MITOCA Specification
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Appendix H -- Multi-Image Scene Table of Contents (MITOC) Tagged Record Extension (TRE) Specification

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NOTICE: This document is not a stand-alone document. It is Appendix H to the Implementation Practices of NITFS (STDI-0005), which is not published yet. The contents of Appendix H are DRAFT. Developers considering implementation are requested to contact the JITC NITFS Lab.

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TBD/TBR Listing

Page Number	TBD/TBR	Description
H-15	TBD002	Define test criteria 12 December 03: Test criteria have been added but will remain an ongoing TBD until testing begins.
H-15	TBD003	Add Implementation Notes
H-5, H-12, H-16	TBD005	Is there a need to allow MITOC to describe a group of sub-scene overview composite images?

Change Log

Date	Pages Affected	Mechanism
29 August 2003	All	Version 0.1, Initial Coord. Draft
10 January 2005	- H-C-1 - 3 (para 3) and Table H-1 - 3.6	Version 0.2, 10 January 2005 - Added a reference to SCENE_TYPE in Annex C, second sentence. - Added guidance for new user communities developing to the MITOC - Removed "The MITOCA TRE remains unchanged when a volume gets chipped" because that may not be true. For the DCGS implementation it is not.
19 July 2005	Table H-1 LOOK_COMPOSITE_ID and VOLUME_COMPOSITE_ID	Changed the Size columns from N/1-999 to A/1-999 to match the type of data expected (alphanumeric)

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7 January 2006	Paragraph 3.6	Removed the last bullet stating the MITOCA TRE remains unchanged when a volume gets chipped. This should be a program level decision and currently the CIP updates the MITOC for each chip. Although leaving the MITOC unchanged may not be a problem, the DCGS implementation states the MITOC will get updated.

Effectivity Log

Number	Effective	Description

Point of Contact for this DRAFT: Chairman, NITFS Technical Board (NTB); ntbchair@nga.mil

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1 SCOPE

1.1 Introduction

The use of remote framing, scanning and similar imaging sensors to collect image data over large areas of the earth poses a number of challenges for managing the resulting large data flows through the traditional Tasking, Collection, Processing, Exploitation and Dissemination (TCPED) process. Such collection activities can result in the collection of hundreds, or even thousands, of images over a specific area of coverage. Users of the data desire a 'macro-view' of the collected coverage area that allows one to drill down to detailed information as needed. Systems often portray this 'macro-view' of a specific collection coverage area (imaging scene) by amalgamating the individual images into a composite overview. Timely exploitation and precision targeting objectives create the requirement to preserve access to the individual images and their associated 'as-collected' support data. The Multi-image Scene Table of Contents (MITOCA) Tagged Record Extension (TRE) provides a significant part of the solution for managing image scenes consisting of large numbers of individual image collects.

1.2 Purpose

The purpose of this document is to specify how this TRE is to be written and used. The MITOCA TRE provides a means to allow a collection of images (a multi-image scene), collected over a designated coverage area, to be treated as if it were a single image scene. This includes sensors collecting multiple images in order to image the full scene and sensors which image the same footprint multiple times. In the later case, each footprint is referred to as a Look. The MITOCA TRE addresses multi-image scenes that consist of:

- Single sensor type; single look
- Single sensor type; multiple looks
- Multiple sensor types; single/multiple look(s)

The MITOCA TRE provides support for managing a multi-image scene during the TCPED process. In particular, the MITOCA approach preserves the original, as-collected, image data and support data for each image collected within the scene to facilitate precision targeting using the best available parameters from the collected imagery. Additionally, support is provided for sub-scene derived products (chipping), both at image boundaries and sub-image boundaries.

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1.3 Background

As advanced framing and similar sensors began to implement multi-image, to include multi-look, scene collects, data management challenges surfaced. Since framing and similar sensors often collect thousands of images just to satisfy one tasked scene, the tracking and maintenance of the images are cumbersome. The NITFS Technical Board (NTB) received several reports that certain Distributed Common Ground/Surface System (DCGS) framing imagery products were unusable because their support data had been altered or was missing. Other reports indicated there were shortcomings in the NITFS. Due to these reports, the NTB hosted a Technical Exchange Meeting (TEM) on 11-12 March 2003, to encourage the DCGS community to articulate the issues needing attention. This led to a series of follow-on TEMs and teleconferences, known as the Multi-image Scene (MiS) TEMs, made up of a team of DCGS representative members. The purpose of the MiS TEMs were to define and articulate a common approach for packaging multiple images using options defined by the NITFS whenever possible. If, in the event existing methods did not exist, the MiS team was tasked to identify alternate candidate solutions. The MiS team began by establishing a set of foundation principles to use as a guideline for achieving a solution. It was determined the solution must:

- Promote precision targeting
- Ensure a means for tracking data through the TCPED process
- Maintain original support data
- Support a unique image ID
- Ensure a means to determine image membership as part of a collection of images
- Ensure a means to determine sequence within a collection of images
- Ensure a means to “bundle” many images with support data from a single scene in a single NITF file that is universally understood by recipients and efficiently assists user needs (e.g. graphic map overlay, overview thumbnail).
- Ensure a standard definition and application of terms are used: scene number, operation number, image segment, etc.

After evaluating the foundation principles, the MiS team agreed to develop a new controlled TRE, the MITOCA.

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2 References

STDI-0002	The Compendium of Controlled Extensions (CE) for the National Imagery Transmission Format, Version 2.1, 16 November 2000
STDI-0005	Implementation Practices of the NITFS (IPON), Draft Version 0.2, 24 January 2003 (Note: The MITOCA TRE was initially published as part of the IPON, which is internally referenced by this TRE.)

3 Overview of MITOCA

A Multi-image Scene (MiS) can potentially consist of multiple Looks, each with thousands of individual images (e.g. frames) and each with its own set of support data. The MITOCA approach provides both a visual and textual index of the images comprising a MiS. The approach is to provide a composite image (overview) of the Looks within a MiS, typically at a reduced resolution when compared to the actual collected image data. The composite image, when used in conjunction with the MITOCA TRE, serves as an index to the actual collected images.

The MITOCA paradigm prescribes a flexible method to organize the images and support data. It provides information on a collection of images that belong to a common scene. The information contained in the MITOCA TRE provides a correlation between the row and column pixel value indices of the composite image and the actual 'as-collected' image(s) (e.g. frame(s)) corresponding to the same coverage depicted in the composite image. This allows a user to identify an area of interest in the composite and then readily find the corresponding full-resolution image(s) to act upon.

There is currently one known user community developing to the MITOC specification, i.e. the DCGS. The specifics of the DCGS MITOC implementation are detailed in Annex C. Other user communities are encouraged to develop their own implementation of the MITOC and should document by adding a new Annex to this specification. For assistance in publishing a new implementation of the MITOC, contact the JITC NITF Lab JITCN@disa.mil.

The use of the MITOCA TRE requires a basic understanding of certain terminology. The following section is intended to provide a basis for this understanding.

3.1 Multi-image Scene (MiS)

A **Multi-image Scene** is a group of images collected over a designated area of coverage, all with the same scene identification value. A MiS has the following characteristics:

- A MiS may be comprised of multiple 'Looks', each defined by a Minimum Bounding Polygon of 4 geo-points (MBP4).
- A MiS may contain data collected from numerous sensor types.
- A MiS may be contained in one or more NITF files.
- A MiS may be organized into multiple 'Volumes'.
- A MiS has an identifier value used as a common root for other identifiers within the MBP4 (see Table1, SCENE_ID field).
- A MiS may have data voids within the coverage area MBP4 (see figure H-1).

3.2 Volume

A **Volume** is a mechanism for dividing data within a MiS. A Volume has the following characteristics:

- The division of a MiS into Volumes is somewhat arbitrary, but is typically based on data size, image segment counts, sensor type and imaging mode.
- A Volume is comprised of data from a single sensor type and imaging mode.
- A Volume only contains data from a single 'Look'.
- Volumes in multiple 'Looks' need not have the same boundaries.
- Each Volume has a Volume number, which should be unique when generated by the same system. Once a Volume is passed on to subsequent users who may re-organize the Volume, the uniqueness of the Volume number may be lost.
- Each Volume has a single MITOCA TRE.
- Each Volume has a MBP4 that is all or part of the total coverage of the Look MBP4.
- Typically, there is a volume composite image associated with the Volume MBP4.

3.3 Look

A **Look** is a mechanism for identifying/grouping related imagings of a MiS. A Look has roughly the same footprint/coverage as the MiS. A Look has the following characteristics:

- A Look is comprised of data from a single sensor type and imaging mode.
- A Look may be organized into multiple Volumes that may contain multiple Component Images.
- Multiple Looks may have different Volume Boundaries.
- A Look has roughly the same aim point or footprint/coverage as the MiS.
- The Look coverage is defined by a MBP4.
- Looks within a MiS have unique look index numbers.
- Volumes associated with a particular Look have the same Look index value.

Note: Although shown as neatly juxtaposed images, the actual collected component images may have overlap, skewing, crabbing and other characteristics typical of remote sensing imagery.

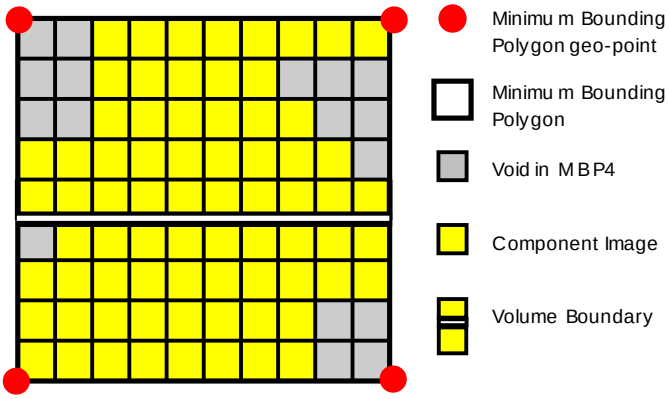

Figure H-1. Single Look Example

3.4 Component Image

A **Component Image** is an array of pixel values and associated support data contained in a volume and may be used to make a composite image. A Component Image has the following characteristics:

- The pixel array and support data have the same area of coverage.
- Typically, a Component Image is a full resolution image as collected by the sensor.
- For a step-framing sensor, each collected frame is a Component Image.
- For a ‘spot’ sensor, each ‘spot’ is a Component Image.
- For a scanning sensor, the scan lines corresponding to the support data coverage is a Component Image.

- Each Component Image has a unique Image ID within a MiS.

3.5 Composite Image

A **Composite Image** is an array of pixel values derived from one or more component images to form a composite overview of the coverage area (MBP4) of the associated component images or the Look containing the component images. A composite image has the following characteristics:

- A composite image portrays a 'macro-view' of a designated coverage area (Look MBP4 or Volume MBP4) by amalgamating the individual Component Images into a single image.
- The Composite image is typically a reduced resolution of the amalgamated Component images, but is not required to be.
- Composite Images are described by a MBP4.
- There are two types of composite images, a Look composite and a Volume composite. A Volume composite image is an overview image of the MBP4 coverage represented by the associated component image(s). A Look composite image is an overview image of the MBP4 coverage represented by the associated component image(s) in the Look.
- A composite image is comprised of data from a single sensor type and imaging mode.
- The Volume composite MBP4 coordinates are always populated.
- The Look composite MBP4 coordinates are populated whenever available.

3.6 MiS Table of Contents (MITOCA) TRE

A **MiS Table of Contents (MITOCA) TRE** correlates a group of one or more component images within a Volume MBP4 and an associated Volume composite image. It also can provide the Look composite image MBP4 of the entire Look to which the MITOCA coverage group (Volume) belongs. A MITOCA TRE has the following characteristics:

- There is one MITOCA TRE per group (Volume) of Component Images.
- A MITOCA may reference up to 999 Component Images.
- A MITOCA may reference one Volume composite and one Look composite image.

- A MITOCA describes the MBP4 for the Volume composite image.
- A MITOCA describes the number of pixel rows and columns in the Volume composite image.
- A MITOCA may describe the MBP4 for the Look composite image.
- A MITOCA provides the MBP4 for each of its Component Images.
- A MITOCA provides a row/column index relative to the Volume composite image for each of its Component Images.
- The MITOCA TRE allows for specifying different 'scene type' implementation practices that can be defined for specific community implementations of the MITOCA. These scene types may be defined and submitted to the NTB for inclusion as an annex to this MITOCA TRE specification. (See Annex C, the DCGS scene type implementation specifications, for the initial implementation description of the MITOCA)
- ~~The MITOCA TRE remains unchanged when a volume gets chipped.~~

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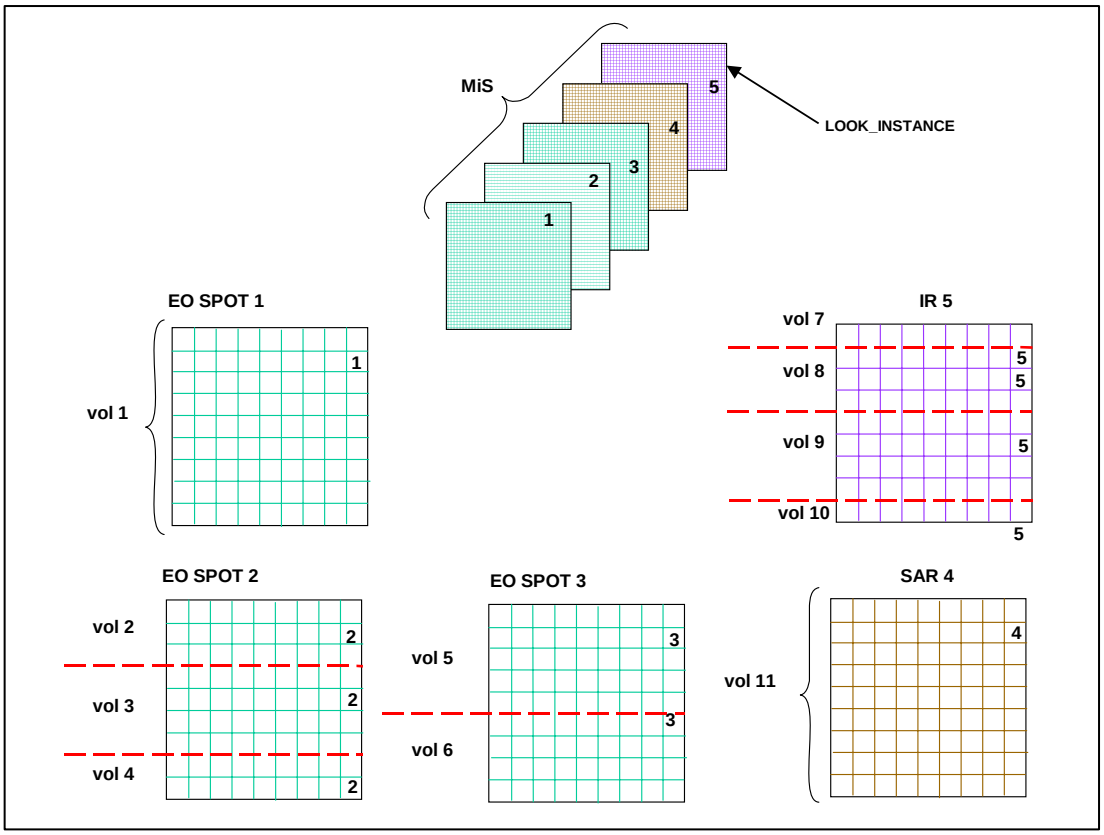

Figure H-2. Conceptual MiS Example

4 REQUIREMENTS

4.1 General Requirements

4.1.1. The MITOCA TRE is used to describe the organization of image segments grouped within a Volume. A Volume has only one Volume composite image. It may also have one Scene (Look) composite image from the Look producing the image segments in the volume. TBD005

4.1.2. A Volume only contains image data from a single sensor imaging mode and a single Look.

4.1.3. A single MITOCA TRE is provided for each volume of a MiS and may be used wherever the need exists to define and advertise a collection of individual component images that satisfy a common collection purpose.

4.1.4. Since an NITF file is limited to 999 image segments, a single NITF file may contain up to 999 volumes and/or component images, in any combination thereof, as long as the total number of NITF image segments does not

exceed 999. This also means a single NITF file may have more than one MITOCA TRE.

4.1.5. The MITOCA TRE, when present, is always placed in the Extended Header Data (XHD) or User Defined Header Data (UDHD) sections of the NITF file header (or an associated TRE_OVERFLOW DES), and serves as a beacon to a recipient that the NITF file contains and/or references multiple NITF image segments (IMs) that belong to a common volume of a specific MiS.

4.1.6. All geographical coordinate points referenced in Table H-1 follow the same format. Xddmmss.cc represents degrees (00 to 89), minutes (00 to 59), seconds (00 to 59), and hundredths of seconds (00 to 99) of latitude, with X = N for North or S for South; and Ydddmmss.cc represents degrees (000 to 179), minutes (00 to 59), seconds (00 to 59), and hundredths of seconds (00 to 99) of longitude, with Y = E for East or W for West. The format ±dd.dddddd indicates degrees of latitude (North is positive), and ±ddd.dddddd represents degrees of longitude (East is positive). Any portion of a coordinate that is unknown shall be filled with a hyphen (-), including a completely unknown coordinate (e.g. ----------). The default hyphen convention should only be used under special circumstances such as when the coordinates will be known at a later lifecycle stage of the data collection, and when only some of the coordinates are known (e.g. not all four). When populating geographic coordinate points, as much information as possible should be provided, even if it is only one of the four coordinates.

4.1.7. Producers of multi-volume Looks should consider organizing volumes on meaningful information boundaries.

4.2 Detailed Requirements

The following table defines the format of the MITOCA TRE. The fields of this TRE are organized into three sections, those relevant to information about the MiS, Volumes and Components.

Table H-1. MITOCA – Multiple Images Table Of Contents

R = Required, C = Conditional, A = Alphanumeric (BCS-A), N = Numeric (BCS-N),
<> = Allowed default is specified

Field	Name/Description	Size	Value Range	Units	Type
CETAG	Unique Extension Identifier.	A/6	MITOCA	N/A	R

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Field	Name/Description	Size	Value Range	Units	Type
CEL	Length of CEDATA Field. This field shall contain the length in bytes of the data contained in the CEDATA Field. The entire TRE length is 11 + CEL.	N/5	Calculated 00000-99988	Bytes	R
The following fields define the MITOCA CEDATA Field:					
The Fields SCENE_TYPE through NUM_VOLUMES constitutes the MiS section of the MITOCA.					
SCENE_TYPE	Scene Type. 000 = Not designated 001 to 100 = DCGS Reserved (see Annex C) 101-999 = Reserved for future user communities. Contact the JITC NITF Lab for assistance JITCN@disa.mil. This field serves as a 'flag' to identify the specific implementation practices and conventions applicable for implementation and use of this TRE. Values can be registered at http://jitc.fhu.disa.mil/nitf/reg_fields.html.	N/3	000 to 999		R
SCENE_ID_LEN	Scene Identifier Length. Length of the SCENE_ID field in bytes. Together, the SCENE_ID field and the COMPONENT_ID field correlate to the IMAGE ID of the component image.	N/3	001 to 999	Bytes	R
SCENE_ID	Scene Identifier. Allows up to 999 characters to serve as the scene identifier. All components of a scene must have a common Scene ID, which is defined as the common portion of each component's unique image ID.	A/1-999	Alphanumeric		R

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Table H-1. MITOCA – Multiple Images Table Of Contents

R = Required, C = Conditional, A = Alphanumeric (BCS-A), N = Numeric (BCS-N),
<> = Allowed default is specified

Field	Name/Description	Size	Value Range	Units	Type
LOOK_COMPOSITE_ INDEX	Look Composite Index Value. Provides the unique "display level" reference in this NITF file for the NITF image segment (IM) that contains the Look Composite/Overview. 000 – Look Composite image is not present in this NITF file but the conditional MBP4 coordinates fields are populated. 001 to 999 – The IDLVL value in the Look Composite image/overview subheader. --- (3 hyphens) – Look Composite image is not present in this NITF file.	N/3	000, 001 to 999 or ---		R
LOOK_COMPOSITE_ID _LEN	Look Composite Identifier Length. Length of the LOOK_COMPOSITE_ID field in bytes. If the LOOK_COMPOSITE_INDEX is --- , then the LOOK_COMPOSITE_ID is not present and this field is populated 000.	N/3	000 to 999	bytes	R
LOOK_COMPOSITE_ID	Look Composite Image Identifier. This field is only present if the LOOK_COMPOSITE_ID_LEN is not 000 and contains the portion of the Look Composite image ID that uniquely identifies this Composite image. Together, the SCENE_ID field and the LOOK_COMPOSITE_ID field correlate to the IMAGE ID of this composite image.	~~NA~~/ 1-999	Alphanumeric		C

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Table H-1. MITOCA – Multiple Images Table Of Contents

R = Required, C = Conditional, A = Alphanumeric (BCS-A), N = Numeric (BCS-N),
<> = Allowed default is specified

Field	Name/Description	Size	Value Range	Units	Type
The following four fields describe the Minimum Bounding Polygon of four geo-points (MBP4) for the Look. In some cases, the coverage area described by these geo-points may not be completely represented with imagery referenced by this MITOCA (see figure 1. Single Look Example for description of void areas). These points are the earth coordinates corresponding with the image pixel array corner locations of the Look composite image and are provided in image coordinate order: (0,0), (0, MaxCol), (MaxRow, MaxCol), (MaxRow, 0). These conditional fields are not present if the LOOK_COMPOSITE_INDEX value is --- (hyphens).					
LOOK_CORNER_1	Look Corner Point 1. Pixel (0,0) corner point location of the composite image in lat/lon coordinates.	A/21	XDDMMSS.SSYDDDMMSS.SS or ±dd.dddddd±ddd.ddddddd		C
LOOK_CORNER_2	Look Corner Point 2. Pixel (0, MaxCol) corner point location of the composite image in lat/lon coordinates.	A/21	XDDMMSS.SSYDDDMMSS.SS or ±dd.dddddd±ddd.ddddddd		C
LOOK_CORNER_3	Look Corner Point 3. Pixel (MaxRow, MaxCol) corner point location of the composite image in lat/lon coordinates.	A/21	XDDMMSS.SSYDDDMMSS.SS or ±dd.dddddd±ddd.ddddddd		C
LOOK_ CORNER_4	Look Corner Point 4. Pixel (MaxRow, 0) corner point location of the composite image in lat/lon coordinates.	A/21	XDDMMSS.SSYDDDMMSS.SS or ±dd.dddddd±ddd.ddddddd		C
NUM_VOLUMES	Number of Volumes. Total number of volumes that make up the Look. ------ = Unknown/Default	N/6	000001 to 999999 or ------		<R>
The Fields LOOK_INSTANCE through DSR constitutes the Volume section of the MITOCA.					

Table H-1. MITOCA – Multiple Images Table Of Contents

R = Required, C = Conditional, A = Alphanumeric (BCS-A), N = Numeric (BCS-N),
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Field	Name/Description	Size	Value Range	Units	Type
LOOK_INSTANCE	Look Instance. Identifies which 'Look' the data in this volume belongs to. Volumes may have special relationships within a Look, such as a MiS imaged with multiple looks (i.e. repetitive point imaging, or a MiS imaged with simultaneous sensors). In this case each repetitive point, EO or IR look image may be organized into one or more volumes that need to be easily associated. The mechanism used to associate the volumes of a repetitive look (point scene for example) is the LOOK_INSTANCE value.	N/6	000001 to 999999		R
VOLUME_NUM	Volume Number. Identifies which volume of the overall MiS the volume composite and/or collection of component images identified in this TRE belongs to. The volume number is strictly a consecutive count of volumes within the MiS, independent of Looks. For MiSs where temporal arrangement is relevant, it is highly recommended volumes be numbered in temporal order, where a lower number (e.g. 000001) represents the volume of images in the MiS that were collected first.	N/6	000001 to 999999		R
SENSOR_ID	Sensor Identifier. Identifies which specific sensor produced the collection of images in this volume. Values can be registered at http://jitc.fhu.disa.mil/nitf/reg_fields.html.	A/6	Alphanumeric		R

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R = Required, C = Conditional, A = Alphanumeric (BCS-A), N = Numeric (BCS-N),
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Field	Name/Description	Size	Value Range	Units	Type
SENSOR_ID_TYPE	Sensor Identifier Type. Identifies the type of sensor that produced the collection of images in this volume. Values can be registered at http://jitc.fhu.disa.mil/nitf/reg_fields.html.	A/4	Alphanumeric		R
MPLAN	Mission Plan Mode. Identifies the collection (imaging) mode of the sensor that produced the collection of images in this volume. Values can be registered at http://jitc.fhu.disa.mil/nitf/reg_fields.html.	A/3	Alpahnumeric		R
VOLUME_COMPOSITE_INDEX	Volume Composite Image Index Value. Provides the unique "display level" referenced in this NITF file for the NITF image segment that contains the composite/overview image segment IM that depicts this volume. 000 – Volume composite image not present in this NITF file 001 to 999 - composite image display level (IDLVL in composite image segment subheader)	N/3	000, 001 to 999		R
VOLUME_COMPOSITE_ID_LEN	Volume Composite Identifier Length. Length of the VOLUME_COMPOSITE_ID field in bytes.	N/3	001 to 999	bytes	R

Table H-1. MITOCA – Multiple Images Table Of Contents

R = Required, C = Conditional, A = Alphanumeric (BCS-A), N = Numeric (BCS-N),
<> = Allowed default is specified

Field	Name/Description	Size	Value Range	Units	Type
VOLUME_COMPOSITE_ID	Volume Composite Image Identifier. This field contains the portion of the Volume Composite image ID that uniquely identifies the Composite image. Together, the SCENE_ID field and the VOLUME_COMPOSITE_ID field correlate to the IMAGE ID of this composite image.	~~N~~A/ 1-999	Alphanumeric		R
The following four fields describe the Minimum Bounding Polygon of four geo-points (MBP4) for the Volume. In some cases, the coverage area described by these geo-points may not be completely represented with imagery referenced by this MITOCA (see figure 1. Single Look Example for description of void areas). These points are the earth coordinates corresponding with the image pixel array corner locations of the Volume composite image and are provided in image coordinate order: (0,0), (0, MaxCol), (MaxRow, MaxCol), (MaxRow, 0). Note: Volume composite coordinates must be provided even if the Volume composite image is not.					
VOLUME_CORNER_1	Volume Corner Point 1. Pixel (0,0) corner point location of the composite image in lat/lon coordinates.	A/21	XDDMMSS.SSYDDDMMSS.SS or ±dd.dddddd±ddd.ddddd		R
VOLUME_CORNER_2	Volume Corner Point 2. Pixel (0, MaxCol) corner point location of the composite image in lat/lon coordinates.	A/21	XDDMMSS.SSYDDDMMSS.SS or ±dd.dddddd±ddd.ddddd		R
VOLUME_CORNER_3	Volume Corner Point 3. Pixel (MaxRow, MaxCol) corner point location of the composite image in lat/lon coordinates.	A/21	XDDMMSS.SSYDDDMMSS.SS or ±dd.dddddd±ddd.ddddd		R
VOLUME_ CORNER_4	Volume Corner Point 4. Pixel (MaxRow, 0) corner point location of the composite image in lat/lon coordinates.	A/21	XDDMMSS.SSYDDDMMSS.SS or ±dd.dddddd±ddd.ddddd		R

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Table H-1. MITOCA – Multiple Images Table Of Contents

R = Required, C = Conditional, A = Alphanumeric (BCS-A), N = Numeric (BCS-N),
<> = Allowed default is specified

Field	Name/Description	Size	Value Range	Units	Type
NUM_COMPONENTS	Number of Component Image Segments. The number of component image segments (e.g. frames, tiles, etc.) that belong to this Volume. If the temporal arrangement of component images is relevant, it is highly recommended they be enumerated (below) and recorded (image segment wise) in the order they were collected.	N/3	001 to 999		R
COMPONENTS_FLAG	Component Image Segments Presence Flag. Indicates whether or not the component images, which belong to this volume, are present as individual image segments within this NITF file. Either **all** or **none** of the component image segments belonging to this volume are present in this NITF file. 0 = None of the component image segments are present in this NITF file (i.e., they are stored individually in separate NITF files). 1 = All of the component image segments are present in this NITF file. 2 to 9 Reserved.	N/1	0 or 1		R

Table H-1. MITOCA – Multiple Images Table Of Contents

R = Required, C = Conditional, A = Alphanumeric (BCS-A), N = Numeric (BCS-N),
<> = Allowed default is specified

Field	Name/Description	Size	Value Range	Units	Type
NUM_ROWS	Number of Pixel Rows. Number of significant pixel rows in the Volume composite/overview image. Same value as in the NROWS field in the composite image subheader. Note: since the coordinates of the Volume composite image must be provided even if the composite image is not, NUM_ROWS should always be known and always populated (similarly for NUM_COLS below).	N/8	00000001 to 99999999		R
NUM_COLS	Number of Pixel Columns. Number of significant pixel columns in the Volume composite/overview image. Same value as in the NCOLS field in the composite image subheader.	N/8	00000001 to 99999999		R
DSR	Down Sample Ratio. The down sample ratio of the Volume_composite/ overview image.	N/7	0001.00 to 9999.99 0001.00 = no down sample 0002.00 = down sampled 2 to 1 0003.00 = down sampled 3 to 1 0003.50 = down sampled 3.5 to 1 etc.		R
The Fields COMPONENT_ID_LEN through LOWER_LEFT_COL constitutes the Component Section of the MITOCA.					
COMPONENT_ID_LEN	Component Identifier Length. Length of the COMPONENT_ID field in bytes. Together, the SCENE_ID field and the COMPONENT_ID field correlate to the IMAGE ID of the component image.	N/3	001 to 999	bytes	R

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Table H-1. MITOCA – Multiple Images Table Of Contents

R = Required, C = Conditional, A = Alphanumeric (BCS-A), N = Numeric (BCS-N),
<> = Allowed default is specified

Field	Name/Description	Size	Value Range	Units	Type
COMPONENT_INDEX_TYPE	Component Image Index Type. In addition to populating the Component ID field, either the Display Level (DL) or sequence count (starting with 001) of the Component Image Segment may be included through use of the conditional ISH_INDEX field. This conditional field allows a specific Component Image Segment within an NITF file to be identified in circumstances wherein the value populated in the ITITLE/IID2 field of the Image Subheader may not provide a means to uniquely identify the Component Image Segment.	N/1	0 – ISH_INDEX field is omitted. 1 – Display Level ISH_INDEX field contains the Display Level of the Image Segment within the NITF file. 2- Sequence Number. ISH_INDEX field contains the instance count of the Image Segment within the NITF file. 3 to 9 Reserved.	N/A	R
The remaining fields of this TRE repeat NUM_COMPONENTS times: ***(Note: If temporal arrangement of images is important, they should be enumerated below in the order they were collected)***					
COMPONENT_ID	Component Image ID. This is the portion of the component image ID within a MiS that uniquely identifies the referenced component image segment within the LOOK. Together, the SCENE_ID field and the COMPONENT_ID field correlate to the IMAGE ID of the component image.	A/1 - 999	Alphanumeric		R

Table H-1. MITOCA – Multiple Images Table Of Contents

R = Required, C = Conditional, A = Alphanumeric (BCS-A), N = Numeric (BCS-N),
<> = Allowed default is specified

Field	Name/Description	Size	Value Range	Units	Type
ISH_INDEX	Image Sub-Header Index. A conditional field depending on the value populated in the COMPONENT_INDEX_TYPE field. Contains either the Display Level (DL) or sequence count (starting with 001) of the Component Image Segment within the NITF file. This conditional field allows a specific Component Image Segment within an NITF file to be identified in circumstances wherein the value populated in the ITITLE/IID2 field of the Image Subheader may not provide a means to uniquely identify the Component Image Segment.	N/3	001 - 999		C
The following four fields describe the Minimum Bounding Polygon of four geo-points (MBP4) for the Component Image. These points are the earth coordinates corresponding with the image pixel array corner locations of the Component Image and are provided in image coordinate order: (0,0), (0, MaxCol), (MaxRow, MaxCol), (MaxRow, 0).					
COMPONENT_ CORNER_1	Component Corner Point 1. Pixel (0,0) corner point location of the component image in lat/lon coordinates.	A/21	XDDMMSS.SSYDDDMMSS.SS or ±dd.dddddd±ddd.ddddddd		R
COMPONENT_ CORNER_2	Component Corner Point 2. Pixel (0, MaxCol) corner point location of the component image in lat/lon coordinates.	A/21	XDDMMSS.SSYDDDMMSS.SS or ±dd.dddddd±ddd.ddddddd		R
COMPONENT_ CORNER_3	Component Corner Point 3. Pixel (MaxRow, MaxCol) corner point location of the component image in lat/lon coordinates.	A/21	XDDMMSS.SSYDDDMMSS.SS or ±dd.dddddd±ddd.ddddddd		R
COMPONENT_ CORNER_4	Component Corner Point 4. Pixel (MaxRow, 0) corner point location of the component image in lat/lon coordinates.	A/21	XDDMMSS.SSYDDDMMSS.SS or ±dd.dddddd±ddd.ddddddd		R

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Table H-1. MITOCA – Multiple Images Table Of Contents

R = Required, C = Conditional, A = Alphanumeric (BCS-A), N = Numeric (BCS-N),
<> = Allowed default is specified

Field	Name/Description	Size	Value Range	Units	Type
UPPER_LEFT_ROW	Upper Left Row Pixel Offset. Row pixel (offset[1]) of the upper left corner point of the component image relative to the Volume composite image. This field is not present if VOLUME_COMPOSITE_INDEX = 0.	N/8	00000000 to 99999998	pixels	C
UPPER_LEFT_COL	Upper Left Column Pixel Offset. Column pixel (offset[1]) of the upper left corner point of the component image relative to the Volume composite image. This field is not present if VOLUME_COMPOSITE_INDEX = 0.	N/8	00000000 to 99999998	pixels	C
UPPER_RIGHT_ROW	Upper Right Row Pixel Offset. Row pixel (offset[1]) of the upper right corner point of the component image relative to the Volume composite image. This field is not present if VOLUME_COMPOSITE_INDEX = 0.	N/8	00000000 to 99999998	pixels	C
UPPER_RIGHT_COL	Upper Right Column Pixel Offset. Column pixel (offset[1]) of the upper right corner point of the component image relative to the Volume composite image. This field is not present if VOLUME_COMPOSITE_INDEX = 0.	N/8	00000000 to 99999998	pixels	C
LOWER_RIGHT_ROW	Lower Right Row Pixel Offset. Row pixel (offset[1]) of the lower right corner point of the component image relative to the Volume composite image. This field is not present if VOLUME_COMPOSITE_INDEX = 0.	N/8	00000000 to 99999998	pixels	C

Table H-1. MITOCA – Multiple Images Table Of Contents

R = Required, C = Conditional, A = Alphanumeric (BCS-A), N = Numeric (BCS-N),
<> = Allowed default is specified

Field	Name/Description	Size	Value Range	Units	Type
LOWER_RIGHT_COL	Lower Right Column Pixel Offset. Column pixel (offset[1]) of the lower right corner point of the component image relative to the Volume composite image. This field is not present if VOLUME_COMPOSITE_INDEX = 0.	N/8	00000000 to 99999998	pixels	C
LOWER_LEFT_ROW	Lower Left Row Pixel Offset. Row pixel (offset[1]) of the lower left corner point of the component image relative to the Volume composite image. This field is not present if VOLUME_COMPOSITE_INDEX = 0.	N/8	00000000 to 99999998	pixels	C
LOWER_LEFT_COL	Lower Left Column Pixel Offset. Column pixel (offset[1]) of the lower left corner point of the component image relative to the Volume composite image. This field is not present if VOLUME_COMPOSITE_INDEX = 0.	N/8	00000000 to 99999998	pixels	C

Note 1: A component image row/col offset is computed with the component image down sampled to the same resolution (DSR) as the composite image it belongs to. Typically each component image in an NITF image segment is a full resolution image, an exception would be a volume of composite images, where the components of the volume are composites (TBD0005).

5 TEST CRITERIA [TBD002]

5.1 MITOCA Pack Criteria

The following test criteria apply to the packing (generation) of NITF files when using the MITOCA TRE.

5.1.1 All character values in MITOCA TRE are in the printable BCS-A character set (space (0x20) through tilde (0x7E)) with eight bits (one byte per character).

5.1.2 All data in fields designated as alphanumeric (BCS-A) are left justified and padded with spaces as necessary to fill the field.

5.1.3 All data in numeric (BCS-N) fields are right justified and padded with leading zeros as necessary to fill the field.

5.1.4 All required fields are present and contain valid data as defined in the MITOCA specification.

5.1.5 Conditional fields are only present when the conditional parameters of predicate fields so signify. When present, conditional fields contain valid data.

5.1.6 Fields are not populated with default or unknown-designator values unless the actual value is truly unavailable at the specific lifecycle stage of data formation.

5.1.7 Coordinate fields are accurately populated within the tolerance requirements designated for the Implementation Under Test (IUT).

5.1.8 The MITOCA TRE(s) is placed in either the Extended Header Data (XHD) or User Defined Header Data (UDHD) sections of the NITF file header, or in an associated TRE_OVERFLOW DES.

5.1.9 Each MITOCA TRE describes a single volume of NITF IM segments comprised of all, or a portion, of the image data collected from a single Look, a single sensor type, and operating in a single imaging mode.

5.1.10 The Volume index value is unique within the scene.

5.1.11 The LOOK_INSTANCE value is unique within the scene and is a common value among volumes of the same Look.

5.1.12 Application of the MITOCA TRE is limited to the established community implementation constraints as flagged by the value populated in the SCENE_TYPE field.

5.1.13 The LOOK_COMPOSITE_INDEX value accurately identifies the state and placement of the Look composite IM Segment.

5.1.14 The VOLUME_COMPOSITE_INDEX value accurately identifies the state and placement of the Volume IM Segment.

5.1.15 The component image row/col pixel (offset) values accurately associate the coverage of the component image within the composite image.

5.1.16 When chipping, a new Volume and MITOCA must be generated, to represent the Components of the chip.

5.1.17 A chipped Volume will maintain the original volumes VOLUME_NUM and LOOK_INSTANCE.

5.1.18 Pixel chipped Components will contain an ICHIPB TRE.

5.1.19 All chipped Composite images will contain an ICHIPB TRE.

5.2 MITOCA Unpack Criteria

The MITOCA TRE specification does not define specific functional requirements for the unpack, interpretation and use of the information provided in the MITOCA TRE. Therefore, the following unpack test criteria serve as foundation principles for determining compliance for whatever MITOCA-based functionality a specific implementation supports. These criteria serve as the basis for establishing the appropriate compliance test measures for the specified functional requirements of the IUT.

5.2.1 The IUT can accurately associate volume MBP4s within the Look MBP4. Upon selecting a point within the Look MBP4, the IUT can identify the volume(s) associated with that point.

5.2.2 Upon selecting a point within the Volume composite image, the IUT can accurately associate the component image(s) with the selected point.

5.2.3 The IUT can accurately associate data for each specific Look within a MiS, both single volume and multiple volume.

5.2.4 The IUT supports a multiple volume MiS collection when the volumes are within a single NITF file.

5.2.5 The IUT supports a multiple volume MiS collection when the volumes are distributed among multiple NITF files.

6 NOTES [TBD003]

Candidate Topics for Inclusion in NOTES section:

- Data/Processing Lifecycle Considerations for Population of MITOCA.
- Initialization of Sequence Numbers and Counters. When they need to be re-started, when they can continue, maintaining sequence order, etc.
- Use of ICHIPB TRE in conjunction with MITOCA.
- Including MITOCA TRE in NITF Files Containing a Single IM Segment.
- Clarify Proper Handling of Void Areas.

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- Candidate Presentation/Display Options for NITF files with MITOCA in Light of Past Practice for Using the CCS and DL/AL Relationships.

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ANNEX A - GLOSSARY

Chip – an extracted Area of Interest (AOI). The AOI may cross numerous independent image arrays, yielding numerous chips. There are two standard chipping techniques, Component chip and Pixel chip. In the case of **Component** chipping, if a Component has pixels in the AOI, then the entire Component is provided as one of the Component chips. In the case of **Pixel** chipping, if a Component has pixels in the AOI, then only the pixels (or close to those pixels) bounded by the AOI are provided. In both cases the resulting product may contain numerous chips, one for each Component associated with the AOI.

Component Image - an array of pixel values and associated support data contained in a volume and may be used to make a composite image.

Composite Image - an array of pixel values derived from one or more component images to form a composite overview of the coverage area (MBP4) of the component images or the Look containing the component images.

Frame - an array of pixel values typically generated from a framing sensor. Typically a frame is a component image.

Look – a mechanism for identifying/grouping related imagings of a MiS. The Look instance will identify which imaging instance a target was imaged in. Some sensors image the same target numerous times, each yielding numerous Looks.

Mosaic Image - for the purposes of this document, the same as a composite image.

Muliti-image Scene - a group of images collected over a designated area of coverage, all with the same scene number.

Overview Image - for the purposes of this document, the same as a composite image.

Scene Composite Image - an overview image of the Scene's Component Images.

Super-Composite – a composite image made up of composite images (TBD005).

TCPED – Tasking, Collection, Processing, Exploitation and Dissemination. A term encompassing the functions that makes up the end-to-end imagery and geospatial cycle.

Volume - a mechanism for dividing data within a single MiS.

Volume Composite Image - an overview image made up of the Volume's Component Images.

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ANNEX B - ACRONYMS

A

AOI – Area of Interest

B

BCS-A – Basic Character Set – Alphanumeric

BCS-N - Basic Character Set – Numeric

C

CIP – Common Imagery Processor

D

DCGS – Distributed Common Ground/Surface System

DL – Display Level

E

EO – Electro-Optical

F

FR – Full Resolution

I

ICHIP – Image Chip (an NITF Tagged Record Extension)

IM –Image Segment

IN – Image Sub Header

IPON – Implementation Practices of the NITFS

IR – Infrared

IUT – Implementation Under Test

M

MBP4 – Minimum Bounding Polygon of 4 geo-points

MiS – Multi-image Scene

MITOCA – Multi-image Scene Table of Contents

N

NITF – National Imagery Transmission Format

NITFS – National Imagery Transmission Format Standard

NTB – NITFS Technical Board

R

RR – Reduced Resolution

S

SAR – Synthetic Aperature Radar

SWS –Software Work Station

T

TEM – Technical Exchange Meeting

TCPED – Tasking, Collection, Processing, Exploitation and Dissemination

TRE – Tagged Record Extension

U

UDHD – User Defined Header Data

V

VC – Volume Composite

X

XHD – Extended Header Data

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ANNEX C – THE DCGS IMPLEMENTATION OF MITOCA

This appendix describes the specific practices for the DCGS implementation of the MITOCA TRE. The implementation described in Annex C corresponds with a SCENE_TYPE of 001.

C.1 DCGS Tactical Image Identification

Each image will be identified by a unique image identification located in the NITF image subheader Image Identification 2 (IID2) field (NITF2.1) or Image Title (ITITLE) field (NITF 2.0). The mapping defined in STDI-0002 Version 2.1, Table 8-4 between AIMIDB and ITITLE/IID2 is no longer a requirement and should not be implemented. The next release of the STDI-0002 will reflect this change. The structure and content of the ID is defined in the Tactical Image ID section of the “Implementation Practices of the National Imagery Transmission Format Standard (IPON)”, version 1.0 (Note: The MITOCA TRE was initially published in the IPON, version 2.0 also). The DCGS Implementation employs two variations of image ID, a Component ID and a Composite ID. Both variations are provided for every Volume in the MITOCA and the respective image subheader IID2 fields of each image. In cases where a Look or Volume Composite is not present, its ID will not be present in the MITOCA.

C.1.1 Component IDs

The first 18 bytes of the 40 character Tactical Image ID identify scene characteristics, and the last 22 bytes uniquely identify the component. In the case of multi-component scenes, there will be numerous components with the same "root" ID (first 18 bytes), each having unique trailing IDs (last 22 bytes). Together the root 18 and trailing 22 bytes constitute a unique image ID.

C.1.2 Composite IDs

The first 18 bytes match the root ID of the components used to make the composite and the trailing 22 bytes uniquely ID the composite. Composite images will use the REPLAY field to indicate the image was processed into a composite. The following codes will identify the type of composite:

- C01 – Look composite
- C02 – Volume composite

The following table provides specific instructions for some fields of the MITOCA TRE. Those fields not listed below adhere to the general implementation as defined in Table 1 above.

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Table H-C-1. MITOCA Fields

Field	Description	DCGS Implementation
SCENE_TYPE	Scene Type. This field serves as a 'flag' to identify the specific implementation practices and conventions applicable for implementation and use of this TRE.	This field is set to 001 to flag this TRE follows the DCGS implementation practices for the MITOCA TRE.
SCENE_ID_LEN	Scene Identifier Length. Length of the SCENE_ID field in bytes. Together, the SCENE_ID field and the COMPONENT_ID field correlate to the IMAGE ID of the component image.	This field must be set to 018 since the first 18 characters of the DCGS image ID are common within a scene.
SCENE_ID	Scene Identifier. Allows up to 999 characters to serve as the scene identifier. All components of a scene must have a common Scene ID, which is defined as the common portion of each component's unique image ID.	This field is 18 bytes long and is populated with the first 18 characters of the DCGS Image ID common to all components in the scene. The first 18 characters of the Image ID must be the same for all components in the scene. Reference the definition of the DCGS Image ID in the "Implementation Practices of the National Imagery Transmission Format Standard (IPON)", version TBD, dated TBD.
LOOK_COMPOSITE_ID_LEN	Look Composite Identifier Length. Length of the LOOK_COMPOSITE_ID field in bytes. If the LOOK_COMPOSITE_INDEX is ---, then the LOOK_COMPOSITE_ID is not present and this field is populated 000.	This field will either be 000, indicating there is not a Look Composite, or it will be 022, since the last 22 characters of the 40-character DCGS image ID are used to differentiate individual images within a common scene.
LOOK_COMPOSITE_ID	Look Composite Image Identifier. This field is only present if the LOOK_COMPOSITE_ID_LEN is not 000 and contains the portion of the Look Composite image ID that uniquely identifies this Composite image. Together, the SCENE_ID field and the LOOK_COMPOSITE_ID field correlate to the IMAGE ID of this composite image.	If the LOOK_COMPOSITE_ID_LEN is 022, this field will contain the remaining 22 of the 40 character image ID beyond the scene ID portion (18 characters) extracted from the ITITLE/IID2 field of the component image. The REPLAY field will be a flag that this is a Composite image.

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Field	Description	DCGS Implementation
SENSOR_ID	Sensor Identifier. Identifies which specific sensor produced the collection of images in this volume.	See STDI-0002, ACFTB: SENSOR_ID field for allowed value range.
SENSOR_ID_TYPE	Sensor Identifier Type. Identifies the type of sensor that produced the collection of images in this volume.	See STDI-0002, ACFTB: SENSOR_ID_TYPE field for allowed value range
MPLAN	Mission Plan Mode. Identifies the collection (imaging) mode of the sensor that produced the collection of images in this volume.	See STDI-0002, ACFTB: MPLAN field for allowed value range
VOLUME_COMPOSITE_INDEX	Volume Composite Image Index Value. Provides the unique "display level" referenced in this NITF file for the NITF image segment that contains the composite/overview image segment IM that depicts this volume. 000 – Volume composite image not present in this NITF file 001 to 999 - composite image display level (IDLVL in composite image segment subheader)	Recommend the Volume Composite image always be present.
VOLUME_COMPOSITE_ID_LEN	Volume Composite Identifier Length. Length of the VOLUME_COMPOSITE_ID field in bytes.	This field must be set to 022 since the last 22 characters of the 40-character DCGS image ID are used to differentiate individual images within a common scene.
VOLUME_COMPOSITE_ID	Volume Composite Image Identifier. This field contains the portion of the Volume Composite image ID that uniquely identifies the Composite image. Together, the SCENE_ID field and the VOLUME_COMPOSITE_ID field correlate to the IMAGE ID of this composite image.	The remaining 22 of the 40 character image ID beyond the scene ID portion (18 characters) extracted from the ITITLE/IID2 field of the component image. The REPLAY field will be a flag that this is a Composite image.

Field	Description	DCGS Implementation
COMPONENT_ID_LEN	Component Identifier Length. Length of the COMPONENT_ID field in bytes. Together, the SCENE_ID field and the COMPONENT_ID field correlate to the IMAGE ID of the component image.	This field must be set to 022 since the last 22 characters of the 40-character DCGS image ID are used to differentiate individual images within a common scene.
COMPONENT_ID	Component Image ID. This is the portion of the component image IDs within a MiS that uniquely identifies the referenced component image segment within the LOOK. Together, the SCENE_ID field and the COMPONENT_ID field correlate to the IMAGE ID of the component image.	The remaining 22 of the 40 character image ID beyond the scene ID portion (18 characters) extracted from the ITITLE/IID2 field of the component image.

C.1.3 Composite/Overview Image ASDE Considerations

When generating a composite overview image, the inclusion of all the ASDEs from the full resolution component(s) is not required and in some cases may even be confusing to a recipient of the data. The necessity of the ASDEs should be determined based on how the composite/overview image will be used. The following list provides some guidelines and considerations for generating ASDEs for composite/overview images.

- As a minimum, the Aircraft Information (ACFTB) and Additional Image Identification (AIMIDB) ASDEs should be present, but both ASDEs will need to be re-populated to reflect the characteristics of the composite/overview image.

- Even though the EO-IR Sensor Parameters (SENSRA) ASDE is required for EO/IR/MSI, it may not be feasible, due to the numerous SENSRA ASDEs present in the component images of the composite. The presence of this TRE is not expected.

- If the SENSRA ASDE were included in a composite/overview, the values should be recalculated to reflect the component images of the composite/overview.

- The presence of the optional ASDEs identified in the STDI-0002 Version 2.1, Table 8-1 will not be expected.

- If the composite/overview image will be used for exploitation purposes, the ASDEs from the full resolution image component(s) should be present with the addition of the ICHIPB ASDE.

- If the composite/overview image is accompanied by the full resolution component(s) and will not be used for exploitation, the presence of the SENSRA and optional ASDEs are not necessary.

- The acceptance of the Tactical Image ID may cause a future action to abolish the requirement for using the AIMIDB ASDE altogether, even in full resolution component images. It is expected that future research will lead toward the abolishment of AIMIDB or a new AIMIDC.

C.2 DCGS Tactical Output Data Types

As DCGS imagery data is passed from one component to another, it will typically conform to one of six output types, lettered A through F. This section attempts to describe these output types. Figure H-C-1 below depicts the DCGS lifecycle with the expected output types for each component.

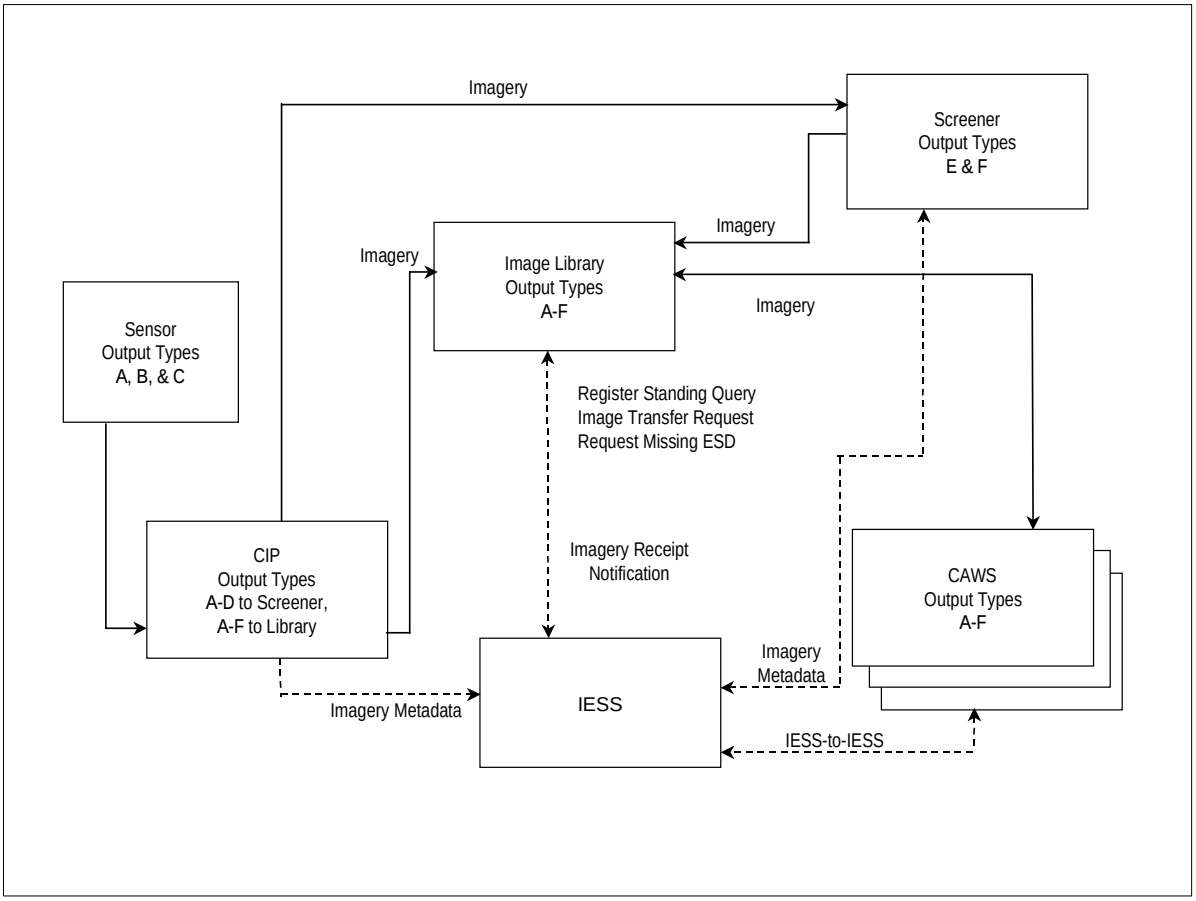

Figure H-C-1 - Expected Output Types

The examples below use the following acronyms:

FR – Full Resolution Image

RR – Reduced Resolution Image

VC – Volume Composite image

M – MITOCA TRE

( ) – delineates an NITF file

[ ] – delineates a Volume

C.2.1 Output Type A

- A Look composed of FR images only, each in a separate NITF file
- A MITOCA is not present
- A composite image is not present

$$(FR_1) + \ldots + (FR_N)$$

C.2.2 Output Type B

- A Look composed of FR images and corresponding RR images
- Ideally, a MITOCA is present for every FR/RR pair, i.e. each pair is a Volume having one Component Image (the FR) and a Volume composite (the RR)
- The only difference between A and B is the RR (which in this case is the Volume composite)

$$(FR_1 + RR_2) + \ldots + (FR_N + RR_N) \text{ or}$$

$$\text{Ideally: } [\,(M_1 + FR_1 + RR_1)\,] + \ldots + [\,(M_N + FR_N + RR_N)\,]$$

C.2.3 Output Type C

- A single or multi-volume Look composed of FR images in separate NITF files
- Contains a MITOCA TRE and a Volume composite

$$[\,(FR_1) + \ldots + (FR_N) + (M_1 + VC_1)\,] \text{ or}$$

$$[\,(FR_1) + \ldots + (FR_N) + (M_1 + VC_1)\,] + [\,(FR_{N+1}) + \ldots + (FR_{N+M}) + (M_X + VC_X)\,] + \ldots$$

C.2.4 Output Type D

- A single or multi-volume Look with Volume composite(s)
- Each Volume contains a MITOCA TRE

$$[\,(M_1 + VC_1)\,] + \ldots + [\,(M_X + VC_X)\,]$$

C.2.5 Output Type E

- A single or multi-volume Look composed of FR images all in a single NITF file
- Contains a MITOCA TRE and Volume composite
- The Volume Composite may be contained in a separate NITF file of Output Type D

$$[\,(M_1 + VC_1 + FR_1 + \ldots + FR_N)\,] + [\,(M_X + VC_X + FR_{N+1} + FR_{N+M})\,] + \ldots \text{ or}$$

[(an Output Type D) + (FR_1+ … + FR_N)] + [(an output type D) + (FR_{N+1} + FR_{N+M})]
+

C.2.6 Output Type F

- An image chip of any of the above output types (Type A – Type E), see section C.3 for a detailed description and examples of chipping outputs

- Contains a MITOCA TRE and Volume composite

C.2.7 Display/Attachment Levels

- Initially, systems may not be able to ingest and exploit the MITOCA to its full potential. It is therefore recommended that the NITF display/attachment Level (DL/AL) fields be used to organize and "collage" the Components of a MiS Volume when possible. This will, as a minimum, act as a default overview display, and will provide a minimum level of visual appreciation for the Volume when a Volume Composite is not present or the receiving application does not support MITOCA. The following items are for consideration only and the implementation of "collaged" Components is not a requirement, just a recommendation. It may not even be possible under all circumstances, due to file size, the size of the NITFS common coordinate system space, and other like constraints. The following is a list of things to consider when implementing DL/AL within a MiS.Use attachment levels to keep from maximizing the ten bytes of the image location ILOC field

- A collage can be generated by:

    - abutting each Component exactly on NROWS/NCOLS pixel boundaries or

    - abut each Component, but not exactly on NROWS/NCOLS pixel boundaries leaving background color between Components

- If a Composite image exists, place it in the upper left corner of the NITFS CCS and begin the collage of Components directly below the Composite, so as to not cover the Composite with the collage

- Ensure maximum CCS size of (00000000, 00000000) to (99999999, 99999999) is not exceeded

C.3 Standard Output of MITOC Chipping

This section contains general purpose information on image chipping in any scenario at any stage of the lifecycle (i.e., exploitation, screener, library, etc.) where chipping may take place. For ease of explanation, the DCGS screener workstation (SWS) scenario has been chosen.

After DCGS imagery has been passed through the Common Imagery Processor (CIP) it will be transferred to a screener as a reduced resolution (RR) composite image. A user at the SWS can then choose an area of interest (AOI) from the composite imagery displayed on the screen. The pixel information contained within the AOI is used to create an image chip file--a full resolution (FR) file(s) containing the AOI. Figure H-C-2 illustrates three types of chipping outputs, which will be further described in following paragraphs.

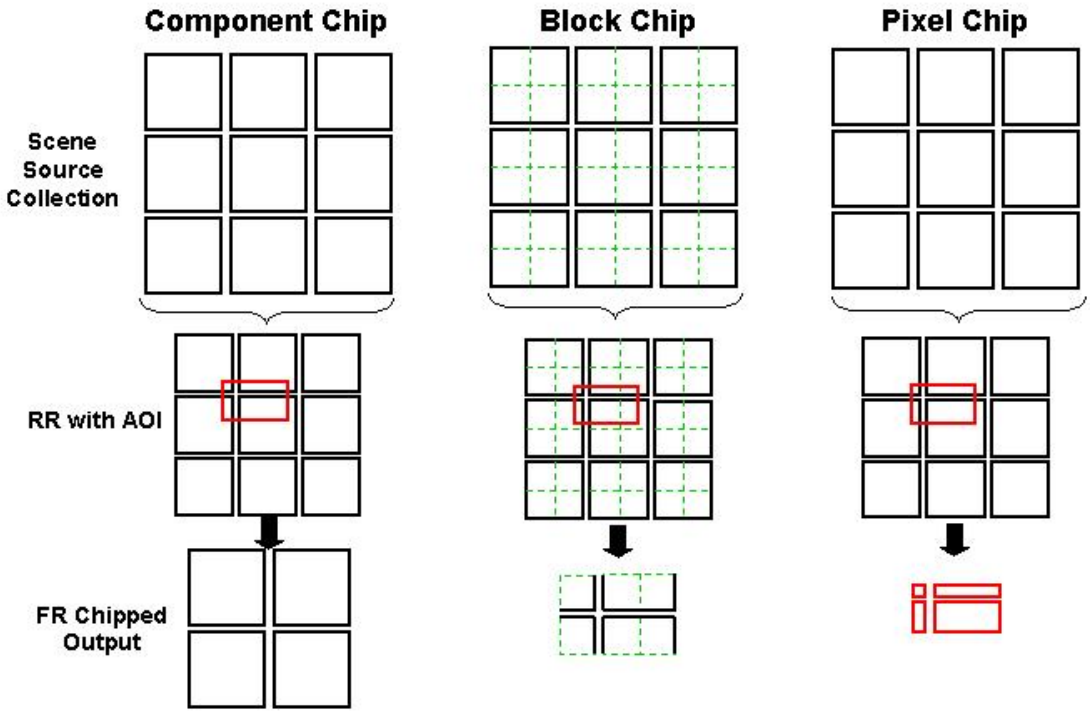

Figure H-C-2 - Standard MITOCA Chip Outputs

C.3.1 Pixel Chip

With pixel chipping, the recipient will receive the pixels bounded within the AOI by the user at the screener workstation. This AOI generates a new composite image (usually RR), and can optionally be included in an image segment in the output chip file. A MITOCA and an ICHIPB TRE will accompany the composite image in the segment's main header and image subheader respectively. When the AOI crosses multiple components, the resulting output will contain each component "piece" (only those pixels within the bounds of the AOI) of the chipped image within its own image segment with an ICHIPB TRE for each. Each component piece will also contain the original support data for that component. See figure H-C-3.

Pixel chipping can also be performed within a single component. In this case, the output would only contain an image segment for the piece chipped and may optionally include a new composite image.

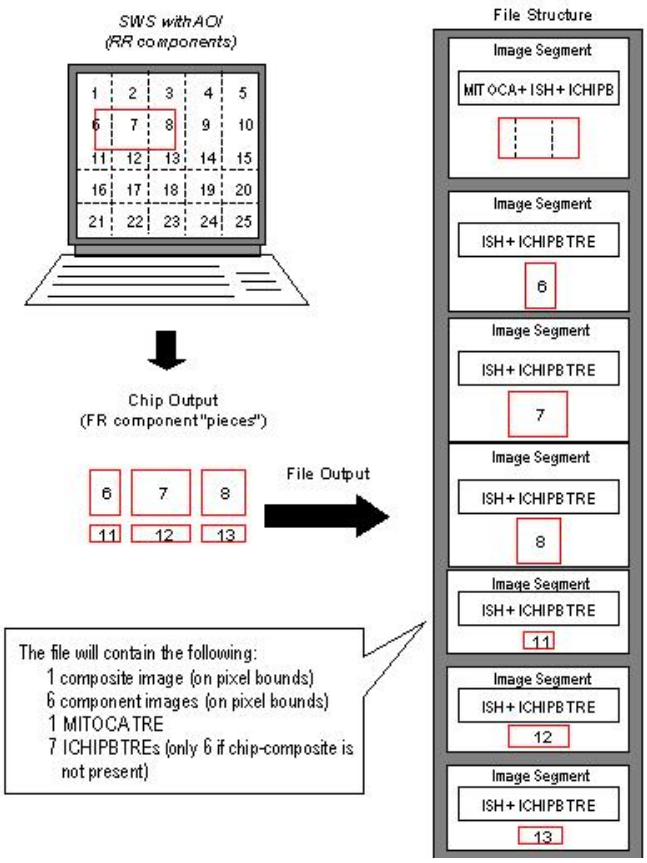

Figure H-C-3 - Pixel Chip Output

C.3.2 Component Chip

With component chipping the output is not necessarily an actual image chip. The recipient will receive each whole component within the bounds of the AOI chosen by the user at the screener workstation. This AOI generates a new composite image (usually RR). Since the output is the same data as the original (just re-grouped) there is no need for an ICHIPB TRE. The new composite image can optionally be included in an image segment in the output "chip" file along with an ICHIPB TRE. A MITOCA TRE will accompany the composite image in the segment's main header. When the AOI crosses multiple components, the resulting output will contain each whole component of the AOI within its own image segment with its original support data. Again, an ICHIPB TRE is not included with any of the components. Figure H-C-4 illustrates Component chipping.

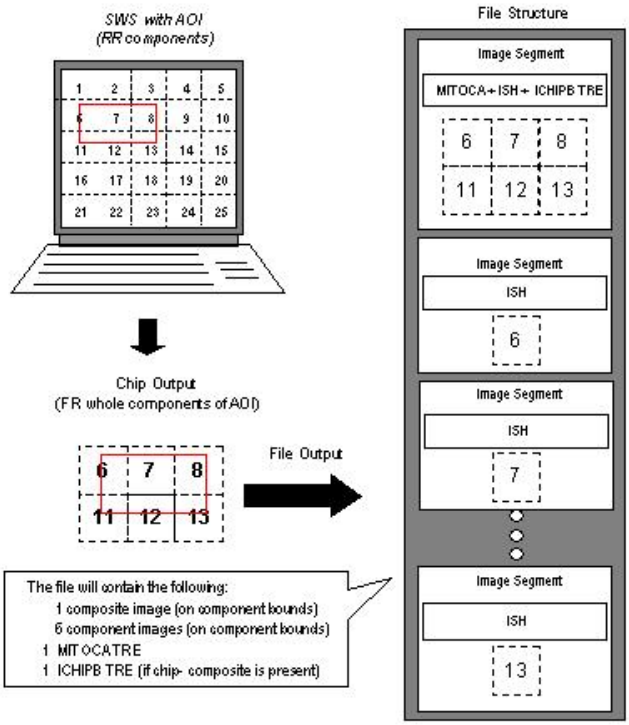

Figure H-C-4- Component Chip Output

C.3.3 Block Chip

With block chipping, the recipient will receive all the internal NITF image blocks touched by the AOI. These blocks generate a new composite image (usually RR), and can optionally be included in an image segment in the output chip file. A MITOCA and an ICHIPB TRE will accompany the composite image in the segment's main header and image subheader respectively. When the AOI crosses multiple components, the resulting output will be an image segment for each component, containing only the affected blocks of each component. Each segment will contain an ICHIPB and the original original support data for that component. See figure H-C-5.

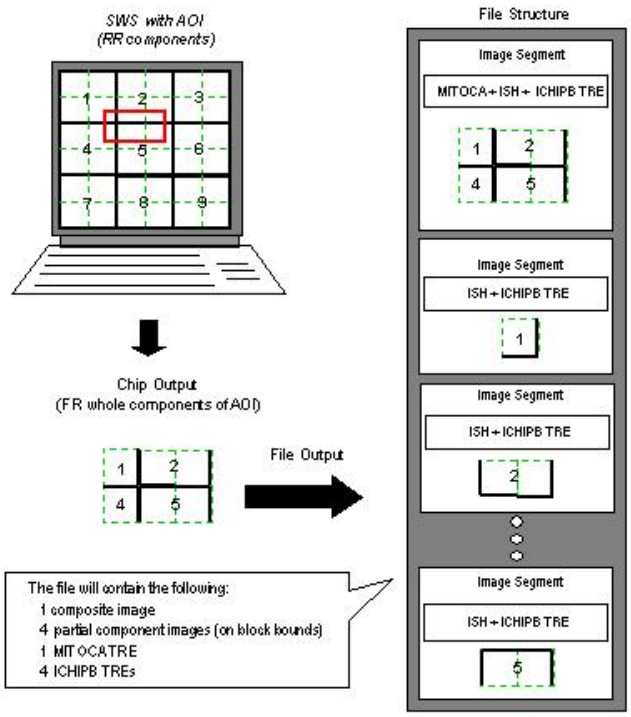

Figure H-C-5- Block Chip Output

C.4 Library Considerations

A library provides services for receipt, catalog, browse, search, select, notify, format conversion, information maintenance, storage, archive, and communicating

geospatial intelligence information. The MITOCA TRE provides support for managing a multi-image scene during the Tasking, Collection, Processing, Exploitation and Dissemination (TCPED) process. A MITOCA TRE can be beneficial to a library because it will be able to act on a Volume of related imagery instead of treating each individual Component as a stand-alone image. The following sub-sections define the basic characteristics of a MiS in a library and provide some minimum guidelines for developers to consider. Features that are somewhat advanced (support not expected during early development stages) are noted by an *.

C.4.1 Ingest

- Volumes should be cataloged as a single image, therefore there is no need to catalog every Component individually (even in the case where every image of a scene is its own Volume)
- Only the FR IM and support data of a paired IM segment Volume (one FR, one RR both having the same image ID) should be cataloged (see Output Type B)
- R-sets should be generated from the FR, not a RR (see Output Type B)
- A RR can be used as a thumbnail image or a new R-set can be made (see Output Type B)
- If a Volume Composite is not provided, consider generating a burned-in composite of the NITF canvas
- A Volume may only contain a file main header with a MITOCA TRE and should still be cataloged
- *A Look Composite can be made by amalgamating Volume Composites

C.4.2 Discovery

- Clients should initially be capable of discovering relevant Volume Composites
- Clients should additionally be capable of using a Volume Composite to narrow down an area of interest
- A Volume with only a MITOCA (and possibly a Volume Composite) can be used by the client to find the list of relevant components, but an additional search will be necessary to retrieve them

- Components belonging to the same scene can be tracked using the image ID (particularly Output Type A)

- Paired IM segments (one FR, one RR both having the same image ID) constituting their own Volume can be identified by: identical image IDs and by comparing Image Magnifications (IMAG) (see Output Type B)

C.4.3 Translation

- Translations/conversions should be uniformly applied across the whole Volume.

C.4.4 Export

- Products should be exported as one of the six output types described in C.2.