Naval Research Laboratory

Stennis Space Center, MS 39529-5004

Moving-Map Composers System Version 3.4P Installation Guide and Training Manual

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14. ABSTRACT

This report provides an installation guide and training manual for the Naval Research Laboratory (NRL) Moving Map Composer (MMC) Version 3.4P software system, which was developed for the Finland Air Force (FiAF). Installation and training will be performed later this year in Finland on an FiAF-owned Digital Alpha computer.

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MOVING-MAP COMPOSERS SYSTEM VERSION 3.4P
INSTALLATION GUIDE AND TRAINING MANUAL

INTRODUCTION

This document provides an installation guide and training manual for the Naval Research Laboratory (NRL) Moving-Map Composer (MMC) version 3.4P software, which was developed for the Finnish Air Force (FiAF). Installation and training will be performed later this year in Finland, on a FiAF-owned Digital Alpha computer.

MMC 3.4P has been developed to perform the following functions for FiAF:

- Process and archive Finland-produced geotiff images into Compressed Aeronautical Chart (CAC) map data, compliant to the Tessellated Spheroid (TS) Projection System;

- Allow the user to change the system color palette for a given map scale during geotiff to CAC processing;

- Design/build Aircraft Optical Disk (AOD) images from user-specified CAC data;

- Write completed AOD images to militarized Write-Once Read-Many (WORM) disks;

- Design/build Mission Planning System (MPS) Compact Disk Images (CDI) from user-specified CAC data and Digital Terrain Elevation Data (DTED);

- Write MPS-CDIs to Recordable Compact Disks (CD-R) for mission planning purposes;

- Write AODIs and processed CAC data to CD-Rs for archival;

- Recycle (where possible) failed AODs;

- Print final AOD and MPS image compositions, chart images, and AOD summaries.

A description of the graphical user interface and many common operations is provided in the MMC V3.3 Software Users' Manual [1]. However, that manual does not include Finland-specific enhancements, including geotiff data processing and color palette modifications. These enhancements are described in this document and in the FiAF/MMC Users' Manual v3.4P [2].

Table 1 provides a list of commonly used acronyms in this document. Figure 1 provides an overview of the hardware platform hosting MMC 3.4P. Figure 2 provides a diagram of hardware connections from this platform to major hardware peripherals. Note that as of Design Review (DR) Meeting #1, FiAF does not own all the hardware peripherals that MMC supports.

Specifically, FiAF does not own a Howtek scanner or Seiko color printer, both of which are supported by MMC. In addition, FiAF does not have a GPIB board, which is required for installation of the scanner. References to all unavailable hardware (i.e., scanner, color printer, and GPIB board) are noted in this document.

Manuscript approved August 21, 2002.

Table 1 – Useful Acronyms

AOD	Aircraft Optical Disk	DTED	Digital Terrain Elevation Data
AODI	Aircraft Optical Disk Image	FiAF	Finnish Air Force
CAC	Compressed Aeronautical Chart	MMC	Moving-Map Composer
CD-R	Compact Disk - Recordable	MPS	Mission Planning System
DMU	Digital Memory Unit	MPS-CDI	MPS Compact Disk Image
DMUI	DMU Interface	TS	Tessellated Spheroid

Several sections within this ATP involve data processing. Table 2 provides a complete listing of required data sources.

Table 2 – Required ATP Source Geotiff Chart Data

| Section	Source CD Label	Description
LESSON 2: MAP DATA PROCESSING	Finland 1:2M Geotiff Source #1	Scanned 1:2M scale geotiff chart data
LESSON 2: MAP DATA PROCESSING	Finland 1:500k Geotiff Source #1	Scanned 1:500K scale geotiff chart data
LESSON 7: INSTALL A NEW COLOR PALETTE AND REBUILD A COMPOSITION	Finland 1:2M Geotiff Source #2.	Scanned 1:2M scale geotiff data including a new color palette
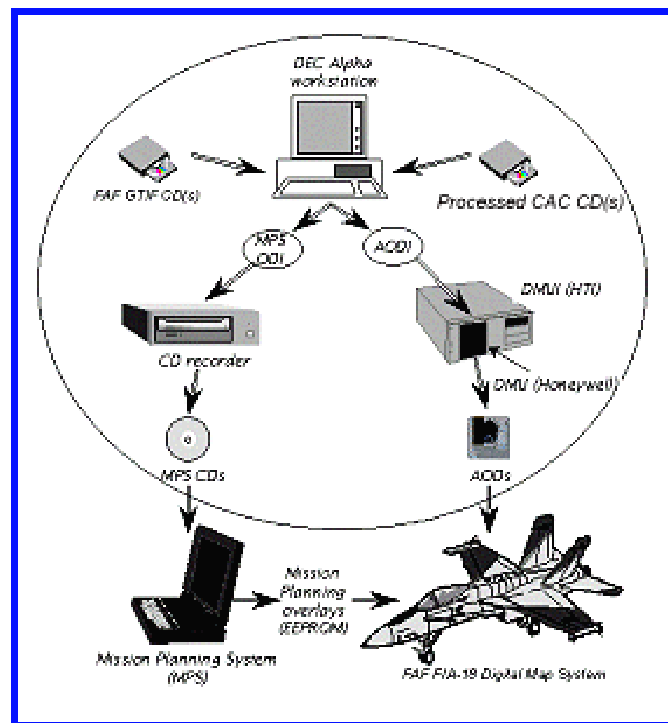
Fig. 1 – MMC hardware components
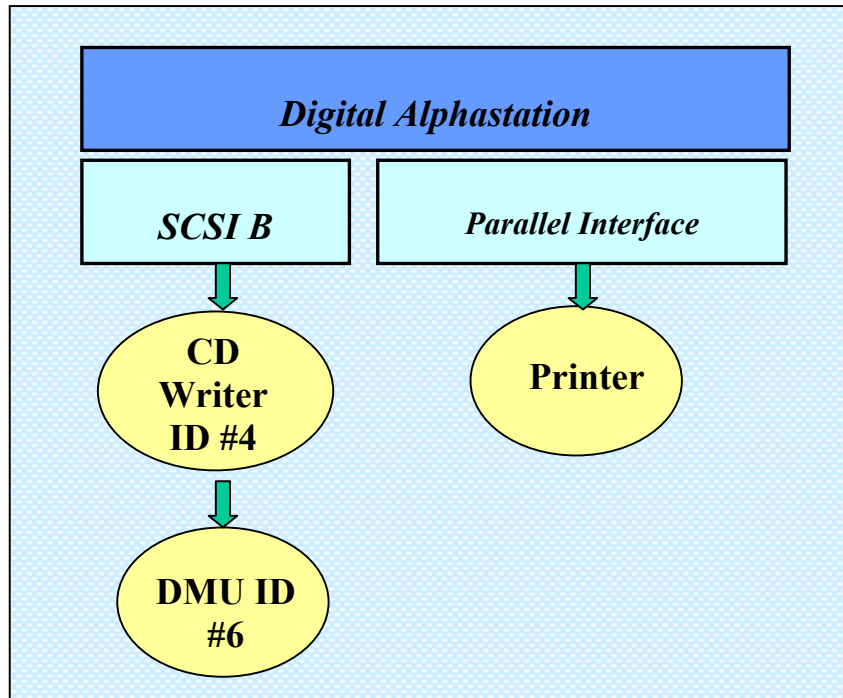
Fig. 2 – Hardware connections to major peripherals

INSTALLATION

Use the following instructions to install MMC version 3.4P:

1. If MMC is running, click on 'Exit' under the FILE menu.

2. Click on 'EXIT' at the bottom of the computer screen, then click 'Continue' to log out.

3. At the login prompt, log in as SYSTEM, and use your SYSTEM password.

4. Put the MMC Version 3.4P CD-ROM in the internal CD-ROM drive (MMC number 7).

5. Click on the little computer screen icon at the bottom of your display.

6. A window with a $ character should come up. At the $ character, type the following commands:

$**MOUNT/OVER=ID DKA400**

   $**@DKA400:[000000]INSTALL MMC FINLAND**

You will be asked for the SOURCE: just press the RETURN key.

You will be asked for the TARGET: just press the RETURN key.

You will be asked if you want to continue with the installation.
Type **Y** and press the RETURN key.

The installation will take awhile. Ignore any error messages that are displayed on the screen.

The install operation will notify you it is complete and the $ will return to the screen.

7. Dismount the internal CD-ROM device by typing $**DISMOUNT MMC7**

8. Invoke the upgrade by rebooting the system: $**REBOOT**

<u>IMPORTANT NOTES:</u>
- ♦   This installation changes the MMC password to "8675309."
- ♦   The SYSTEM password does not change.

LESSON 1: MMC SYSTEM SET UP

This section provides all of the necessary steps for setting up the MMC System and making it available for use.

1. **Unpack all equipment** from their boxes.

2. **Parts List:** (1) DEC Alpha CPU, (1) monitor, (1) DMUI, (1) DMU, (1) CD writer, (1) keyboard, (1) mouse, (1) Centronix to High-Density SCSI cable, (1) Centronix to Centronix SCSI cable, (1) SCSI terminator, (4) power cords, (1) box of CD-Rs.

3. **Arrange equipment in workspace (Fig. 3):**
   a. Set DMUI on table, place Alpha CPU next to the DMUI, and place the CD writer on top of DMUI.
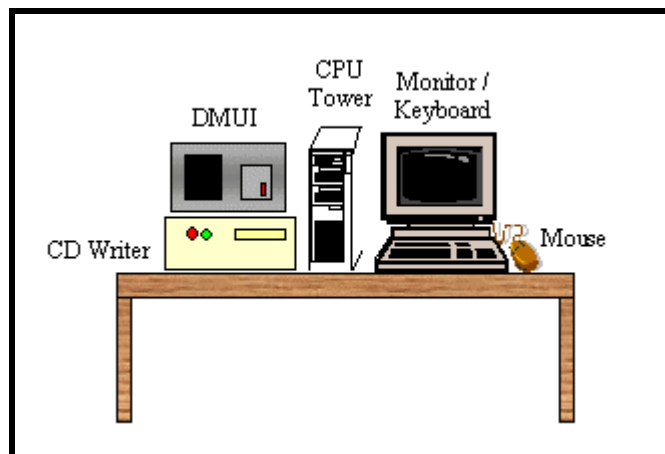   b. Place monitor, keyboard, and mouse next to the stack of equipment.

Fig. 3 – MMC system equipment

4. **Connect peripherals to the back of the CPU (Fig. 4):**
   a. <u>Monitor</u>: Plug the monitor's video cable into the video port on the CPU (lower half of CPU panel, first horizontal port).
   b. <u>Keyboard / Mouse</u>: Plug the keyboard and mouse into their respective ports on the CPU box (middle part of panel - there is a line above the keyboard port and a circle with an arrow above the mouse port).
   c. <u>DMUI</u>: Plug the Centronix…High-Density SCSI cable into the external SCSI port on the CPU box (High-Density SCSI port, located directly below the monitor port). Plug the other end of the cable into either of the DMUI SCSI ports.
   d. <u>DMU</u>: (If not preinstalled in DMUI) Place DMU in DMUI opening and connect the DMU Optic plug to J2 on the DMU and connect the DMU power plug to J1.
   e. <u>CD writer</u>: Plug the Centronix - Centronix cable into the other SCSI port on the DMUI. Plug the other end of this cable into one of the CD writer SCSI ports. Plug a SCSI terminator into the remaining CD writer SCSI port.
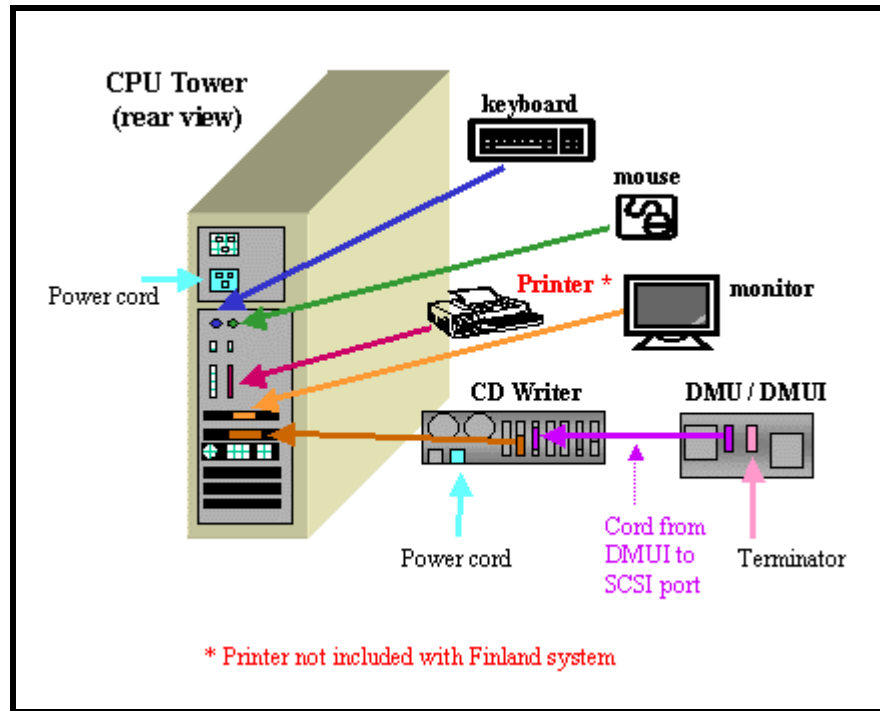
Fig. 4 – MMC system peripherals connected to CPU tower

5. **Power connections:**

   NOTE: All equipment requires clean, uninterrupted 60 Hz, 110 Vac. NRL recommends that high-quality power converters be used to insure clean power. The DMU and DMUI are especially sensitive to power fluctuations, which can damage the equipment.

   a. Verify that the power supplies of the CPU and all peripherals are switched to use 60 Hz power.

   b. Connect power cords to each peripheral (CPU, monitor, DMUI, and CD writer) and then plug to an unplugged power strip.

   c. Verify that all equipment is turned OFF at their individual power switches BEFORE plugging in power strip.

   d. Plug in and turn on power strip.

   e. Turn on the peripherals:

      i. First turn on DMUI (first using the power switch located on the back of the box, then with the switch on the front).

      ii. Next turn on the CD writer and the monitor.

   f. Turn on the MMC System CPU.

6. **Check device configuration and boot MMC System:**

   a. Wait until the MMC System's " >>>" prompt is displayed.

   b. Check that the CD writer's red HDD light is *off*. If it is *on*, press the RESET button on the front of the CD writer (which will turn it off), then, at the ">>>" prompt on the MMC System monitor, type **INIT**.

    c. When the ">>>" prompt returns on the MMC System monitor, wait 5 to 10 s, then type **SHOW DEVICE**. You should see the listing shown in Table 3 (except the highlighted devices, if still unavailable).

Table 3 – MMC System Device Listing

DEVICE ID	Device name	Description
DKA0	RZ29B	System disk
DKA100	RZ29B	MMC disk (Disk 1 of Volume Set)
DKA200	RZ29B	MMC disk (Disk 2 of Volume Set)
DKA400	RRD45	Internal CD-ROM drive
DVA0		Internal floppy disk drive
MKB400	YNGMINDS TURBO STUDIO	CD Writer
EWA0		Ethernet (e.g., 00-00-F8-00-E7-43)
PKA0	SCSI Bus ID 7	Internal SCSI Bus - A
PKB0	SCSI Bus ID 7	External SCSI Bus - B

    If this listing is incomplete or inaccurate, turn off the CPU, then turn off the power strip. Next, turn the power strip back on, and then turn the CPU on. Repeat the steps in Lesson 1, step 6 until the listing is complete, or after two attempts, call NRL-SSC.

    d. When the device listing is correct, type **B** (for boot) at the ">>>" prompt. It will take about 3 min to completely boot the system.

7. **Login:**
   Username: **MMC**
   Password: **8675309**

8. **Lesson Complete:**
   ✓ System boots up correctly and user is able to log in.

LESSON 2: MAP DATA PROCESSING

   In this section, you will create the processed map data that will be used throughout the rest of the lessons. The source data for MMC to process are geotiff map files. MMC reads geotiff map files from CD and can only process one scale of geotiff data on any given CD. The volume label and directory structure for the geotiff map files are defined in Appendix A. **MMC will not process FiAF map data that do not conform to the map data and directory structure formats listed in Appendix A.**

1. **Install CD-ROM containing source geotiff map files:**
   a. Install CD-ROM labeled: *Finland 1:2M Geotiff Source #1*.
   b. From the MMC main menu, click on *Tools*, then *Data Processing*.
   c. Under *Process Scale*, select *JNC(1:2M)*.
   d. From the **CD-ROM Site Window**, select CD-ROM drive *7*, click on *Scan Readers* (Fig. 5).
   e. Once the Volume ID of the CD-ROM is shown (FiAF_GTIF), click *Start Processing*.
   f. This CD-ROM will not contain a palette file included with the source data, click *Yes* to use the system color palette.
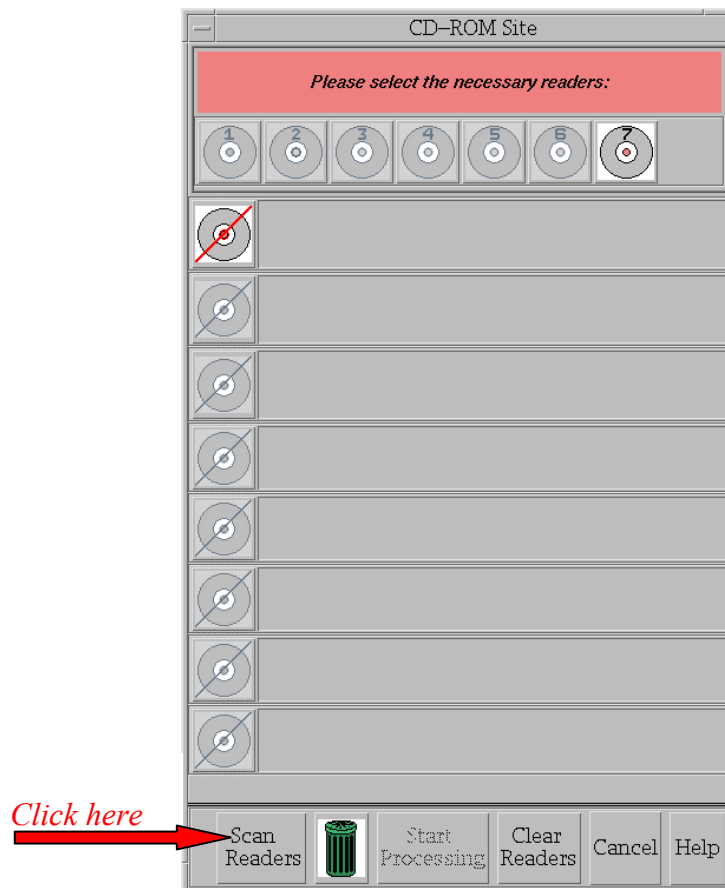

Fig. 5 – CD-ROM site window

2. **Process the geotiff map files:**

   a. The **GeoTIF Processing Window** (Fig. 6) displays information about disk usage, processing options, and advanced options.

   b. Review the **GeoTIF Processing Window** information, making sure that the *Finalize Automatically* option is "checked," then click *Accept*.

   NOTE: When *Finalize Automatically* is checked, MMC will not allow more data at the same map scale to be processed until this data has been archived and/or deleted from the system. If more than one CD-ROM of map data at a given scale requires processing, do not select *Finalize Automatically* until the final CD-ROM is inserted.

   c. A bitmap of the map segments to be processed from this geotiff data is displayed (Fig. 7). Verify the approximate geographic extents of the map coverage shown and if correct, click *Yes*.

   d. A processing meter appears near the bitmap coverage of the data to be processed. The bitmap displays map segments that have not been processed and compressed. The bitmap becomes smaller as more map segments are processed. Once processing is complete, click *Acknowledge*, and then click *Okay*.
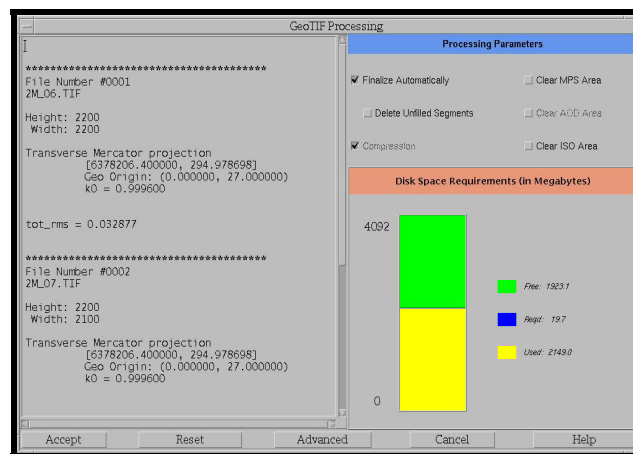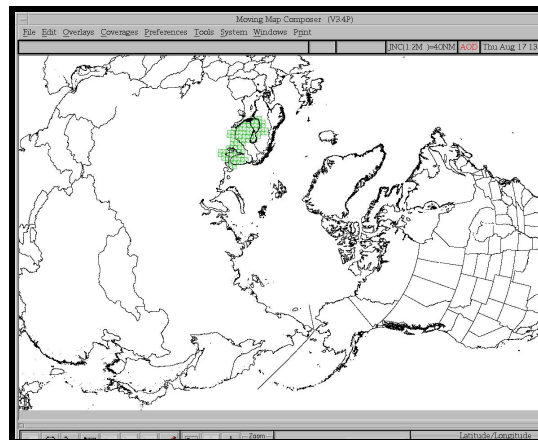

Fig. 6 – GeoTIF Processing window

Fig. 7 – Geotiff map segments to be processed

3. **Review the Processed map data (FiAF CAC) on hard drive:**

    a. From the main menu, click on *Coverages*, then *Include Processed Coverage*.

    b. Select *PROCESSED-HD-MAP5* in the dialog box, and then click *OK*.

    c. On the toolbar (located at the bottom of MMC window), change the map projection of the display from *Mercator* to *North Polar* and use the ⭢🗆 button to zoom in to the location of the map coverage.

    d. Move the mouse to the location of the map coverage and click the right mouse button.

    e. In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

        NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).*

    f. When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

4. **Process Another Map Scale:**

    a. **Install CD-ROM containing source geotiff map files:**

        i.   Install CD-ROM labeled: *Finland 1:500k Geotiff Source #1*.

        ii.   From the MMC main menu, click on *Tools*, then *Data Processing*.

        iii.   Under *Process Scale*, select *TPC(1:500k)*.

        iv.   From the **CD-ROM Site Window**, select CD-ROM drive *7*, click on *Scan Readers* (Fig. 5).

        v.   Once the Volume ID of the CD-ROM is shown (FiAF_GTIF), click *Start Processing*.

        vi.   This CD-ROM will not contain a palette file included with the source data, click *Yes* to use the system color palette.

    b. **Process the geotiff map files:**

        i.   The **GeoTIF Processing Window** (Fig. 6) displays information about disk usage, processing options, and advanced options.

        ii.   Review the **GeoTIF Processing Window** information, making sure that the *Finalize Automatically* option is "checked," then click *Accept*.

                NOTE: When *Finalize Automatically* is checked, MMC will not allow more data at the same map scale to be processed until these data have been archived and/or deleted from the system. If more than one CD-ROM of map data at a given scale requires processing, do not select *Finalize Automatically* until the final CD-ROM is inserted.

        iii.   A bitmap of the map segments to be processed from this geotiff data is displayed (Fig. 7). Verify the approximate geographic extents of the map coverage shown and if correct, click *Yes*.

        iv.   A processing meter appears near the bitmap coverage of the data to be processed. The bitmap displays map segments that have not been processed and compressed. The bitmap becomes smaller as more map segments are processed. Once processing is complete, click *Acknowledge*, and then click *Okay*.

    c. **Review the Processed map data (FiAF CAC) on hard drive:**

        i.   From the main menu, click on *Coverages*, then *Include Processed Coverage*.

        ii.   Select *PROCESSED-HD-MAP3* in the dialog box, and then click *OK*.

        iii.   On the toolbar (located at the bottom of MMC window), change the map projection of the display from *Mercator* to *North Polar* and use the ⬉▭ button to zoom into the location of the map coverage.

        iv.   Move the mouse to the location of the map coverage and click the right mouse button.

        v.   In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

      NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).*

        vi.   When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

  5. **Lesson Complete:**

     ✓ Geotiff map data were processed.

     ✓ FiAF CAC is correctly georeferenced.

     ✓ Color fidelity of the FiAF CAC is acceptable.

LESSON 3: ARCHIVE AND LOG FiAF CAC

   This section describes the procedures used to archive FiAF CAC files since they may be used to create new AODIs. FiAF CAC files are logged to update and maintain the MMC source database.

   1. **Archive the FiAF CAC:**
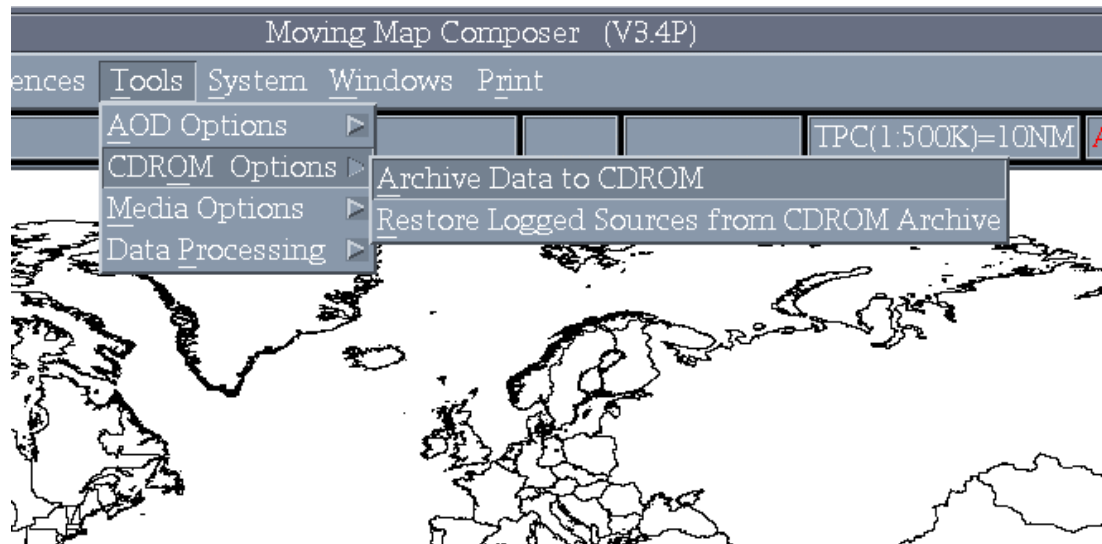   a. On the main menu, click on *Tools*, *CDROM Options*, and *Archive Data to CDROM* (Fig. 8).

Fig. 8 – CDROM Options Menu

      b. From the **Archive to CDROM** window, click on *File*, then click *PreMaster* (Fig. 9), and then click *Processed CAC Data*. Select the map scale *JNC(1:2M)*.
      c. If data already exists on the system, MMC will ask if you wish to delete it. Click *Yes*, and then click *Yes* again to verify that you wish to proceed.
      d. Enter a descriptive title for the processed map data (e.g., First Processed 1 to 2M).
      e. When premastering is complete, click *OK* and insert a blank CD-R label-up in the CD writer.
      f. From the **Archive to CDROM** window, click on *File*, and then *Cut (*Fig. 9).
      g. Write down the MMC-assigned name of the archived data (e.g., SC-2000-A-MAP5-X00001) and then click *Yes.*
      h. Wait until the CD writer has finished writing to the CD-R (i.e., no red or blinking green lights are on), and then remove the CD-R from the CD writer.
      NOTE: Even if MMC displays a message saying the write is finished, <u>wait</u> until the CD writer's Read (green) and Write (red) lights stop blinking! The green Disc and 8x lights will stay on.
      i. Label the CD-R with the descriptive and MMC-assigned name, and insert it into the CD-ROM drive.
      j. From the **Archive to CDROM** window, click on *File*, and then *Close (*Fig. 9).

Fig. 9 – Archive to CDROM window

2. **Log the FiAF CAC:**
   a. From the main menu, click on *Tools*, then *Media Options*, then *Log Media* (Fig. 10).
   b. From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*, then *Start Processing* (Fig. 5).
   c. When logging is complete, remove CD-R from CD-ROM drive.
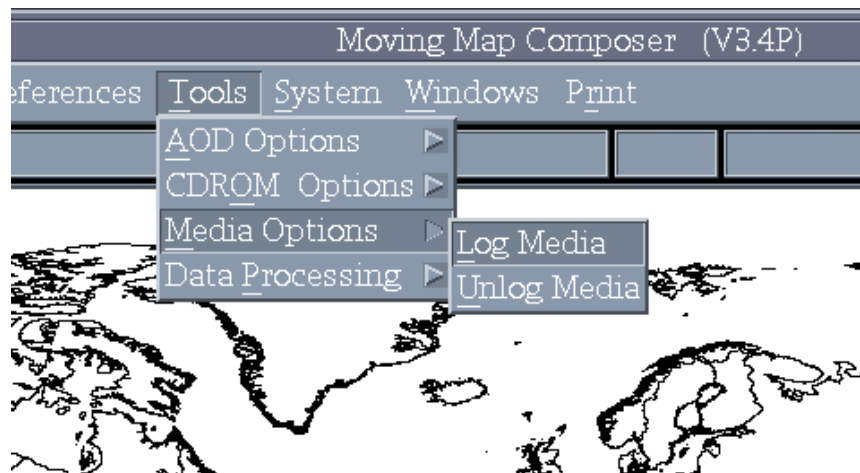
Fig. 10 – Media options

3. **Archive and log another map scale:**
   a. Archive the FiAF CAC:
      i. On the main menu, click on *Tools*, *CDROM Options*, and *Archive Data to CDROM* (Fig. 8).
      ii. From the **Archive to CDROM** window, click on *File*, then click *PreMaster* (Fig. 9), and then click *Processed CAC Data*. Select the map scale *TPC (1:500k)*.

     iii. If data already exist on the system, MMC will ask if you wish to delete them. Click *Yes*, and then click *Yes* again to verify that you wish to proceed.

     iv. Enter a descriptive title for the processed map data (e.g., First Processed 1 to 500k).

     v. When premastering is complete, click *OK* and insert a blank CD-R label-up in the CD writer.

     vi. From the **Archive to CDROM** window, click on *File*, and then *Cut (*Fig. 9).

     vii. Write down the MMC-assigned name of the archived data (e.g., SC-2000-A-MAP5-X00001) and then click *Yes*.

     viii. Wait until the CD writer has finished writing to the CD-R (i.e., no red or blinking green lights are on), and then remove the CD-R from the CD writer.

       NOTE: Even if MMC displays a message saying the write is finished, <u>wait</u> until the CD writer's Read (green) and Write (red) lights stop blinking! The green Disc and 8x lights will stay on.

     ix. Label the CD-R with the descriptive and MMC-assigned name, and insert it into the CD-ROM drive.

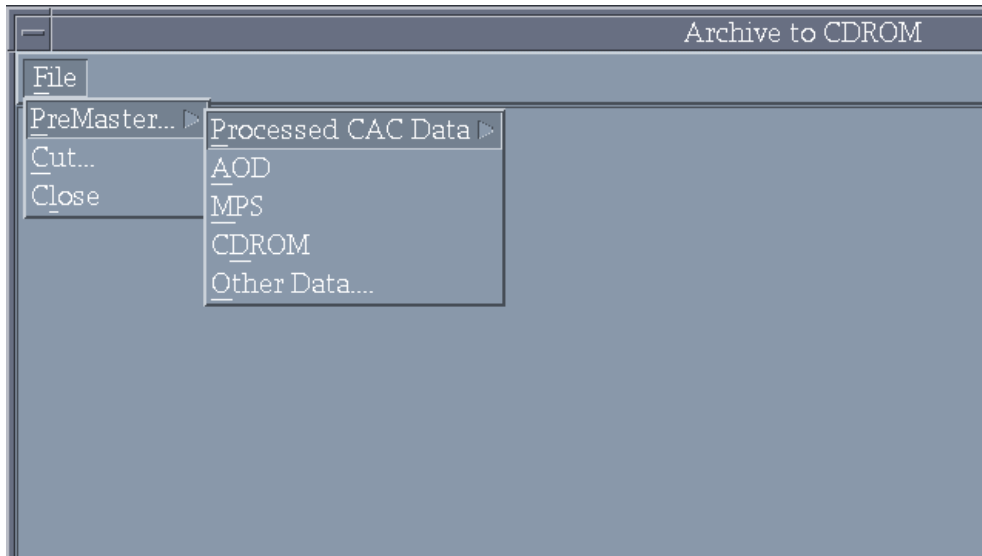   x. From the **Archive to CDROM** window, click on *File*, and then *Close (*Fig. 9).

  b. Log the FiAF CAC:

     i. From the main menu, click on *Tools*, then *Media Options*, then *Log Media* (Fig. 10).

     ii. From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*, then *Start Processing* (Fig. 5).

   iii. When logging is complete, remove CD-R from CD-ROM drive.

4. **Lesson Complete:**

   ✓ The processed map data has been archived and logged.

LESSON 4: DESIGN AN MMC COMPOSITION

This section describes the procedures that are used to design a composition. A composition is a user-defined geographic coverage area (or set of areas) saved as a series of bitmaps. A composition includes a bitmap for each contiguous geographic area, within each TS zone, and at each map scale required to build the user's AOD image or MPS image.

1. **Display the existing logged coverage bitmap:**
   a. From the main menu, click on *File*, then *New* (Fig. 11).
   b. If the Build Type Mode (either *AOD* or *MPS*, just below menu bar on far right) is not set to *AOD*, change it by clicking on *Preferences*, then *Composing MPS ON*, then *Compose AOD* (Fig. 12) and then click *Yes*.
   c. On the toolbar, change the map scale to *JNC(1:2M)* and change the map projection of the display from *Mercator* to *North Polar*.
   d. From the main menu, click on *Overlays*, then *Available Coverage* (Fig. 13).
   e. If needed, use the ⬚ button on the toolbar to zoom.
   f. MMC will display the coverage of the logged CD at the selected scale.
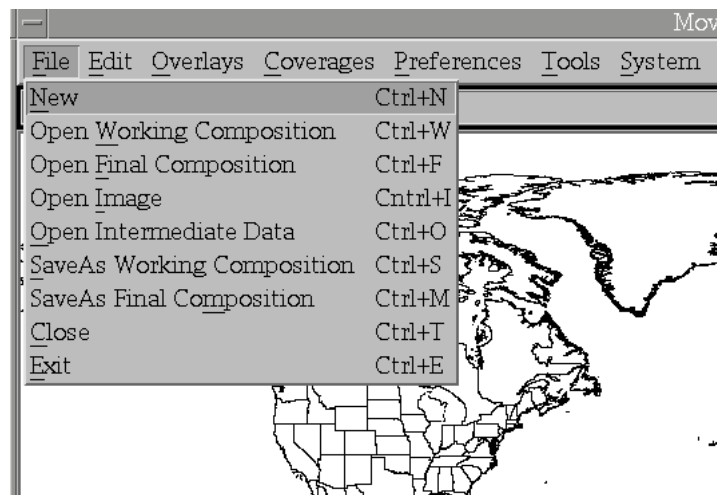
Fig. 11 – File menu
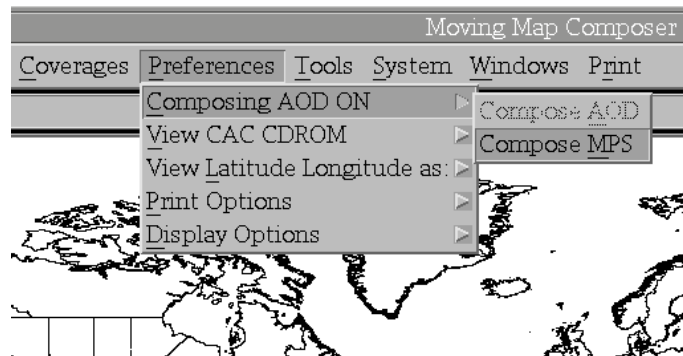
Fig. 12 – Composing preferences

Fig. 13 – Overlays menu

2. **Design a composition:**
   a. From the lower-left corner of the toolbar, select the ⬚ button to define an area of coverage. Define a small area, smaller than the available coverage.
   b. MMC will display your defined areas in colored boxes (the color reflects the TS zone of the data).
   c. To check the size of the composition, from the main menu, click on *Windows*, and then *Composition Data Size* (Fig. 14) to see a meter showing how much space has been used (Fig. 15).
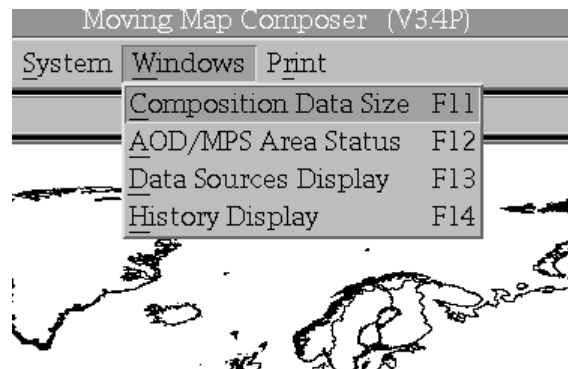
Fig. 14 – Windows Menu
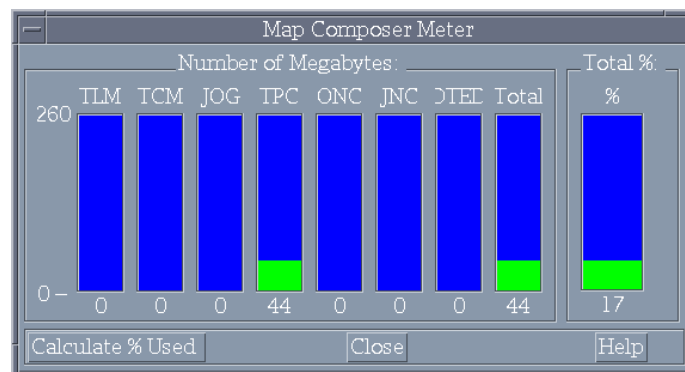
Fig. 15 – Composition size with limits

3. **Add another map scale:**
   a. On the toolbar, change the map scale to *TPC(1:500k)* and change the map projection of the display from *Mercator* to *North Polar*.
   b. From the main menu, click on *Overlays*, then *Available Coverage* (Fig. 13).
   c. Design a composition:
      i. From the lower-left corner of the toolbar, select the ⬚ button to define an area of coverage. Define a small area, less than the available coverage.
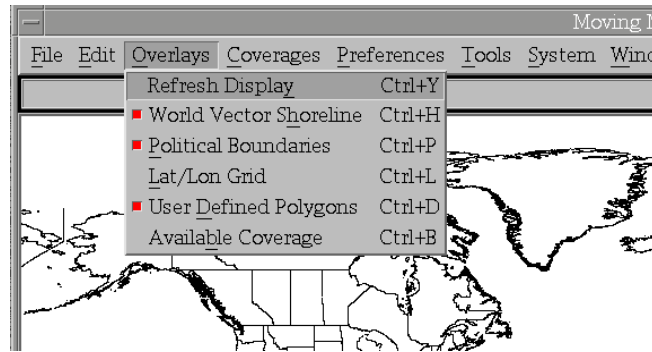   ii. MMC will display your defined areas in colored boxes (the color reflects the TS zone of the data).
      iii. To check the size of the composition, from the main menu, click on *Windows*, and then *Composition Data Size* (Fig. 14) to see how much space has been used (Fig. 15).
   d. You may switch to any map scale to add more coverage or delete coverage (where map data is available) using the buttons located on the toolbar.

4. **Save your composition** when you are satisfied with your defined coverage(s).

   a. From the main menu, click on *File*, then *SaveAs Final Composition* (Fig. 11).

   b. When prompted for a filename, type **LESSON4** and click *OK*, then enter a descriptive title and click *OK*.

5. **Lesson Complete:**
   ✓ A MMC final composition named **LESSON4** containing map data at two scales has been created**.**

LESSON 5: BUILD, REVIEW, AND ARCHIVE A NEW AODI AND MPS-CDI

This section describes the procedures that are used to build new AODI and MPS images. When a new image is built, the area of coverage must be defined and source data are identified and processed. Newly created images should be reviewed for acceptability and archived for future use.

1. **Open the Final Composition:**
    a. From the main menu, click on *File*, then *Open Final Composition* to view the list of available final compositions (Fig. 16). This must be done even if the composition is still active in MMC (see note below).
    b. Scroll through the list of available compositions and select the <u>*AOD*</u> composition **LESSON4** (*not* the <u>*MPS*</u> composition) you just created. Note that MMC has saved both an AOD and MPS version of the **LESSON4** composition. All MMC compositions created in AOD mode are also valid MPS compositions, but not all compositions created in MPS mode are valid AOD compositions (see note at Lesson 9, step 5). MMC will display your templates on the world map. You may change the map view on the tool bar as discussed in Lesson 4.

    NOTE: An <u>active</u> composition that has been saved as a final composition may still be modified as long as these modifications are saved *using a different composition name*. However, these modifications may result in a new composition that is invalid. Therefore, as a security measure, MMC only allows a final composition be opened – any modifications to be saved require the creation a new final composition (and leave the original intact).

Fig. 16 – Sample list of final compositions

2. **Build the AODI and MPS image (MMC automatically builds both in AOD Mode):**
    a. From the main menu, click on *Tools*, then *AOD Options*, and then *Build AOD Image* (Fig. 17). A dialog box will appear asking you to verify that you want to build the AOD image; click *Yes*.
    b. MMC will open a **Data Sources** window showing which sources (e.g., FiAF CAC CDs) are needed.
    c. MMC will also open the **CD-ROM Site Window** (Fig. 5). Load and process the necessary CDs one at a time. From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*, then *Start Processing*.
    d. Once all the CDs have been read and processed, the **Data Sources** window will disappear and MMC will build the MPS and AOD images.

e. ***Wait*** until MMC states that the image build is complete before continuing with the next step. Click *Acknowledge* when the build is complete.
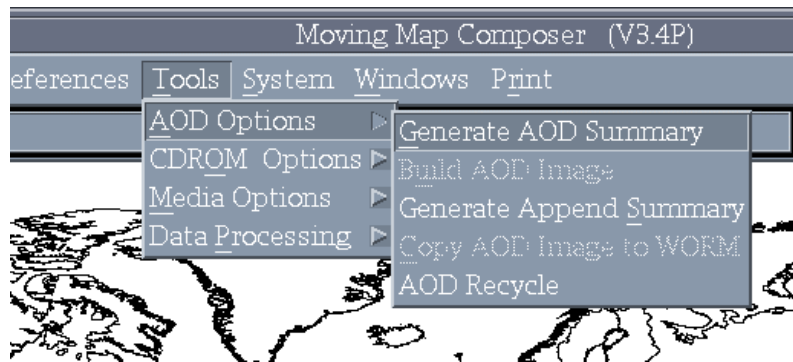
Fig. 17 – AOD options menu

3. **Review the AOD image and Archive to CD:**
   a. From the main menu, click on *File*, then *Open Image* (Fig. 11), select *AOD*, and then *Hard Disk*. This will open the AOD Image on hard disk that you just built.
   b. To check that MMC will view the map data from the AOD image, click on *Preferences*, then *View CAC drop-down list* (Fig. 18), and verify that *View AOD* is selected. MMC should set the correct view type to the current map image by default.
   c. View the CAC data in the AOD image:
      i. Move the mouse to the location of the map coverage and click the right mouse button.
      ii. In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

   **NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).***

      iii. When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.
   d. Archive the AOD Image to CD-R:
      i. On the main menu, click on *Tools*, *CDROM Options*, and *Archive Data to CDROM* (Fig. 8).
      ii. From the **Archive to CDROM** window, click on *File*, then click *PreMaster* (Fig. 9), and then click *AOD*.
      iii. If data already exist on the system, MMC will ask if you wish to delete it. Click *Yes*, and then click *Yes* again to verify that you wish to proceed.
      iv. Enter a descriptive title for the processed map data (e.g., First Processed 1 to 500k).
      v. When premastering is complete, click *OK* and insert a blank CD-R label-up in the CD writer.
      vi. From the **Archive to CDROM** window, click on *File*, and then *Cut* (Fig. 9).
      vii. Write down the MMC-assigned name of the archived data (e.g., SC-2000-A-MAP5-X00001) and then click *Yes.*
      viii. Wait until the CD writer has finished writing to the CD-R (i.e., no red or blinking green lights are on), and then remove the CD-R from the CD writer.

NOTE: Even if MMC displays a message saying the write is finished, <u>wait</u> until the CD writer's Read (green) and Write (red) lights stop blinking! The green Disc and 8x lights will stay on.

    ix.   Label the CD-R as **LESSON4_AODI**, and insert it into the CD-ROM drive.

    x.   From the **Archive to CDROM** window, click on *File*, and then *Close (*Fig. 9).

e.   Review the archived AOD image from CD:

    i.   Select *File*, *Open Image*, select *AOD*, and then select *CDROM*.

    ii.   Load the **LESSON4_AODI** CD. From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*, then *Start Processing* (Fig. 5).

    iii.   Verify under *Preferences* that *View AOD from CDROM* is selected.

    iv.   View the CAC data in the AOD image:

        a)   Move the mouse to the location of the map coverage and click the right mouse button.

        b)   In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences)*.

        c)   When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

Fig. 18 – View chart data preferences

4. **Review the MPS image and Archive to CD:**

a.   From the main menu, click on *File*, then *Open Image* (Fig. 11), select *MPS*, and then *Hard Disk*. This will open the MPS Image on hard disk that you just built.

b.   To check that MMC will view the map data from the MPS image, click on *Preferences*, then *View CAC drop-down list* (Fig. 18), and verify that *View MPS Hard Disk* is selected. MMC should set the correct view type to the current map image by default.

c.   View the CAC data in the MPS image:

    i.   Move the mouse to the location of the map coverage and click the right mouse button.

    ii.   In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).*

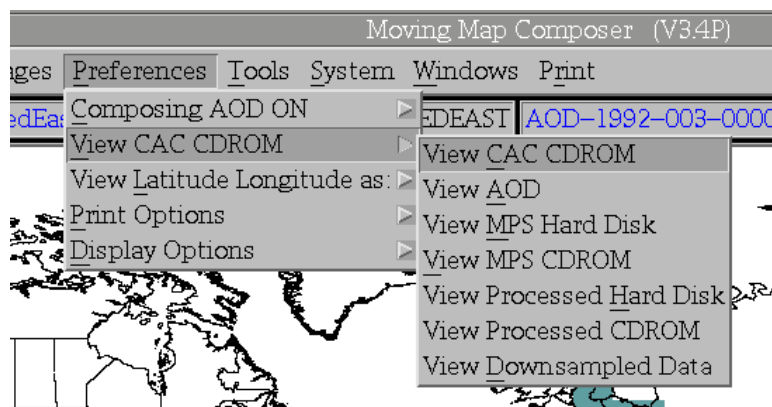   iii.   When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

d.   Archive the MPS Image to CD-R:

    i.   On the main menu, click on *Tools*, *CDROM Options*, and *Archive Data to CDROM* (Fig. 8).

    ii.   From the **Archive to CDROM** window, click on *File*, then click *PreMaster* (Fig. 9), and then click *MPS*.

    iii.   If data already exist on the system, MMC will ask if you wish to delete them. Click *Yes*, and then click *Yes* again to verify that you wish to proceed.

    iv.   Enter a descriptive title for the processed map data.

    v.   When premastering is complete, click *OK* and insert a blank CD-R label-up in the CD writer.

    vi.   From the **Archive to CDROM** window, click on *File*, and then *Cut (*Fig. 9).

    vii.   Write down the MMC-assigned name of the archived data (e.g., MPS-2000-A-MAP5-X00002) and then click *Yes*.

    viii.   Wait until the CD writer has finished writing to the CD-R (i.e., no red or blinking green lights are on), and then remove the CD-R from the CD writer.

NOTE: Even if MMC displays a message saying the write is finished, <u>wait</u> until the CD writer's Read (green) and Write (red) lights stop blinking! The green Disc and 8x lights will stay on.

    ix.   Label the CD-R as **LESSON4_MPS**, and insert it into the CD-ROM drive.

    x.   From the **Archive to CDROM** window, click on *File*, and then *Close*.

e.   Review the archived MPS image from CD:

    i.   Select *File*, *Open Image*, select *MPS*, and then select *CDROM*.

    ii.   Load the **LESSON4_MPS** CD. From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*, then *Start Processing*.

    iii.   Verify under *Preferences* that *View MPS CDROM* is selected.

    iv.   View the CAC data in the MPS image:

        a)   Move the mouse to the location of the map coverage and click the right mouse button.

        b)   In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).*

        c)   When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

f.   After verifying **LESSON4_MPS** on MMC, install the **LESSON4_MPS** CD on a MPS system and review the map data. **Verify that the correct color palettes for all map scales relevant to this map data are installed on the MPS system.**

NOTE: An AOD image *contains* internal color palettes that are copied from the MMC system palette directory during the AOD build. A future change to a color palette will *not*

affect the color fidelity of a given AOD image. However, a MPS image *does not contain* internal color palettes and relies on the installed system palettes (e.g., MMC, MPS system). Therefore, a color palette change will severely degrade the color fidelity of previously built MPS images, as will be demonstrated in Lesson 9, step 8.

5. **Lesson Complete:**
- ✓ The final composition **LESSON4** was opened and used to build MPS and AOD images.
- ✓ The **LESSON4_AODI** and **LESSON4_MPS** images were reviewed and verified on the hard disk.
- ✓ The **LESSON4_AODI** and **LESSON4_MPS** images were archived to CDs, then reviewed from the archived CDs.
- ✓ The MPS CD (**LESSON4_MPS)** was verified on a MPS system without error.

LESSON 6: WRITE AN AODI TO AN AOD AND REVIEW THE IMAGE

This section describes the procedures that are used to write an AODI to an AOD and then view the newly written image from the AOD.

1. **Mount an AOD in the DMU:**
   a. Turn off the DMU via the power switch located in front.
   b. Use side A of a good "scratch" AOD. Write down the serial number of the AOD (located on side A). Make sure the write-protect tab is off (both arrows are pointing up) and visually inspect the AOD glass to make sure it is free from dust or debris being careful *not to touch the glass*. Use a lens cloth to clean, if required.
   c. Install side A of the scratch AOD in the DMU (side A label will be visible when installed).
   d. Close and secure the DMU door.
   e. Turn on the DMU.
   f. Wait 30 seconds after turning on the DMU for initialization to complete before continuing.

2. **Open the AODI:**
   a. On the main menu, click on *File*, then *Open Image* (Fig. 11), *AOD*, and then *CDROM*.
   b. Load the **LESSON4_AODI** CD. From the **CD-ROM Site Window**, select CD-ROM drive 7, select *Scan Readers*, and *Start Processing*.

3. **Write to the AOD:**
   a. On the main menu, click on *Tools*, then *AOD Options*, and then *Copy AOD Image to WORM* (Fig. 17).
   b. Click *Yes* in the confirmation window to proceed.
   c. Enter the serial number of the AOD and the AOD side installed, then click *OK*.
   d. A processing meter appears that updates the percent of the AOD write that is complete. When the processing meter is completely yellow, the AOD write has finished and a dialog box will appear stating that the write is complete and noting any recoverable errors encountered during the process. Click *OK*.

   NOTE: Recoverable write errors are not uncommon and can be caused by dust, debris, or fingerprints on the AOD glass. If 25 *consecutive* write errors are encountered, the write process will fail, in which case, the AOD may be recycled (see Lesson 8, step 3). If several hundred recoverable write errors are encountered, this may indicate that the AOD media is bad (e.g., glass bubbles) or very dirty, or that the DMU may be failing.

4. **Review the AOD from the DMU:**
   a. From the main menu, click on *File*, then *Open Image*, select *AOD*, and then select *DMU*.
   b. View the FiAF CAC from the AOD:
      i. Move the mouse to the location of the map coverage and click the right mouse button.
      ii. In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).*

      iii.   When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

  c. When finished reviewing the map data, click on *File* from the main menu, then *New*.

  d. Leave the scratch AOD installed and the DMU power turned on.

5. **Lesson Complete:**

   ✓ The **LESSON4_AODI** AOD image was written to a scratch AOD without any fatal errors.

   ✓ The map data on the AOD was reviewed and verified on MMC.

LESSON 7: INSTALL A NEW COLOR PALETTE AND REBUILD A COMPOSITION

   In this section, you will install a new color palette on MMC when processing more source geotiff map data. *There is no stand-alone program on MMC to install a color palette without processing additional map data*. A separate program named **MAKEPAL.EXE** that is provided by NRL must be used to convert a Finland color palette text file into a binary color palette file (see Appendix A for Finland color palette file formats). The binary color palette file and its associated geotiff map files are then transferred to a CD-ROM. This CD-ROM is the source for MMC to begin processing. For the installation and training manual, a CD containing Finland 1:2M geotiff data including a new color palette has been created to demonstrate this procedure.

NOTE: Color palettes *should remain static* since changing a color palette will require reprocessing of all previous map data at a given scale and render all archived AODI and MPS media obsolete. This function should be used sparingly.

   1. **Process Map Data**:
      a. Install the CD-ROM labeled: *Finland 1:2M Geotiff Source #2*.
      b. From the MMC main menu, click on *Tools*, then *Data Processing*.
      c. Under *Process Scale*, select *JNC(1:2M)*.
      d. From the **CD-ROM Site Window**, select CD-ROM drive *7*, click on *Scan Readers* (Fig. 5).
      e. Once the Volume ID of the CD-ROM is shown (FiAF_GTIF), click *Start Processing*.

         NOTE: A dialog box will appear that states: "A SCAC (Scanned Compressed Aeronautical Chart) exists for this scale, but the processed data have NOT been deleted. The SCAC must be logged in and reviewed and the processed data must be DELETED off the hard drive for this scale before processing can continue". You may click *Delete Processed Data Now,* or delete the processed map data from the main menu under the *System* option. The term SCAC is actually a misnomer from a previous version of MMC when processed map data were derived solely from scanned paper charts.

      f. This CD-ROM contains a new color palette file, so a warning dialog box (Fig. 19) will appear stating that the color palette installed on the CD-ROM does not match the MMC system palette. Click on *Yes Build New Palette*.
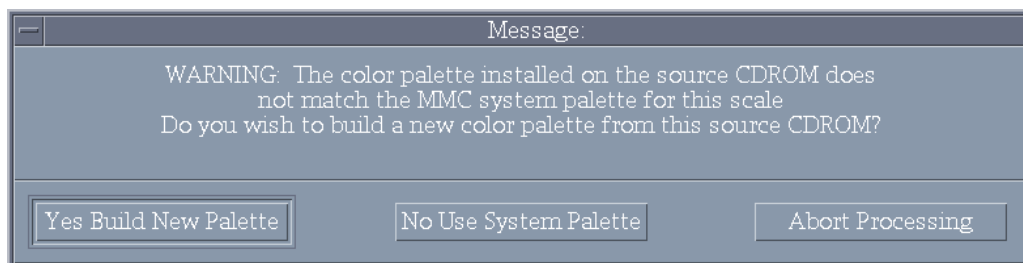

Fig. 19 – New color palette dialog

      g. MMC displays a **Summary Information** window (Fig. 20) listing cautions and recommendations to consider before creating a new color palette. Use the scroll bar to read *all* recommendations. **Please read this information carefully!** Click on *I AGREE* to proceed.
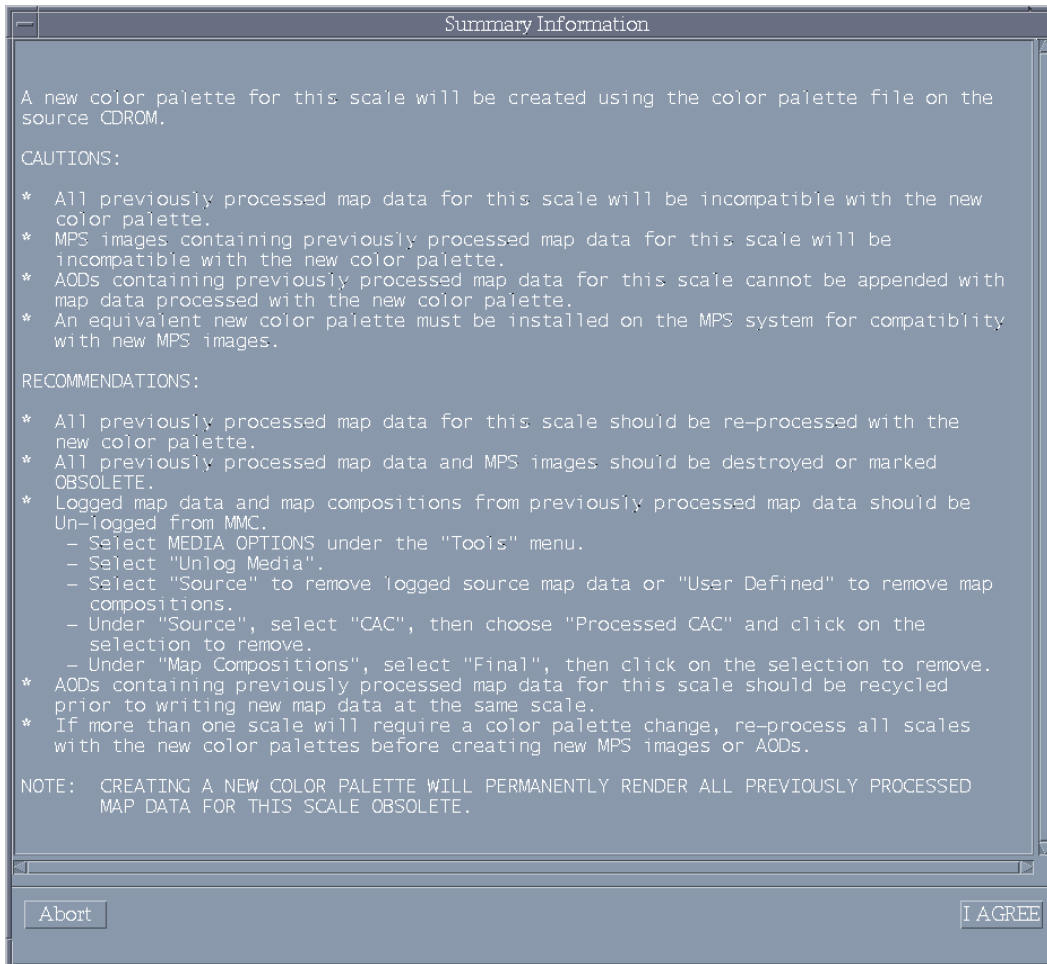
Fig. 20 – Color palette summary information window

h. If logged map data sources exist for this map scale, a message will appear that states you must unlog these sources prior to continuing. To automatically unlog these sources, click *Yes UNLOG sources*.

i. Process the geotiff map files:

 i. The **GeoTIF Processing Window** (Fig. 6) displays information about disk usage, processing options, and advanced options.

 ii. Review the **GeoTIF Processing Window** information, making sure that the *Finalize Automatically* option is "checked," then click *Accept*.

NOTE: When *Finalize Automatically* is checked, MMC will not allow more data at the same map scale to be processed until these data have been archived and/or deleted from the system. If more than one CD-ROM of map data at a given scale requires processing, do not select *Finalize Automatically* until the final CD-ROM is inserted.

 iii. A bitmap of the map segments to be processed from this geotiff data is displayed (Fig. 7). Verify the approximate geographic extents of the map coverage shown and if correct, click *Yes*.

 iv. A processing meter appears near the bitmap coverage of the data to be processed. The bitmap displays map segments that have not been processed and compressed. The

bitmap becomes smaller as more map segments are processed. Once processing is complete, click *Acknowledge*, and then click *Okay*.

NOTE: Installing a new color palette renders all previously processed map data for the same scale obsolete and also renders all previous AOD Images and MPS Images obsolete. Any color palette changes made on MMC must also be made on the MPS system. A color palette with changes to only the last 16 entries (241 to 256) does NOT require re-processing since only the first 240 color entries are used in map processing.

j. Review the Processed map data (FiAF CAC) on hard drive:

    i. From the main menu, click on *Coverages*, then *Include Processed Coverage*.

    ii. Select *PROCESSED-HD-MAP5* in the dialog box, and then click *OK*.

    iii. On the toolbar (located at the bottom of MMC window), change the map projection of the display from *Mercator* to *North Polar* and use the ⬉▭ button to zoom into the location of the map coverage.

    iv. Move the mouse to the location of the map coverage and click the right mouse button.

    v. In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

     NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).*

    vi. When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

2. **Archive and Log Processed Map Data**:

a. Archive the FiAF CAC:

    i. On the main menu, click on *Tools*, *CDROM Options*, and *Archive Data to CDROM* (Fig. 8).

    ii. From the **Archive to CDROM** window, click on *File*, then click *PreMaster* (Fig. 9), and then click *Processed CAC Data*. Select the map scale *JNC(1:2M)*.

    iii. If data already exist on the system, MMC will ask if you wish to delete them. Click *Yes*, and then click *Yes* again to verify that you wish to proceed.

    iv. Enter a descriptive title for the processed map data (e.g., First Processed 1 to 2M).

    v. When premastering is complete, click *OK* and insert a blank CD-R label-up in the CD writer.

    vi. From the **Archive to CDROM** window, click on *File*, and then *Cut (*Fig. 9).

    vii. Write down the MMC-assigned name of the archived data (e.g., SC-2000-A-MAP5-X00001) and then click *Yes*.

    viii. Wait until the CD writer has finished writing to the CD-R (i.e., no red or blinking green lights are on), and then remove the CD-R from the CD writer.

     NOTE: Even if MMC displays a message saying the write is finished, <u>wait</u> until the CD writer's Read (green) and Write (red) lights stop blinking! The green Disc and 8x lights will stay on.

      ix.   Label the CD-R with the descriptive and MMC-assigned name, and insert it into the CD-ROM drive.

      x.   From the **Archive to CDROM** window, click on *File*, and then *Close (*Fig. 9).

  b. Log the FiAF CAC:

      i.   From the main menu, click on *Tools*, then *Media Options*, then *Log Media* (Fig. 10).

      ii.   From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*, then *Start Processing* (Fig. 5).

      iii.   When logging is complete, remove CD-R from CD-ROM drive.

  c. Mark all archived media containing the original 1:2M FiAF CAC data as <u>***obsolete***</u> (e.g., **LESSON4_AODI**, **LESSON4_MPS**, SC-2000-A-MAP5-X00001).

3. **Design a MMC Composition**:

  a. To demonstrate MMC error checking, from the main menu, click on *File*, then *Open Final Composition* (Fig. 11), and then select the AOD composition **LESSON4**. If the re-processed map data do not contain at least the same map coverage as the old map data, MMC will display a warning message that not all sources for the composition are available. MMC will not allow the AOD composition **LESSON4** to be opened, click *Acknowledge*.

  b. However, the composition may be <u>included</u> as part of another composition. This will allow the user to access the composition **LESSON4**, insert additional coverage, and then save a new final composition. From the main menu, click on *Coverages*, then *Include Final Composition* (Fig. 21), and then select the AOD composition **LESSON4**. Warning messages that are similar to those in Lesson 7, step 3, will be displayed, click *Acknowledge*. The **LESSON4** composition should now be loaded in MMC.

  c. For the purpose of the training, no coverage should be displayed at the 1:2M scale, since this map coverage was unlogged. Coverage should exist at the 1:500k scale. Verify that the 1:500k coverage remains for the included **LESSON4** composition. On the toolbar, change the map scale to *TPC(1:500k)* and change the map projection of the display from *Mercator* to *North Polar*.

  d. Add the new 1:2M processed map data to the current composition:

      i.   On the toolbar, change the map scale to *JNC(1:2M)* and change the map projection of the display from *Mercator* to *North Polar*.

      ii.   From the main menu, click on *Overlays*, then *Available Coverage* (Fig. 13).

      iii.   If needed, use the ⬜ button on the toolbar to zoom.

      iv.   MMC will display the coverage of the logged CD at the selected scale.

      v.   From the lower-left corner of the toolbar, select the ⬚ button to define an area of coverage. Define a small area, less than the available coverage.

      vi.   MMC will display your defined areas in colored boxes (the color reflects the TS zone of the data).

      vii.   To check the size of the composition, from the main menu click on *Windows*, and then *Composition Data Size* to see a meter showing how much space has been used.

  e. Save this final composition when you are satisfied with your defined coverage(s). From the main menu, click on *File*, then *SaveAs Final Composition* (Fig. 11). When prompted for a filename, type **LESSON7** and click *OK*, then enter a descriptive title and click *OK*.
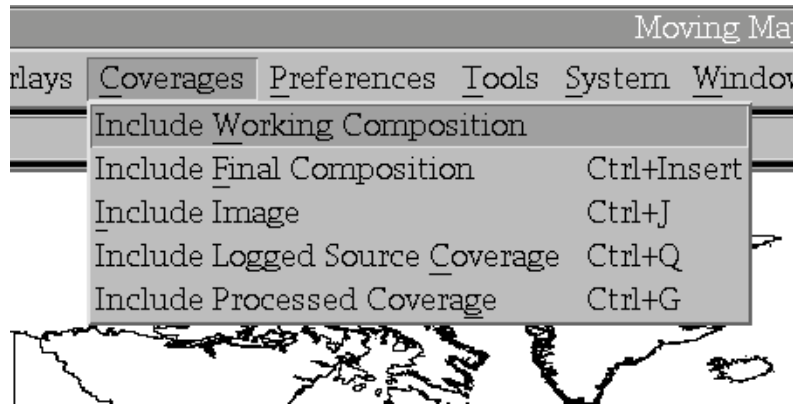
Fig. 21 – Coverages menu

4. **Lesson Complete**:
    ✓ A new palette for the 1:2M scale was created and installed as the new MMC system palette for this scale.
    ✓ The new geotiff map data were processed, reviewed, archived, and logged.
    ✓ A new MMC final composition named **LESSON7** was constructed by including the **LESSON4** composition and adding the newly processed 1:2M map data.

LESSON 8: BUILD A NEW AODI / MPS-CDI AND RECYCLE AN AOD

    This section describes the procedures that are used to build a new AODI and MPS-CDI, recycle an AOD, and then write the images on the AOD. Step 2 demonstrates error checking for proper color palette usage. Recycling allows remaining space on a previously used AOD to be used for new AOD images.

1. **Build a new AODI and MPS-CDI:**

    a. Open the Final Composition:

        i. From the main menu, click on *File*, then *Open Final Composition* to view the list of available final compositions (Fig. 16). This must be done even if the composition is still active in MMC (see note below).

        ii. Scroll through the list of available compositions and select the <u>***AOD***</u> composition **LESSON7** (*not* the <u>***MPS***</u> composition) you just created. Note that MMC has saved both an AOD and MPS version of the **LESSON7** composition. All MMC compositions created in AOD mode are also valid MPS compositions, but not all compositions created in MPS mode are valid AOD compositions (see note at Lesson 9, step 5). MMC will display your templates on the world map. You may change the map view on the tool bar as discussed in Lesson 4.

NOTE: An <u>active</u> composition that has been saved as a final composition may still be modified as long as these modifications are saved *using a different composition name*. However, these modifications may result in a new composition that is invalid. Therefore, as a security measure, MMC only allows a final composition be opened – any modifications to be saved require the creation a new final composition (and leave the original intact).

    b. Build the AODI and MPS image (MMC automatically builds both in AOD Mode):

        i. From the main menu, click on *Tools*, then *AOD Options*, and then *Build AOD Image* (Fig. 17). A dialog box will appear asking you to verify that you want to build the AOD image; click *Yes*.

        ii. MMC will pop up a **Data Sources** window showing which sources (e.g., FiAF CAC CDs) are needed.

        iii. MMC will also pop-up the **CD-ROM Site Window** (Fig. 5). Load and process the necessary CDs one at a time. From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*, then *Start Processing*.

        iv. Once all the CDs have been read and processed, the **Data Sources** window will disappear, and MMC will build the MPS and AOD images.

        v. <u>***Wait***</u> until MMC states that the image build is complete before continuing with the next step. Click *Acknowledge* when the build is complete.

    c. Review the AOD image:

        i. From the main menu, click on *File*, then *Open Image* (Fig. 11), select *AOD*, and then *Hard Disk*. This will open the AOD Image on hard disk that you just built.

        ii. To check that MMC will view the map data from the AOD image, click on *Preferences*, then *View CAC drop-down list* (Fig. 18), and verify that *View AOD* is selected. MMC should set the correct view type to the current map image by default.

        iii. View the CAC data in the AOD image:

            a) Move the mouse to the location of the map coverage and click the right mouse button.

b) In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).*

c) When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

d. Archive the AOD Image to CD-R:

i. On the main menu, click *Tools*, *CDROM Options*, and *Archive Data to CDROM*.

ii. From the **Archive to CDROM** window, click on *File*, then *PreMaster*, then click *AOD*.

iii. If data already exist on the system, MMC will ask if you wish to delete them. Click *Yes*, and then click *Yes* again to verify that you wish to proceed.

iv. Enter a descriptive title for the processed map data.

v. When premastering is complete, click *OK* and insert a blank CD-R label-up in the CD writer.

vi. From the **Archive to CDROM** window, click on *File*, and then *Cut* (Fig. 9).

vii. Write down the MMC-assigned name of the archived data and then click *Yes*.

viii. Wait until the CD writer has finished writing to the CD-R (i.e., no red or blinking green lights are on), and then remove the CD-R from the CD writer.

NOTE: Even if MMC displays a message saying the write is finished, <u>wait</u> until the CD writer's Read (green) and Write (red) lights stop blinking! The green Disc and 8x lights will stay on.

ix. Label the CD-R as **LESSON7_AODI**, and insert it into the CD-ROM drive.

x. From the **Archive to CDROM** window, click on *File*, and then *Close (*Fig. 9).

e. Review the archived AOD image from CD:

i. Select *File*, *Open Image*, select *AOD*, and then select *CDROM*.

ii. Load the **LESSON7_AODI** CD. From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*, then *Start Processing* (Fig. 5).

iii. Verify under *Preferences* that *View AOD from CDROM* is selected.

iv. View the CAC data in the AOD image:

a) Move the mouse to the location of the map coverage and click the right mouse button.

b) In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).*

c) When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

f. Review the MPS image and Archive to CD:

i. From the main menu, click on *File*, then *Open Image* (Fig. 11), select *MPS*, and then *Hard Disk*. This will open the MPS Image on hard disk that you just built.

ii. To check that MMC will view the map data from the MPS image, click on *Preferences*, then *View CAC drop-down list* (Fig. 18), and verify that *View MPS Hard Disk* is selected. MMC should set the correct view type to the current map image by default.

iii. View the CAC data in the MPS image:

   a) Move the mouse to the location of the map coverage and click the right mouse button.

   b) In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

   NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).*

   c) When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

g. Archive the MPS Image to CD-R:

   i. On the main menu, click on *Tools*, *CDROM Options*, and *Archive Data to CDROM* (Fig. 8).

   ii. From the **Archive to CDROM** window, click on *File*, then click *PreMaster* (Fig. 9), and then click *MPS*.

   iii. If data already exist on the system, MMC will ask if you wish to delete them. Click *Yes*, and then click *Yes* again to verify that you wish to proceed.

   iv. Enter a descriptive title for the processed map data.

   v. When premastering is complete, click *OK* and insert a blank CD-R label-up in the CD writer.

   vi. From the **Archive to CDROM** window, click on *File*, and then *Cut (*Fig. 9).

   vii. Write down the MMC-assigned name of the archived data (e.g., MPS-2000-A-MAP5-X00001) and then click *Yes*;

   viii. Wait until the CD writer has finished writing to the CD-R (i.e., no red or blinking green lights are on), and then remove the CD-R from the CD writer.

   NOTE: Even if MMC displays a message saying the write is finished, __wait__ until the CD writer's Read (green) and Write (red) lights stop blinking! The green Disc and 8x lights will stay on.

   ix. Label the CD-R as **LESSON7_MPS**, and insert it into the CD-ROM drive.

   x. From the **Archive to CDROM** window, click on *File*, and then *Close*.

h. Review the archived MPS image from CD:

   i. Select *File*, *Open Image*, select *MPS*, and then select *CDROM*.

   ii. Load the **LESSON7_MPS** CD. From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*, then *Start Processing*.

   iii. Verify under *Preferences* that *View MPS CDROM* is selected.

   iv. View the CAC data in the MPS image:

      a) Move the mouse to the location of the map coverage and click the right mouse button.

      b) In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned

inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

> **NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).***

c) When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

i. After verifying **LESSON7_MPS** on MMC, install the **LESSON7_MPS** CD on a MPS system and review the map data. **Verify that the correct color palettes for all map scales relevant to this map data are installed on the MPS system.**

> **NOTE: An AOD image *contains* internal color palettes that are copied from the MMC system palette directory during the AOD build. A future change to a color palette will *not* affect the color fidelity of a given AOD image. However, a MPS image *does not contain* internal color palettes and relies on the installed system palettes (e.g., MMC, MPS system). Therefore, a color palette change will severely degrade the color fidelity of previously built MPS images, as will be demonstrated in Lesson 9, step 8.**

2. **Attempt to append the AODI from the LESSON7_AODI CD to the scratch AOD:**

   a. With the scratch AOD still installed and the DMU power on, on the main menu click on *File*, then *Open Image* (Fig. 11), *AOD*, and then *CDROM*. Load the **LESSON7_AODI** CD. From the **CD-ROM Site Window**, select CD-ROM drive 7, select *Scan Readers*, and *Start Processing.*

   b. Write to the AOD:

      i. On the main menu, click on *Tools*, then *AOD Options*, and then *Copy AOD Image to WORM* (Fig. 17).

      ii. Click *Yes* in the confirmation window to proceed.

      iii. Enter the serial number of the AOD and the AOD side installed, then click *OK*.

   c. This will **fail**, and MMC will display an error stating that a color palette conflict exists between the current image (**LESSON7_AODI**) and the map data on the AOD. This error check prohibits writing two (or more) different color palettes at a given map scale (and zone).

> **NOTE: The Cockpit Digital Map System uses a single color palette per map scale and zone. Without this error check, the color fidelity of an AOD using two color palettes for the same map scale / zone would become corrupt, since the digital map system can only reference one palette. MMC does not allow a partial append (e.g., appending the 1:500k portion of LESSON7_AODI to the scratch AOD, where the palettes do not conflict).**

3. **Recycle AOD:**

> **NOTE: Since an AOD is a write-only medium, it can only be appended with additional information and not overwritten. However, MMC provides a recycle function that essentially "erases" the current map data by writing a new superdirectory with null pointers. This allows the AOD to be written again as if it were blank, but with less available disk space.**

   a. From the main menu, click on *Tools*, then *AOD Options*, and then *AOD Recycle* (Fig. 17).

   b. The **AOD Recycle** window (Fig. 22) is displayed. In this window, click on *File*, then *Open* to access the DMU and read the map information from the AOD (may take 30 to 60 seconds).
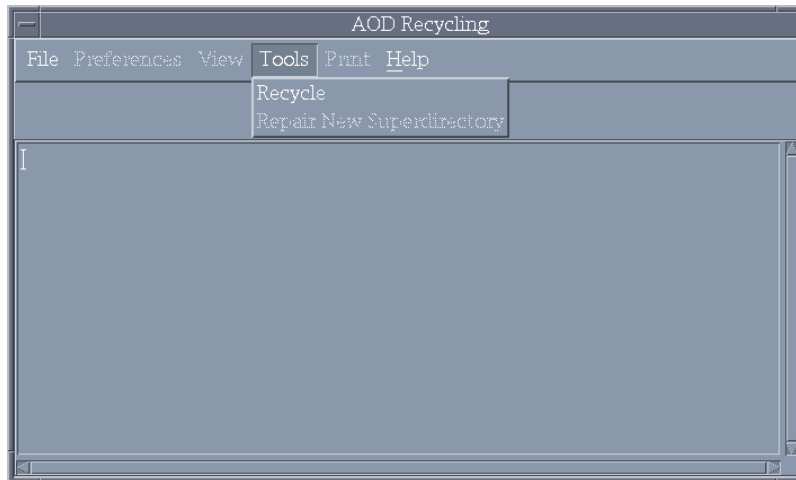
Fig. 22 – AOD Recycle window

    c. Information regarding the AOD is displayed in the **AOD Recycle** window, including the amount of disk space that will remain available and the remaining number of times the AOD can be written.

    d. Review the information, then click on *Tools* in the **AOD Recycle** window, then *Recycle*.

    e. Once the **AOD Recycle** window indicates the AOD has been successfully recycled, click on *File*, and then *Close*.

4. **Write LESSON7_AODI to the recycled (old scratch) AOD:**

    a. With the scratch AOD still installed and the DMU power on, on the main menu click on *File*, then *Open Image* (Fig. 11), *AOD*, and then *CDROM*. Load the **LESSON7_AODI** CD. From the **CD-ROM Site Window**, select CD-ROM drive 7, select *Scan Readers*, and *Start Processing*.

    b. Write to the AOD:

        i. On the main menu, click on *Tools*, then *AOD Options*, and then *Copy AOD Image to WORM* (Fig. 17).

       ii. Click *Yes* in the confirmation window to proceed.

      iii. Enter the serial number of the AOD and the AOD side installed, then click *OK*.

    c. MMC shows a message stating that the AOD has been recycled; click *OK* to continue.

    d. A processing meter appears that updates the percent of the AOD write that is complete. When the processing meter is completely yellow, the AOD write has finished and a dialog box will appear stating that the write is complete and noting any recoverable errors encountered during the process. Click *OK*.

       NOTE: Recoverable write errors are not uncommon and can be caused by dust, debris, or fingerprints on the AOD glass. If 25 *consecutive* write errors are encountered, the write process will fail, in which case, the AOD may be recycled (see Lesson 8, step 3). If several hundred recoverable write errors are encountered, this may indicate that the AOD media is bad (e.g., glass bubbles) or very dirty, or that the DMU may be failing.

5. **Review the AOD from the DMU:**

    a. From the main menu, click on *File*, then *Open Image*, select *AOD*, and then select *DMU*.

    b. View the FiAF CAC from the AOD:

        i.   Move the mouse to the location of the map coverage and click the right mouse button.

        ii.   In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

        NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).*

        iii.   When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

6. Click on *File* from the main menu, then *New*. Leave the scratch AOD installed and the DMU power turned on.

7. **Lesson Complete:**

    ✓ Error check prohibited an AOD append with a conflicting color palette from **LESSON7_AODI**.

    ✓ The scratch AOD was recycled and the **LESSON7_AODI** image was successfully written and reviewed.

LESSON 9: BUILD AN MPS-CDI WITH FiAF DTED AND PROCESSED MAP DATA

This section describes the procedures that are used to build an MPS-CDI. Prior to building any MPS composition, the user must first log all the necessary NIMA data sources. As a standard practice, NRL recommends that the user login every available data source as it is received from NIMA. In this section, we create an MPS with DTED data. Available DTED coverage is contained in a very large data set (i.e., selection of a large area of coverage could take 1 to 2 full days to build). The training manual demonstrates this function by defining a much smaller area of DTED coverage.

1. **Log in a FiAF DTED CD:**
    a. Insert the FiAF DTED CD **FiAF DTED #1** in the CD reader.
    b. From the main menu, click on *Tools*, then *Media Options*, and then *Log Media* (Fig. 10).
    c. MMC will pop up the **CD-ROM Site Window** (Fig. 5). Select CD reader 7, click on *Scan Readers*, then *Start Processing*. MMC will prompt for a descriptive title for the CD.

2. **Display the existing DTED coverage overlay:**
    a. From the main menu, click on *File*, then *New* (Fig. 11).
    b. Change the Build Type Mode by clicking on *Preferences*, then *Composing AOD ON*, then *Compose MPS* (Fig. 12).
    c. On the toolbar, change the scale to *DTED_1*.
    d. Zoom into your area of interest using the ⬉▭ button.
    e. From the main menu, click on *Overlays*, then *Available Coverage* (Fig. 13).
    f. MMC will display the coverage of the DTED CD you logged.
        NOTE: All DTED coverage is displayed only in Mercator projection (not Polar).

3. **Design an MPS composition using DTED and processed map data:**
    a. From the lower left-hand corner of the toolbar, select the ⬚ button to define an area of DTED coverage.
    b. MMC displays defined DTED area(s) in colored boxes (where the color reflects the TS zone of the data). Verify the size of the MPS before proceeding (use the *Windows* menu *Composition Data Size* option). If the MPS is too large, use one of the delete data tools to remove some of the DTED from the composition.
    c. From the main menu, click on *Coverages*, then *Include Final Composition* (Fig. 19).
    d. Select the ***MPS*** composition **LESSON7**.

4. **Save your work** when finished. From the main menu, click on *File*, then *SaveAs Final Composition* (Fig. 11). When prompted for a filename, type **LESSON9** and click *OK*, then enter a descriptive title and click *OK*.

5. **Now reopen this composition.** (As a security measure, MMC requires you to open a final composition and *not modify it* prior to building the MPS-CDI).
    a. From the main menu, click on *File*, then *Open Final Composition* (Fig. 11).
    b. Scroll through the list of available compositions and select the *MPS* composition **LESSON9** that you just created. MMC will display your composition on the world map.
        NOTE: An AOD composition also exists for LESSON9, even though LESSON9 includes DTED data. This is the case because the CAC portion of the composition fits within the

constraints of an AOD build. However, since DTED cannot reside on an AOD image, the DTED portion of the AOD composition LESSON9 is not built. An AOD composition is more restrictive than a MPS composition in maximum size and the amount of map coverage that can be contained within a scale and zone.

6. **Build the MPS image:**
   a. From the main menu, click on *Tools*, then *MPS Options*, then *Build MPS Image* (Fig. 23).
   b. MMC will open up a **Data Sources** window showing which sources (e.g., FiAF CAC CDs) are needed.
   c. MMC will also pop-up the **CD-ROM Site Window** (Fig. 5). Load and process the necessary CDs one at a time. From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*, then *Start Processing*.
   d. Once all the CDs have been read and processed, the **Data Sources** window will disappear and MMC will build the MPS and AOD images.
   e. *Wait* until MMC states that the image build is complete before continuing with the next step. Click *Acknowledge* when the build is complete.
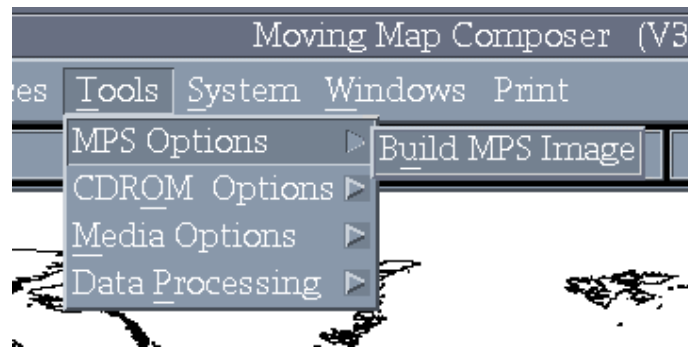

Fig. 23 – MPS Options menu

7. **Review the MPS image and Archive it to CD:**
   a. From the main menu, click on *File*, then *Open Image* (Fig. 11), select *MPS*, and then *Hard Disk*. This will open the MPS Image on hard disk that you just built.
   b. To check that MMC will view the map data from the MPS image, click on *Preferences*, then *View CAC drop-down list* (Fig. 18), and verify that *View MPS Hard Disk* is selected. MMC should set the correct view type to the current map image by default.
   c. View the CAC data in the MPS image:
      i. Move the mouse to the location of the map coverage and click the right mouse button.
      ii. In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

      **NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).*

      iii. When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.
   d. Archive the MPS Image to CD-R:

    i.   On the main menu, click on *Tools*, *CDROM Options*, and *Archive Data to CDROM* (Fig. 8).

    ii.   From the **Archive to CDROM** window, click on *File*, then click *PreMaster* (Fig. 9), and then click *MPS*.

    iii.   If data already exists on the system, MMC will ask if you wish to delete them. Click *Yes*, and then click *Yes* again to verify that you wish to proceed.

    iv.   Enter a descriptive title for the processed map data.

    v.   When premastering is complete, click *OK* and insert a blank CD-R label-up in the CD writer.

    vi.   From the **Archive to CDROM** window, click on *File*, and then *Cut (*Fig. 9).

    vii.   Write down the MMC-assigned name of the archived data (e.g., MPS-2000-A-MAP5-X00001) and then click *Yes*.

    viii.   Wait until the CD writer has finished writing to the CD-R (i.e., no red or blinking green lights are on), and then remove the CD-R from the CD writer.

NOTE: Even if MMC displays a message saying the write is finished, <u>wait</u> until the CD writer's Read (green) and Write (red) lights stop blinking! The green Disc and 8x lights will stay on.

    ix.   Label the CD-R as **LESSON9_MPS**, and insert it into the CD-ROM drive.

    x.   From the **Archive to CDROM** window, click on *File*, and then *Close*.

e. Review the archived MPS image from CD:

    i.   Select *File*, *Open Image*, select *MPS*, and then select *CDROM*.

    ii.   Load the **LESSON9_MPS** CD. From the **CD-ROM Site Window**, select CD-ROM drive 7, click on *Scan Readers*, then *Start Processing*.

    iii.   Verify under *Preferences* that *View MPS CDROM* is selected.

    iv.   View the CAC data in the MPS image:

        a)   Move the mouse to the location of the map coverage and click the right mouse button.

        b)   In the **Map Coverage** window, view and scroll the FiAF CAC and verify its georeferenced accuracy and color fidelity (note that the mouse must be positioned inside the **Map Coverage** window to display accurate color fidelity in *Virtual Colors* mode).

NOTE: To provide accurate color fidelity of the map data, the MMC display must be set to *Virtual Colors* (see MMC main menu under *Preferences).*

        c)   When finished viewing the map data, click on *File*, then *Close* in the **Map Coverage** window.

f. After verifying **LESSON9_MPS** on MMC, install the **LESSON9_MPS** CD on a MPS system and review the map data. **Verify that the correct color palettes for all map scales relevant to this map data are installed on the MPS system.**

NOTE: MMC does not display DTED data. To ensure accuracy, MPS DTED data must be reviewed and verified on a MPS.

8. **Recheck obsolete MPS image:**

a. To verify that the color palette change took place in Lesson 7, load the ***obsolete*** MPS image **LESSON4_MPS**.

b.   From the main menu, click on *File*, then *Open Image* (Fig. 11), select *MPS*, and then *Hard Disk*. Select **LESSON4_MPS**.

c.   To check that MMC will view the map data from the MPS image, click on *Preferences*, then *View CAC drop-down list* (Fig. 18), and verify that *View MPS Hard Disk* is selected.

d.   Set the map scale to *TPC(1:500k)*. Move the mouse to the location of the map coverage and click the right mouse button. View the CAC data in the MPS image. The color palette for this scale *was not* changed and this map data should look accurate.

e.   Set the map scale to *JNC(1:2M)*. Move the mouse to the location of the map coverage and click the right mouse button. View the CAC data in the MPS image. The color palette for this scale *was* changed and this map data should *not* look accurate.

   NOTE: This check emphasizes the importance of either destroying or clearly marking as <u>OBSOLETE</u> any processed map data product that was created with an obsolete color palette.

9.   **Lesson Complete:**

   ✓   A FiAF DTED CD has been logged on MMC.

   ✓   An MPS composition, **LESSON9**, containing processed map data and DTED was created.

   ✓   An MPS image, **LESSON9_MPS**, was built, archived, and verified (on both MMC and MPS).

   ✓   The obsolete **LESSON4_MPS** image was reviewed with the new color palette to show color degradation.

ACKNOWLEDGMENTS

REFERENCES

1. M.C. Lohrenz, M.L. Gendron, S.A. Myrick, J.M. Mehaffey, M.E. Trenchard, and P.B. Wischow, "AV-8B Map System II: Moving Map Composer (MMC) Version 3.3, Software Users' Manual (Second Edition)," NRL/FR/7440--00-9938, June 2000.

2. M.C. Lohrenz, S.A. Myrick, M.E. Trenchard, M.L. Gendron, and J.L. Watkins, "Finland Air Force F/A-18 Moving-Map Composer (MMC) Version 3.4P FiAF Software Users' Manual," NRL/FR/7440--04-10,030, January 2004.

MAP DATA FORMAT INTERFACE CONTROL DOCUMENT

A1. INTRODUCTION

   This Appendix provides detailed information on the data formats and directory structure of the Finnish source map data that may be processed by MMC version 3.4P. In addition to the Finnish-particular map data that MMC 3.4P supports (as defined below), MMC also is designed to read the following data types and associated directory structure:

- Compressed Aeronautical Chart (CAC): *The Navy Standard Compressed Aeronautical Chart Database,* NOARL Report 8, July 1990 [A1].

- Digital Terrain Elevation Data (DTED): *Performance Specification for Digital Terrain Elevation Data,* MIL-PRF-89020A [A2].

- Mission Planning System (MPS) images: *Interface Control Document for Mission Planning System Optical Disk Image Version 6+C,* NRL/MR/7441--97-8046, June 1997 [A3].

- Aircraft Optical Disk (AOD) images: *Engineering Bulletin for Interface Control Document for the Honeywell Ground Support Station Optical Disk Subsystem, Part number 8507985-1, Used with the Honeywell Digital Video Mapping Set, Part Number 8506200-911, Engineering Bulletin EB8513923,* April 1989 [A4].

   The following sections consist of Finnish-specific data types that are processed and supported in MMC to produce MPS and AOD images as defined in the documents listed above.

NOTE: The Finnish MMC 3.4P system is initially installed with CAC color palettes. When a color palette has been changed to support Finnish processing at a particular scale, CAC data produced by the National Imagery and Mapping Agency (NIMA) for the given scale will be incompatible with MMC.

A2. FIAF GEOTIFF FILE FORMAT AND DIRECTORY STRUCTURE

1. MMC 3.4P supports geotiff files that conform to the geotiff format specification version 1.8.1 (see http://www.remotesensing.org/geotiff/spec/geotiffhome.html for a full definition). MMC has tested sample Finnish geotiff map data and will support both Model Transformation Tag and Model Pixel Scale/Model Tiepoint Tag geocoding. However, due to cost constraints, MMC cannot extensively test all possible geocoding and geokey combinations, but has successfully tested Finnish implementations used to date. MMC *only* supports the *Transverse Mercator* projection when the geotiff model type is *Projected*.

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

3. A FiAF geotiff CD-ROM may contain any number of geotiff files for a *single* map scale and <u>one</u> <u>optional</u> *palette.bin* file. All geotiff files must contain a *TIF* suffix (e.g., *ABCDEFGH.TIF*) and all files must reside in the root directory.

A3. FIAF COLOR PALETTE FORMAT

1. NRL provides the FiAF with a PC-based utility program called **MAKEPAL.EXE** (see Lesson 7). This utility program will convert a Finnish text color palette file into a *palette.bin* file. The *palette.bin* file may be written in addition to the source geotiff files on a **FiAF_GTIF** CD-ROM. The utility program is designed to be executed on a Win NT operating system and will read a Finnish ASCII text color palette of the form:

```
 #   R  G  B
 ---  --- --- ---
 1 => 0  0  0
 2 => 0  99  15
 3 => 0 137 158
            .
            .
            .
```

2. The Finnish ASCII text palette is limited to a maximum of 256 colors with valid R,G,B values ranging from 0 to 255. The program will *only* read the first 240 color palette values because the first 240 colors are reserved for map data (the remaining 16 colors are reserved for mission planning overlays). If less than 240 colors are used for the map data, the remaining map data colors must be filled with zeros (i.e., "0 0 0"). If fewer than 240 colors exist, or an R, G, or B value is out of range, the **MAKEPAL.EXE** program will not execute correctly.

3. The geotiff producer is responsible for creating the *palette.bin* file and writing this file to the **FiAF_GTIF** CD-ROM. The *palette.bin* file is the color palette that will be used by MMC to process the geotiff files on the **FiAF_GTIF** CD-ROM. If the *palette.bin* file is <u>exactly</u> the same as the MMC system palette for the *map scale selected*, MMC will use the system color palette. If *any* difference is detected between the *palette.bin* and the MMC system palette for the map scale selected, then MMC will prompt the user to either install the new palette (which will then become the new system palette for that scale) or ignore the new palette and use the MMC system palette.

4. A *palette.bin* file is optional for a **FiAF_GTIF** CD-ROM. If a *palette.bin* file does not exist on a **FiAF_GTIF** CD-ROM, MMC will use the system color palette for that scale by default.

A4. FIAF DTED FORMAT

1. The FiAF DTED files must conform to the structure defined in MIL-PRF-89020A, Performance Specification Digital Terrain Elevation Data (April 1996) in Section 3.14.

2. MMC 3.4P will support *only* DTED level 1. DTED level post (elevation) spacing is defined in Section 3.9 of the DTED military specification.

3. 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.

4. For MMC to identify and process FiAF DTED, all FiAF DTED CD-ROMs *must* have a volume identification of **FiAF_DTED***xxx* (where *xxx* is a <u>unique</u> number ranging from **500-999**). Otherwise, MMC will *not* process the data. The FiAF DTED producer is responsible for providing the CD-ROM volume identification.

REFERENCES

A1. M. Lohrenz and Ryan. July 1990. *The Navy Standard Compressed Aeronautical Chart Database* (NOARL Report 8).

A2. *Performance Specification for Digital Terrain Elevation Data* (MIL-PRF-89020A) April 1996.

A3. M. Trenchard et al. June 1997. Interface Control Document for Mission Planning System Optical Disk Image Version 6+C (NRL/MR/7441--97-8046).

A4. Ronish. April 1989. Engineering Bulletin for Interface Control Document for the Honeywell Ground Support Station Optical Disk Subsystem, Part Number 8507985-1, Used with the Honeywell Digital Video Mapping Set, Part Number 8506200-911 (Engineering Bulletin EB8513923).