



# Streamlining U.S. Army Military Installation Map (MIM) Production

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Army Garrison Fort A.P. Hill, Virginia, USA



# Report Documentation Page

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# Agenda / Objectives



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- What is a MIM?
- Provide a historical look at MIM development.
- Highlight the Memorandum of Agreement (MOA) between Army G-2, Army SRP, and NGA.
- Detail SRP-created procedures and tools which streamline and automate MIM production.
- Provide SRP MIM completion and current development figures.
- Reiterate the importance of unifying and streamlining MIM Production.
- So, how can Parsons support your geospatial mission?

# Purpose of the MIM



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- Primary use is for military personnel to gain the skill of map reading under diverse and challenging conditions resembling combat environment.
- Military personnel are required to learn all components of the MIM in order to make sound tactical decisions.
- Directly improves the ability to properly train Soldiers.
- Utilization of the MIM during training maintains high relevance for the Armed Forces' combat engagement capabilities.
- However, MIM valued by all installation directorates for planning and decision making purposes.

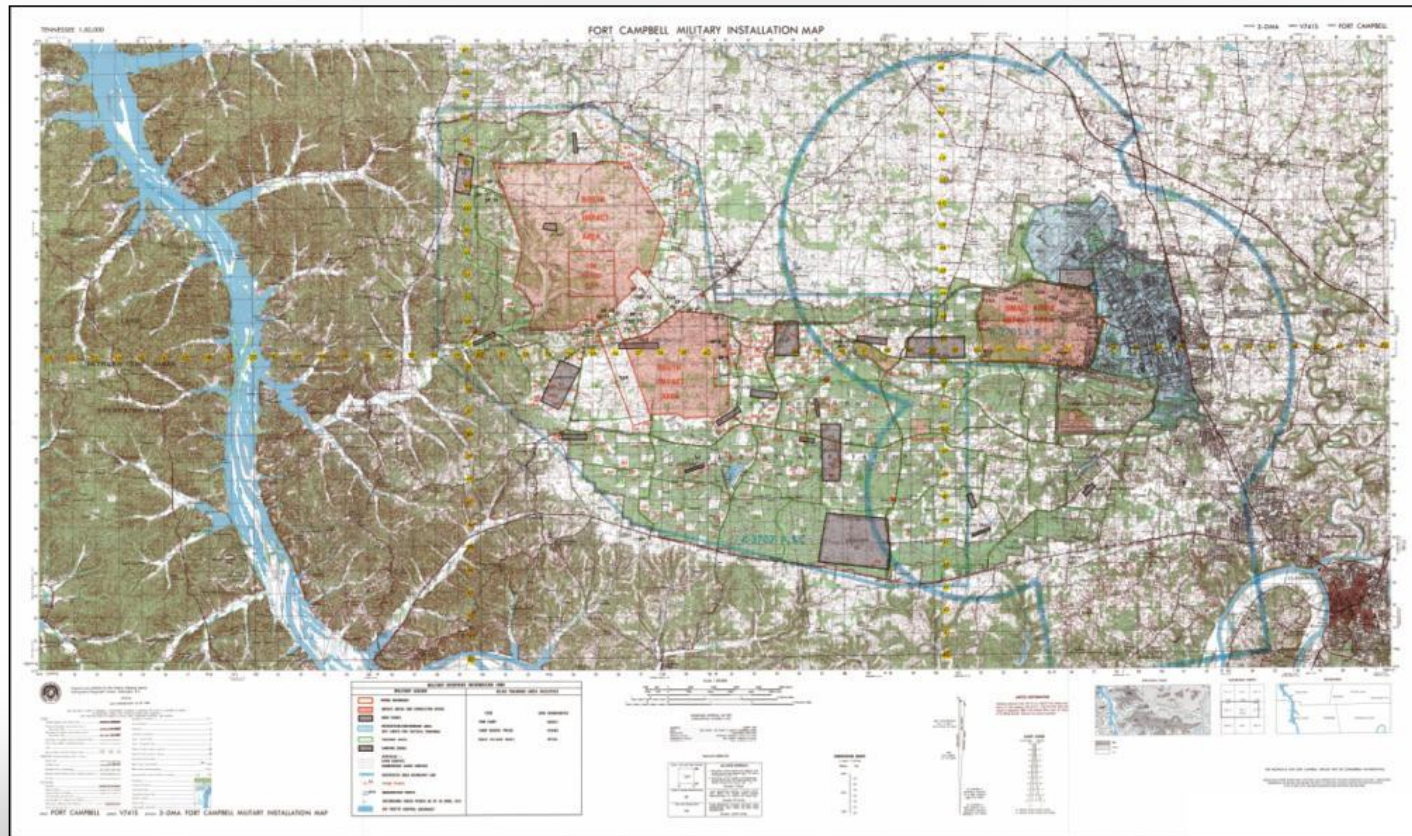


# History of the MIM



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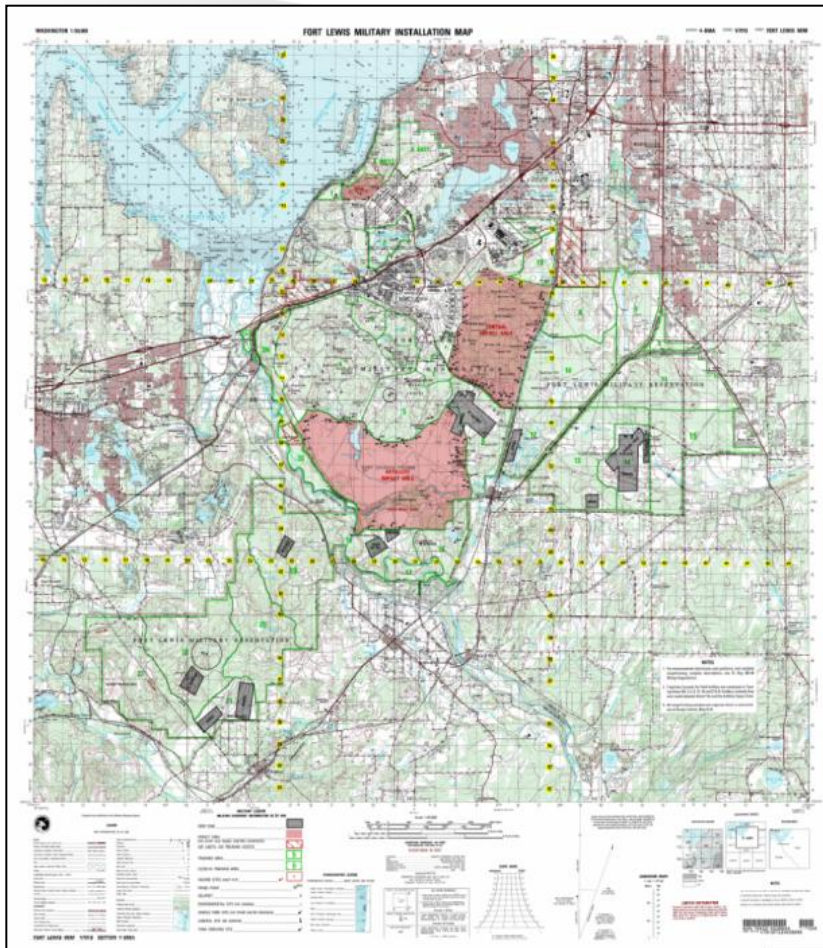
- MIMs were first developed in the 1950s by the Army Map Service, currently known as the National Geospatial-Intelligence Agency (NGA).



# NGA MIM Production



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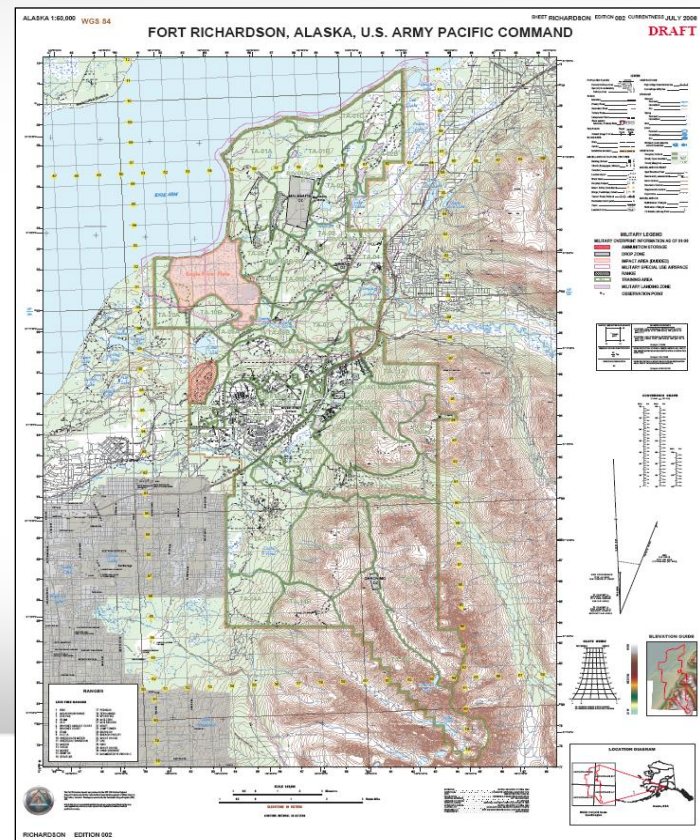
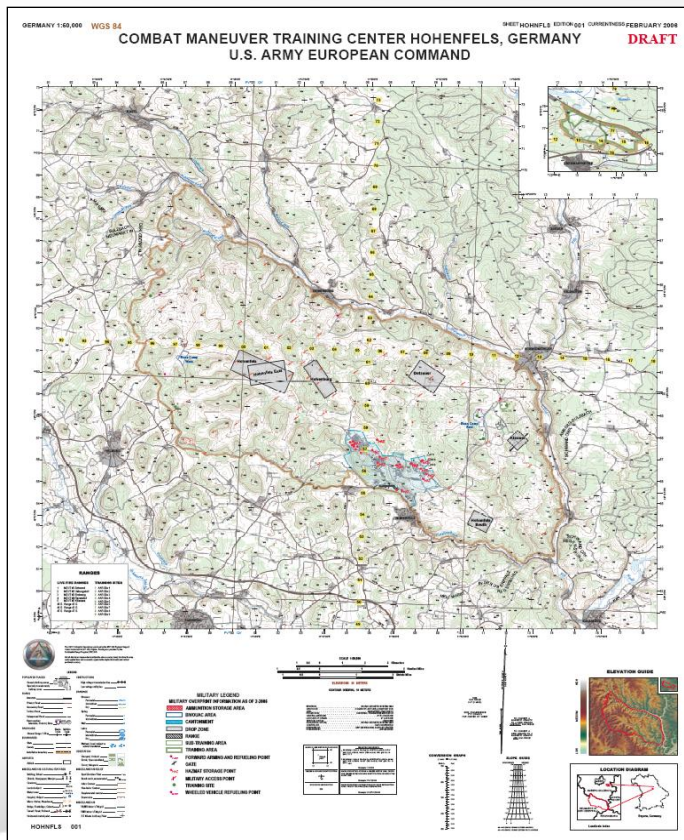
- Historically, NGA created MIMs for the larger Army / Marine Corps installations, at a rate of 1 per year, and with updates on a 10-15 year rotation.
- Most recent NGA-produced Army MIM – Fort Lewis (2007).
- Many smaller installations have never had a MIM produced by NGA and stocked for ordering.
- NGA's current focus is on OEF / OIF / Anti-terrorism products, making MIM production a lower priority.

# Initial SRP MIM Production



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- Beginning in 2004, DRAFT MIMs were created by SRP for 180 installations, training centers, and range complexes worldwide, but without overarching guidance or standardization of processes.



# MIM Production Partnership



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- During FY07, the Department of the Army G-2 (Intelligence), Army SRP (Ranges and Training) and NGA began collaborating on production of MIMs.
- G-2, SRP and NGA signed Memorandum of Agreement (MOA) on 9 Feb 09 to formalize support for MIM production.
- SRP MIM Production Team now consults G-2's list of priority MIM updates in order to prioritize MIM production list.
- Also coordinates with NGA to request NRN/NSN for new MIMs.
- NGA has agreed to print MIMs for 15-20 installations per FY, thus saving a significant amount of SRP funding traditionally used towards the printing of maps in-house.



# Existing Military Map Standards



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- G-2, SRP and NGA agreed that future MIM production should be based on existing military cartographic standards to ensure consistency across all Army training and testing installations.
  - FM 21-31. Topographic Symbols. April 1961.
  - PS/3AH/101. Product Specifications for Topographic Military Installation Map Supporting Mark 90 Systems. March 1983.
  - MIL-STD-60001. DoD Standard Practice, Mapping, Charting, and Geodesy. February 1990.
  - MIL-T-89301A. Military Specifications for 1:50,000 Scale Topographic Maps. February 1995.
  - NGA TLM Finishing Review Checklist, Version 6. November 2006.
- SRP MIM Production Team adopted these existing standards, and then further clarified and documented guidelines to meet both current training and cartographic requirements.
- Collaborative effort resulted in an extensive overhaul of the initial MIM template, margin information, and symbology.

# MIM Production Specifications



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As a result, SRP MIM Production Team developed a complete set of guidance documentation for Army personnel to use when updating and finalizing MIMs.

## Military Installation Map Toolkit (MIMT) v. 3.0

MIMT is a set of tools for developing common military surround elements, including north arrows, slope guide, international system of units (SI) Coordinate Reference System (MGRS) labels. MIMT assists users in quickly and cost effectively creating standardized maps, such as the Military Installation

### Files:

**NEW!** [MIMT 3.0 For ArcGIS Desktop 9.3.1](#)  
**NEW!** [MIMT 3.0 Help Document For ArcGIS Desktop 9.3.1](#)

[MIMT 3.0 For ArcGIS Desktop 9.3](#)  
[MIMT 3.0 Help Document For ArcGIS Desktop 9.3](#)

[MIMT 3.0 For ArcGIS Desktop 9.2 Service Pack 6](#)  
[MIMT 3.0 Help Document For ArcGIS Desktop 9.2 Service Pack 6](#)

**NEW!** [MIMT Version 3.0 For ArcGIS 9.3.1 Technical Article](#)  
[MIMT Version 3.0 For ArcGIS 9.3 & ArcGIS 9.2 SP6 Technical Article](#)

**Developer:** Center for Environmental Management of Military Lands (CEMML)  
**Release Dates:** MIMT 3.0 for ArcGIS 9.3.1: April 2010; MIMT 3.0 for ArcGIS 9.3 & ArcGIS 9.2 SP6: August 2009  
**Software Requirements:** Desktop ArcInfo, ArcEditor, or ArcView (version corresponding to software package name)  
**Intended Users:** SRP GIS Personnel  
**Certification:** Certificate of Networkiness (CoN) approved 20 February 10

To provide feedback on MIMT or report bugs, please contact the [SRP GIS RSC at Fort AP Hill, VA](#).

## MIM Production Guidance Documentation

The SRP GIS Program has worked closely with Army G-2 and NGA to standardize symbology and graph they train across Army training and testing installations. As a result of these collaborations, the MIM guidance and the MIM Production Guidance Documentation (MPGD), are available for download below.

**NOTE:** Previously, the MPGD was available for download collectively as a .ZIP file. As of 5 June 2009, user symbology, templates) are now available for download, and these files supersede all previously released versions below to ensure compliancy with current MIM production requirements. This individual file download format will ensure that persons can be notified when updates to individual files occur.

[Memorandum - Production of Military Installation Maps \(MIMs\)](#)  
[Production Specifications for Military Installation Maps \(MIMs\)](#)  
[Appendix A - Required Data Layers for the MIM](#)  
[Appendix B - Additional SRP Proponent Data Layer Requirements](#)  
[Appendix C - Non-Proponent Data Layer Requirements](#)  
[Appendix D - MIM Spacing & Font Requirements](#)  
[Appendix E - MIM Layout Examples](#)  
[Appendix F - FAQ Regarding MIM Development and Quality Assurance](#)  
[Appendix G - MIM Finishing Review Checklist](#)  
[Appendix H - MIM Approval Signature Document](#)

[MIM Style](#) (An organized collection of predefined colors, symbols, properties of symbols, and map element mapping products.)

[MIM Template](#) (Map templates make it easy to reuse or standardize a layout, or even the same data on a map you don't have to manually reproduce the common parts of the map. Like maps and layers, templates can standardize the maps that we produce.)



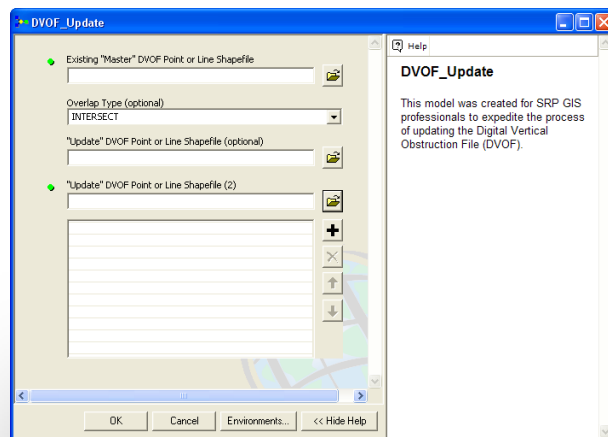
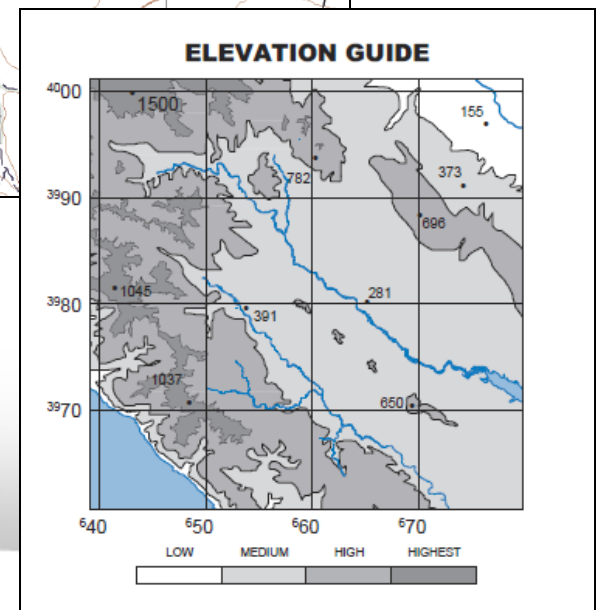
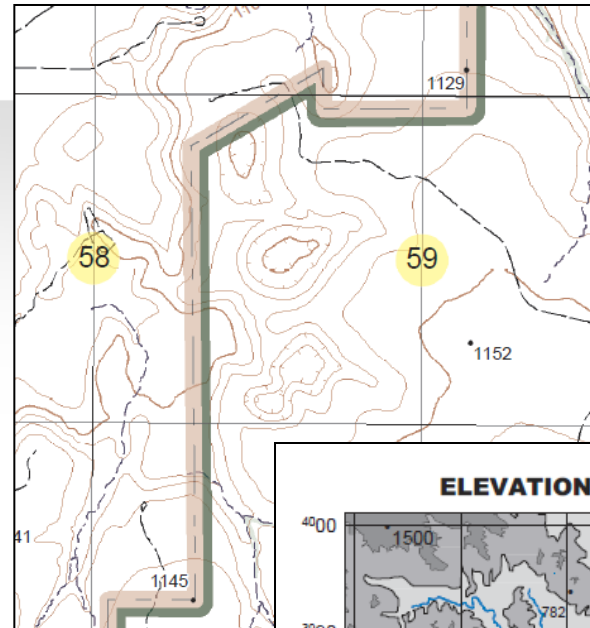
Documentation available on  
**SRPWeb** (<https://srp.army.mil>)

# Data Development Models



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- SRP MIM Production Team used ESRI ArcGIS Model Builder to create data development processes which expedite development of the MIM.
  - Depression Contours
  - Digital Vertical Obstruction File (DVOF)
  - Elevation Guide



# Geodatabase Template



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Sustainable Range Program Quality Assurance Plan      Military Range Area, FY09

**MILITARY RANGE AREA**

**1. DESCRIPTION**

The military range area layer represents controlled areas that allow the firing of live ammunition from direct-fire or line-of-sight weapons systems at targets within the controlled area, subject to certain restrictions. A number of military range areas also allow for non-live fire training. Military range areas are normally equipped for practice and qualification. Typically, a range has a left and a right boundary that extend from the firing line forward to just past the last target array. Military range areas constitute a functional complex that normally includes an up military range area, firing points or firing line, and downrange targets or impact area. A range may include areas for back-blast safety zones that can have a secondary use as non-dudded impact area or maneuver area. A modernized or automated range is equipped to systematically control the targets, score target hits, and provide the user with target status information for the purposes.

Common names for this feature type are: live-fire range footprint, firing area

**2. PROPONENTS AND STEWARDS**

The Army functional proponent for the Director of Plans, Training, and Management will have the overall responsibility for the accuracy of the military range area data. The Army functional proponent for the Management Office-Training Support will have the overall responsibility for the accuracy of the military range area data.

**3. POLICY AND REGULATIONS**

Program(s)	
Installation Management	- AR 210-16 May
Command (IMCOM)	- AR 415-1 Septem
	- DA PAN-10 Septem
	- DA PAN-12 April 20
	- DODD-10 January
	- DODD-10 May
	- DODD-12 July
	- DODD-14

Edwards\_SRP.mdb

- common
  - coordinate\_grid\_area
  - coordinate\_grid\_line
  - coordinate\_grid\_point
- military\_operations
  - ammunition\_storage\_area
  - firing\_point
  - impact\_area
  - impact\_buffer\_area
  - mil\_restricted\_access\_area
  - mil\_special\_use airspace\_area
  - military\_landing\_zone\_area
  - military\_landing\_zone\_point
  - military\_observation\_point
  - military\_range\_area
  - military\_safety\_marker\_point
  - military\_target\_point
  - range\_controller\_point
  - training\_area
  - training\_point
- transportation\_air
  - airspace\_obstruct\_navaid\_point
  - j\_trainobs\_air\_obs\_id

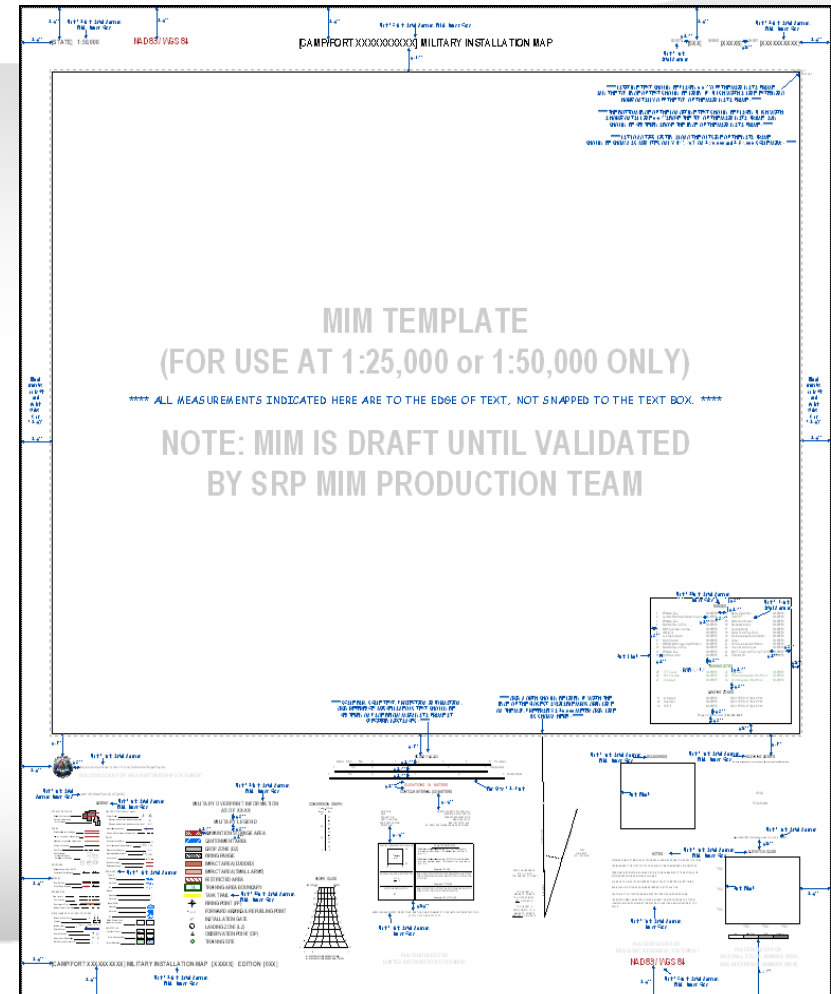
- SRP Geospatial Support Center created geodatabase template (.mdb) to meet the requirements of the SRP Geospatial Data Quality Assurance Plans (QAPs).
- Serves as the standardized data structure across all Army training and testing installations.
- Once populated, this geodatabase feeds directly into the MIM Template, automatically populating the required data layers to be portrayed on the MIM.

# MIM Template



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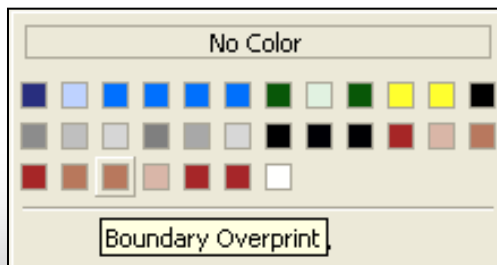
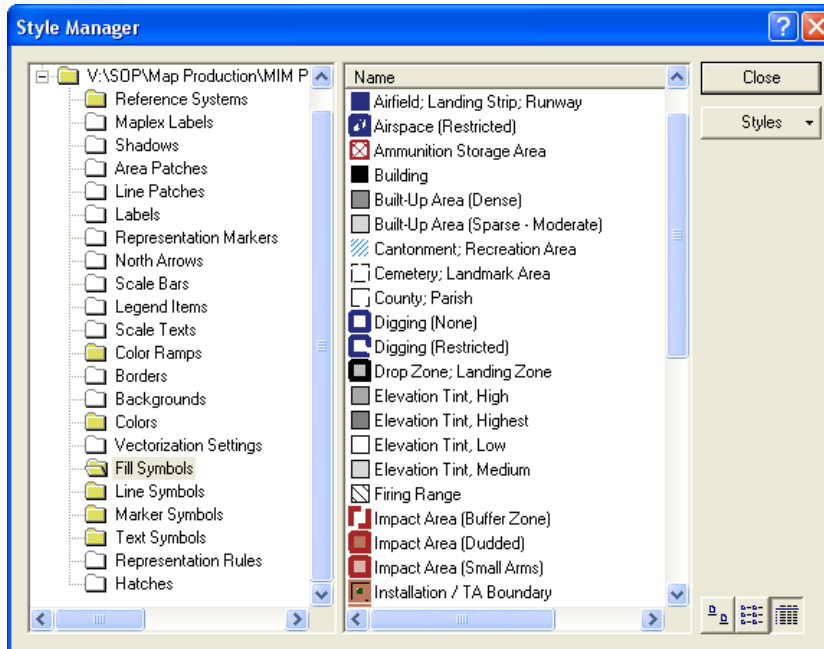
- SRP MIM Production Team created MIM template (.mxt) based on layout of previously produced NGA MIMs and supporting documentation.
- All aspects reflect the layout, fonts, and features which are common to MIMs.
- Based on SRP QAP (CIP) and SDSFIE data layers and attribution.
- Dictates the required spacing guidelines within and between the data frames and margin elements, as well as margin text font requirements.



# MIM Symbology

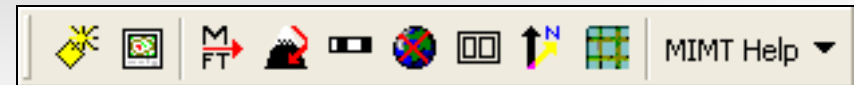


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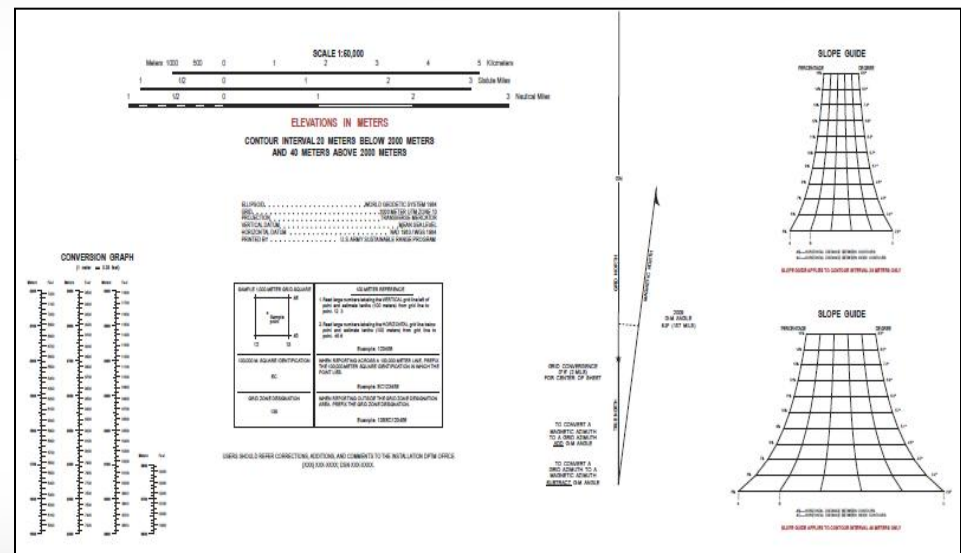


- SRP MIM Production Team created the MIM.style file, which contains symbols, labels, and tints based on existing DoD and NGA standards.
- Military symbology has been reviewed and amended by NGA in order to match existing standards.
- Recent addition of several new symbols based on Army training requirements.
- Symbology validated to work with both 1:25,000 and 1:50,000 scale products.

- SRP MIM Production Team designed MIMT to expedite and standardize the process of creating and locating MIM margin elements within ArcGIS.



- MIM Extent
- MIM Template
- Conversion Graph
- Slope Guide
- Scale Bars
- Projection Information
- Grid Reference
- North Arrow / Declination
- MGRS Grid Lines / Labels



- Tool outputs tested to ensure compliance with standards and guidelines established by Army, DoD, and NGA.

# MIM Quality Assurance



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SRP MIM Production Team performs QA to ensure consistency with symbology, spacing, and layout requirements.

Work flow spreadsheet created for QA - based off of NGA TLM review checklist.

Following QA, the MIM is then returned to the installation for continued edits or final review.

Once validated by SRP, the MIM is sent to NGA for inspection.

MIM SHEET INFORMATION			
Sheet Name:	XXXXXXXXXX		Requirement satisfied. Comment occasionally provided.
Series Number:	X7X/S or X8X/S		Requirement likely satisfied. Verification by installation staff required.
Edition Number:	0X		Requirement not satisfied. Further instruction provided.
Reviewer:	SRP GIS Regional Support Center		Requirement not currently applicable to the MIM.
Date:	XX / XX / 20XX		
DATA QUALITY			
ITEM	REQUIREMENT	STATUS	COMMENT
Source Materials / Quality Assessment	Source materials documented / obtained for all data layers being included on map.		
	All data layers complete (all features included) when compared to stated source materials.		
	All data layers pass QA/QC assessment when compared to stated source materials.		
	Geodetic tab run acquired for all map sheets.		
GEODETTIC INFO & MARGINALIA			
ITEM	REQUIREMENT	STATUS	COMMENT
Sheet Identification	State name in upper left margin identifier.		
	Scale of map is either 1:25,000 or 1:50,000.		
	Installation / sheet name entered into title, upper right margin identifier, and lower left margin identifier.		
	Edition entered in upper right margin identifier and lower left margin identifier.		
Projection	NGA series number entered in upper right margin identifier and lower left margin identifier.		
	Measurement of projection dimensions agrees with geodetic tab run.		
	Geographic coordinates labeled and spaced correctly on all four corners.		
	All geographic 1' ticks shown, and 5' ticks labeled.		
Grid - Major	Interior geographic intercepts (latitude/longitude ticks) at 5' shown.		
	"One second" notes correct on all four sides (latitude notes read from east).		
	Data frame rotated prior to converting graticule to graphic.		
	Measurement of grid lines from projection corners agrees with geodetic tab run.		
Legend	Full Easting and Northing grid values on SW corner for first grid lines shown (not necessarily first full line).		
	Each line of major grid labeled - small numbers included for each 10,000m grid number.		
	1,000 meter and 10,000 meter grid lines symbolized properly.		
	Proper number of rows and columns represented (emulating previous NGA MIM - if applicable).		
Military Legend	All labels represented as two digits, with single digits preceded by 0.		
	Legend contains all symbols not labeled in the map interior.		
	Hydrographic legend shown (if applicable).		
	Symbols and fills match map interior.		
Conversion Graph	Generic names for administrative boundaries shown (if not in glossary).		
	Connect month and year text entered.		
	Symbols and descriptions ordered first by feature type (polygon, line, point) and then alphabetically.		
	Abbreviations added to appropriate feature names (DZ, FP, LZ, OP, etc.).		
Scale Bar(s) / Note(s)	All symbols within legend represented on map and all symbols on map represented within legend.		
	Encompasses highest and lowest elevations on map interior to nearest 100 meters.		
	Highest elevation accounts for AMSL Vertical Obstruction (VO) heights.		
	Graph split into 2 columns of near equal height (with left column being taller) if elevation range of greater than 700 meters exists within map interior.		
Geodetic Notes	Scale note exists, and bar scales correct (Meters, Kilometers, Statute Miles, Nautical Miles).		
	Scale bars aligned on 0'.		
	Scale bars checked for accurate representation of scale using engineer's scale or appropriate ruler.		
	"Elevations in Meters" note present and accurate.		
	Contour interval note present (or maximum elevation note present if no contours on sheet).		
	Supplementary contour note present (if applicable).		
	ELLIPSOID = WORLD GEODETTIC SYSTEM 1984		



# MIM Accuracy Assessment

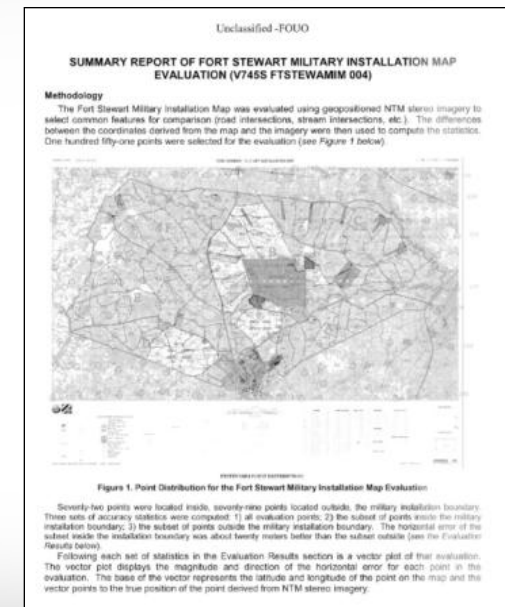


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- NGA staff conduct an evaluation of the MIM to verify that it meets the required accuracy standards.
- “Summary Report of Fort XXX Military Installation Map Evaluation”
  - Provides numerical results, both inside and outside the installation boundary, for the following parameters:
    - Absolute horizontal error
    - Relative horizontal (feature to feature) accuracy
    - Circular Map Accuracy Standard (CMAS)
    - Absolute vertical error
    - Relative vertical error

● **ALL** MIMs created by SRP using the MIM Production Guidance Documentation have:

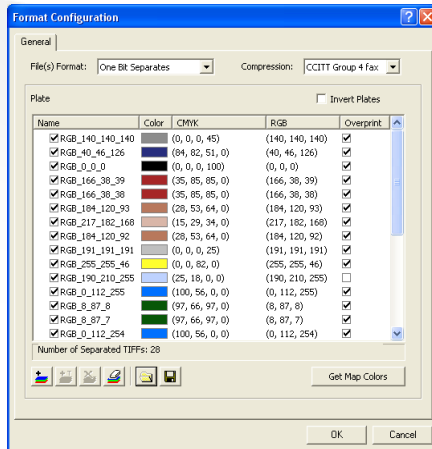
“met NGA horizontal and vertical accuracy standards for TLM mapping.”



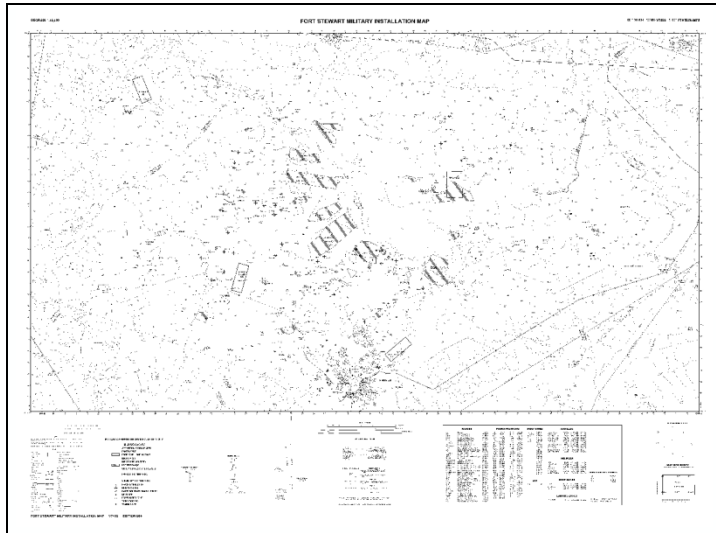
# MIM Color Separation



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- Once MIMs pass inspection by NGA, they are exported by SRP MIM Production Team.
- NGA's required output format for MIM printing is 1-bit 1200 dpi color separated TIFF.
- SRP MIM Production Team created an ESRI color file (MIM.ect) with the defined MIM colors, which is loaded using PLTS TIFF Color Separator, and assists in export process.
- Army is maximizing the benefits of NGA printing by having the SRP MIM Production Team complete the color separation process for MIMs, ensuring a consistent process.

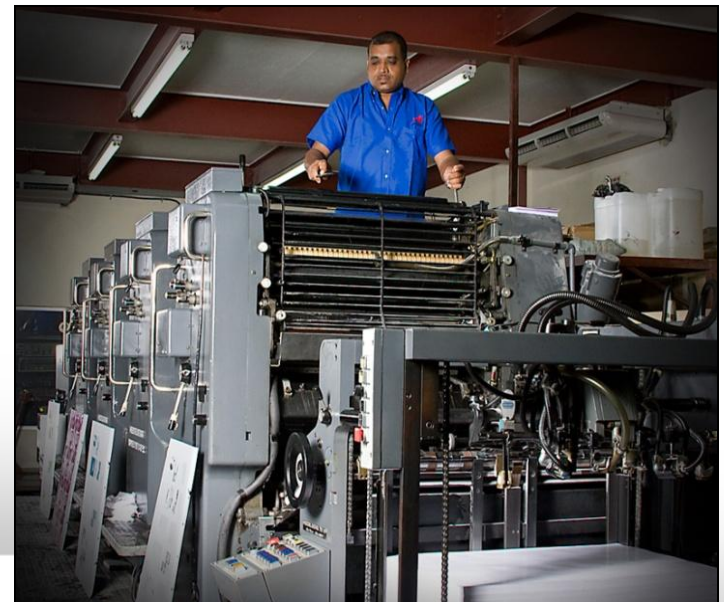


# MIM Printing Operations



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- Tens of thousands of maps and charts are printed each year by NGA on presses in a computer-to-plate (CTP) digital environment.
- Red-light & blue/green-light options available.
- SRP MIM Production Team sends MIM color separates to NGA CTP staff.
- NGA CTP staff perform final QA of color separates, and any remaining issues are addressed.
- MIM is then printed, and the SRP MIM Production Team is notified upon its completion.
- NGA also contacts MIM Production Team when a MIM is up for reprint to determine if an update to that sheet is planned for the near future.



# MIM Requisition



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- Once the MIMs are printed, they are cut, stacked, loaded on pallets, shipped to Defense Logistics Agency (DLA), and are readily available to all DLA customers.
- To date, there is an ~ **90 day** turn-around from completion of MIM color separation to MIM being stocked at DLA.
- DLA notifies SRP MIM Production Team of newly stocked MIM(s), and the installation personnel are then notified by the MIM Production Team.
- In return, SRP MIM Production Team sends DLA updated extent coordinates of the newly stocked MIM(s) in order to keep their map catalog current and accurate.

# Additional MIM Formats



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- Hard-copy MIMs stocked at DLA are not the only way for Warriors and civilians to visualize the installation any longer.
- SRP MIM Production Team exports finalized MIMs to GeoPDF format, and they are posted to *SRPWeb* as well as the Army Geospatial Center (AGC) website, and available for download.
- GeoPDF is a breakthrough in that the user can view a digital version of the MIM, turn on/off desired data layers, and acquire specific and accurate coordinates without needing to access GIS software.
- In addition, the SRP MIM Production Team is currently developing a CADRG-like raster product which can be loaded into both ground and aerial vehicles, as well as be used within FalconView™ and ESRI® ArcGIS.

# MIM Production Statistics



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- 32 MIM sheets have been finalized and validated by SRP since 2007.
- 29 of these have been printed by NGA, and are currently in stock at DLA, with 2 more ready for printing.



- 24 additional MIM sheets are currently in some stage of development by SRP MIM Production Team or installation personnel, or are awaiting validation by installation staff.
- SRP projected hourly estimates for the development of ALL geospatial data to extent and the completion of the MIM are **250-350 hours**.
- As previously noted, estimates by NGA staff for the completion of 1 MIM were approximately 1 man-year (**1,920 hours**).

# In Summary



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- This overall strategy has proven to be highly successful at streamlining Army MIM Production, and is a win-win-win relationship for G-2, SRP and NGA.
  - G-2 priority map updates are completed.
  - Existing DoD and NGA topographic standards are utilized.
  - SRP funding can be re-directed to enhance other training avenues.
  - Most importantly, Warriors gain access to additional training products in a variety of formats.
- SRP MIM Production Team's development of customized geospatial tools, along with incorporation of automation and validation procedures, has been critical to success of this on-going effort.



Army G-2

<http://www.dami.army.pentagon.mil>



Army SRP

<https://srp.army.mil>



NGA

<http://www.nga.mil>

# Points of Contact



**PARSONS**

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