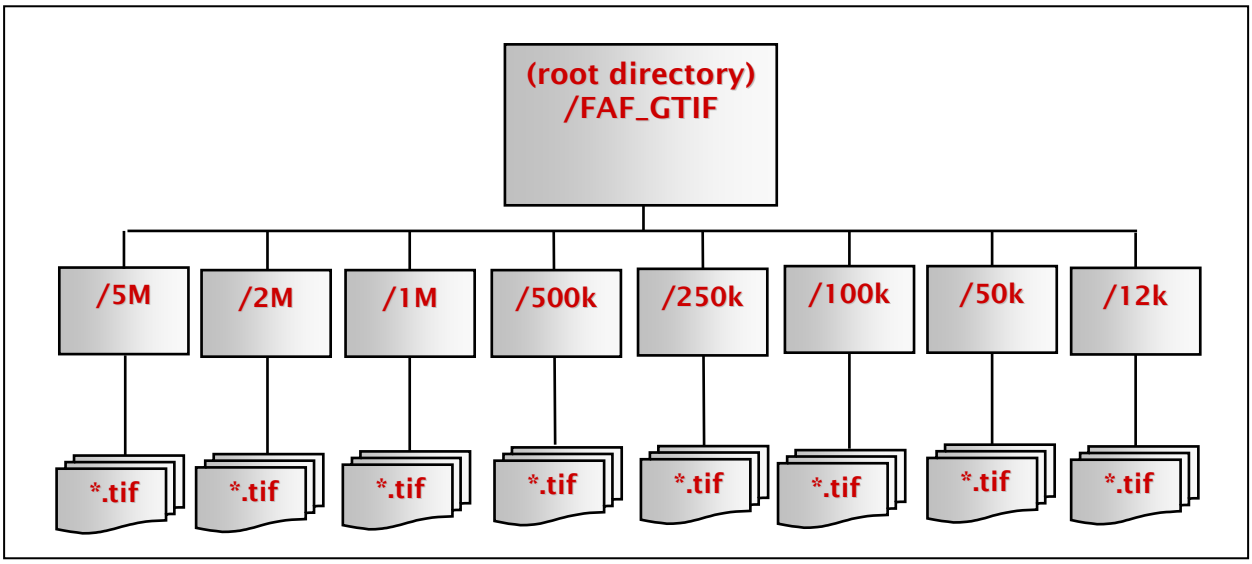

Fig. C1 — FiAF source GeoTIFF directory structure

C2. FiAF DTED FORMAT

MMCPC 1.0 will support only DTED level 1. DTED level 1 post (elevation) spacing is defined in Section 3.9 of the DTED military specification MIL-PRF-89020A.

The directory structure and file naming convention of FiAF DTED must conform to the format defined in the DTED military specification, Section 3.14.2, with the exception that FiAF DTED is not required to have a gazetteer, a DMED file, text files, or the GAZETTE or TEXT directories.

Appendix D

FiAF CUSTOM COLOR PALETTE

D1. INTRODUCTION

This section describes the installation and format of custom color palettes for use by MMCPC when source FiAF GeoTIFF files are processed into CADRG-like files (required for compatibility with the TAMMAC Digital Map System). The color palette is an ASCII file containing a maximum of 216 colors as shown in Fig. D1. Color palettes are used by MMCPC to transform source GeoTIFF files from 24-bit color to 8-bit color (i.e., color compression). MMCPC is originally installed with a default set of 8 color palettes (one for each map scale supported: 1:5M, 1:2M, 1:1M, 1:500k, 1:250k, 1:100k, 1:50k, and 1:12.5k) that are derived from NGA source CADRG files.

Custom color palettes are automatically installed by MMCPC during processing of FiAF GeoTIFF data (into CADRG). A custom color palette must reside in the appropriate scale directory along with the set of GeoTIFF files to be processed. Only one color palette per scale is allowed and it must be named PALETTE.TXT. Once data processing begins, the custom color palette will replace the current default color palette for that particular map scale. The custom color palette now becomes the new default palette for that scale and will subsequently be used to color compress the source GeoTIFF files at that scale into CADRG files. A PALETTE.TXT file may exist in each map scale directory that contains GeoTIFF files. To reduce the impact of color loss during processing, custom color palettes that provide good representations of the true colors of the source data should be used.

D2. FiAF COLOR PALETTE FORMAT

MMCPC requires that a custom color palette file follow a specific format (Fig. D1). The first line of the color palette file must contain the number of colors being defined. The maximum number of colors is 216. If the actual number of colors does not match the number listed in the first line, the file will be considered invalid and the map data will not be processed. After the first line, each successive line must contain the text “Set x,” where “x” is the numeric identifier of the color (e.g., “Set 216”). These numbers should be consecutive. The “S” in “Set” must be capitalized. Following this text, the red, green, and blue components (valid values 0–255) for the color follow, with each value delimited by a single space. In Fig. D1, each space is shown as “▒” for clarity only.

```
154
Set▒1▒0▒0▒0
Set▒2▒33▒0▒209
Set▒3▒64▒0▒128
        •
        •
        •
Set▒154▒0▒99▒15
```

Fig. D1 — FiAF custom color palette format

Appendix E

MPS IMPORT FILE FORMAT

The MPS import is an ASCII file that serves as an interface between the MPS system and MMCPC. The MPS import can be used to create a composition and process data frames in MMCPC based on the contents of the MPS-ASCII file. All MPS import files must end with an extension of "MPS".

MMCPC reads the MPS import file (defined below) and creates an MMCPC composition from the file's contents. The user may import an MPS file into MMCPC from any available directory or hard drive. Further, source files for data frames listed in an MPS file may exist in any available directory or hard drive available to MMCPC. However, a full path name for each data frame is required.

All source files for data frames must be 768 × 768 pixels in size as required by TAMMAC. Resultant mission builds are stored in a predetermined and permanent directory on MMCPC, namely, C:\MMCPC\TAMMAC\MISSION. A file folder will exist with the name given in the MPS file. All required files for a valid TAMMAC mission load will exist within this directory EXCEPT for the MF.DAT file, which must be created by the MPS system. The MPS import file format is shown in Fig. E1 and is comprised of three sections: header, data, and location. Figure E2 presents an example of an import file.

The **header** section contains the unique mission name that will be assigned as the MMCPC composition name. The maximum name length is 10 characters and it cannot include spaces or special characters. This is accompanied by an integer that indicates the number of data sections to follow. An exclamation point (!) in the first column indicates that the line is a comment field and the entire line is ignored during import.

The **data** section consists of information to identify the map data type, map scale, and source/destination directories for data frames. Valid map data types include CADRG, CIB, RDTED, and DF (data frames). Valid map scales for these data types are listed in Table E1. Source and destination paths for data frames must specify the full directory path and file name. For example, a source destination could be C:\MMCPC\IMPORT\TEST.GIF.

The **location** subsection is applicable to CADRG, RDTED, and CIB data types. The first entry in this section lists the number of coordinates that will follow for that particular *data* section (e.g., CADRG @ 1:2M). This is accompanied by a series of latitude and longitude coordinates that are specified in +/- decimal degrees and delimited by commas.

```
{Header section}
<Unique Identifier> (e.g. MPS0001)
{Data section}
  <Data Type>  (CADRG, CIB, RDTED, DF)
  <Scale> (Applicable for CADRG and CIB only)
<Source path and filename> (Applicable for DF only)
<Destination path and filename> (Applicable for DF only)
   <Number of lat / lon points>
  {Location subsection} (CADRG, CIB, or RDTED with max. of 256 defined points)
    <Lat, Lon> (Decimal degrees [dd.ddd,ddd.ddd])
  }
}
! Indicates comment field
```

Fig. E1 — MPS Import file format

Table E1 — Valid data types and map scales

Data Type	Map Scale
CADRG	1:12.5k
	1:50k
	1:100k
	1:250k
	1:500k
	1:1M
	1:2M
	1:5M
RDTED	150m
CIB	5m
	10m

```
ATP4
! Composition title
5
! Number of sections to follow
! CIB has 2 scales [5m (5 meter) 10m (10 meter)]
CIB
5m
4
61.5,024.5
62.5,024.5
62.5,025.5
61.5,025.5
! CADRG has 8 scales [1:12.5k,1:50k,1:100k,1:250k,1:500k,1:1M,1:2M,1:5M]
CADRG
1:250k
4
61.5,024.5
62.5,024.5
62.5,025.5
61.5,025.5
CADRG
1:2M
4
61.5,024.5
62.5,024.5
62.5,025.5
61.5,025.5
! Both scales of RDTED 750m and 150m are always included
! Always specify 150m
RDTED
150m
4
61.5,024.5
62.5,024.5
62.5,025.5
61.5,025.5
! Data frames - specify source dir and name / destination dir and name.
! DF
! C:\MMCPC\import\STOOGIES.GIF
! C:\MMCPC\data\DATAFRAME\stoogies.hdf
DF
C:\MMCPC\import\faf.gif
C:\MMCPC\data\DATAFRAME\FAF.hdf
```

Fig. E2 — MPS import file example (MPSIMPORT.MPS)