

STILL AND MOTION IMAGERY METADATA STANDARD

FOREWORD

The National Aeronautics and Space Administration (NASA) has been preserving imagery from the late 1950's to the present. NASA and its affiliates, like all federal agencies has a requirement to provide for the safekeeping of records that document the agency's mission and to transfer those records to the National Archive and Records Administration (NARA) based on record retention schedules developed between NASA and NARA.

The preservation of NASA still and motion imagery collections has evolved over the years and is documented in paper log books, spreadsheets, and most recently, in stand-alone computerized databases. The metadata or information about the imagery varies from catalog to catalog depending on the needs of the personnel who are responsible for the "custodial care" of the imagery content.

This standard has been developed by the NASA Metadata Working Group and is approved and published by NASA for use by NASA Headquarters, NASA Centers and their subsidiary locations as well as NASA contractors where applicable to NASA contractual agreements.

This standard provides a comprehensive guide for all imagery resources produced by or for the agency, and also defines applicable requirements for metadata as required by Federal law.

Table of Contents

1. Scope	4
1.1 Purpose	4
1.2 Applicability.....	4
1.3 General Guidance.....	4
2. Applicable and Reference Documents	5
2.1 Applicable and Reference Documents	5
3. Acronyms and Definitions	6
3.1 Acronyms.....	6
3.2 Definitions.....	6
4. Core Metadata Set	7
4.1 Core Metadata Elements	7
5. Extended Metadata Set	8
5.1 Extended Metadata Elements	8
Appendix A: Core Set Table	9
Appendix B: Extended Set Table	10
Appendix C: Naming Convention	11
Appendix D: Best Practice Guidelines	12
Motion Imagery Guideline	13
Still Imagery Guideline	14

1. Scope

1.1 Purpose

This standard establishes requirements and responsibilities related to metadata for NASA still and motion imagery resources. It contains requirements for a required core metadata set and a recommended extended metadata set along with guidelines to assist NASA organizations in complying with the standard. The standard does not address Section 508 compliance for imagery resources.

1.2 Applicability

- 1.2.1 Compliance with this standard is mandatory for all NASA centers and affiliates that are supporting imagery tasks, NASA projects and/or programs that manage imagery resources. The individual NASA Centers and affiliates are responsible for implementation and enforcement.
- 1.2.2 This NASA standard is applicable to all still and motion imagery content created by or for NASA and its affiliates.
- 1.2.3 Any decision to waive or vary from the requirements in this NASA-STD requires the concurrence of the NASA Metadata Working Group, Configuration Control Board.
- 1.2.4 Within this NASA standard, the word “shall” indicates a mandatory requirement, the word “should” indicates that a statement is strongly recommended for implementation but not required, and the word “may” indicates an optional implementation.

1.3 General Guidance

- 1.3.1 This document establishes at minimum, the necessary metadata for imagery resources and is intended to be the foundation for the preservation of NASA imagery records. The metadata standard will be compliant with Dublin Core Metadata Initiative (DCMI) specifications. This requirement is subject to change upon revision of the laws governing Federal record preservation. These requirements shall apply to all NASA still and motion imagery. All NASA Centers and facilities are responsible for keeping up to date with applicable Federal requirements.

2. Applicable and Reference Documents

2.1 Applicable and Reference Documents

The documents listed in this section are accessible via the World Wide Web, or directly from the Standards Developing Organizations (SDO) or other document distributors.

Federal Laws and Regulations:

- U.S. Code of Federal Regulations, Title 36, Subchapter B Records Management.
<http://www.archives.gov/about/regulations/part-1222.html#partb>
- U.S. Code, Title 44, Chapter 31, Records Management by Federal Agencies.
<http://www.archives.gov/about/laws/fed-agencies.html>

NASA Directives and Requirements:

- NPR 1441.1, NASA Records Retention Schedules (NRRS).
<http://nodis3.gsfc.nasa.gov./displayDir.cfm?t=NPR&c=1441&s=1D>
- NPD 1440.6, NASA Records Management.
<http://nodis3.gsfc.nasa.gov./displayDir.cfm?t=NPD&c=1440&s=6H>
- NPD 1383.1, Release and Management of Audiovisual Products.
<http://nodis3.gsfc.nasa.gov./displayDir.cfm?t=NPD&c=1383&s=1C>

Reference Documents:

- CCSDS 650.0-B-1, Consultative Committee for Space Data Systems: Open Archival Information System (OAIS)
<http://public.ccsds.org/publications/archive/650x0b1.pdf>
- DCMI Metadata Terms
<http://dublincore.org/documents/dcmi-terms/>
- Department of Defense (DoD), How to Create a Visual Information Record Identification Number (VIRIN)
<http://www.defenseimagery.mil/learning/howto/virin.html>
- Society of Motion Picture & Television Engineers (SMPTE) Standard 377-1, Material Exchange Format (MXF) — File Format Specification
<http://specs4.ihserc.com/DocViewDetails.aspx?sess=833953210&prod=SPECS4&docid=QWJLNEAAAAAAAAAA>

3. Acronyms and Definitions

3.1 Acronyms

AVI	Audio Video Interleave
CMS	Content Management System
DCMI	Dublin Core Metadata Initiative
DoD	Department of Defense
EXIF	Exchangeable Image File Format
JPG	Joint Photographic Expert Group
MIME	Multipurpose Internet Mail Extensions
MLP	Mobile Launch Platform
MOV	QuickTime Movie
MXF	Material Exchange Format
NARA	National Archive and Records Administration
NASA	National Aeronautics and Space Administration
NRRS	NASA Records Retention Schedules
OAIS	Open Archival Information System
SDO	Standards Developing Organizations
SMPTE	Society of Motion Picture & Television Engineers
STS	Space Transportation System
VAB	Vehicle Assembly Building
VIRIN	Visual Information Record Identification Number

3.2 Definitions

Camera RAW: Image file format of the uncompressed data captured by a camera sensor.

Dublin Core: A metadata element standard of generic resource descriptions which provide a set of rules for describing content.

Exchangeable Image File Format (EXIF): Metadata are elements of descriptive information embedded in a resource by the device that captured the content.

Metadata: Structured information that describes, explains, locates, or otherwise makes it easier to retrieve, use, or manage an information resource.

Metadata Element: A term used as part of a standard that describes content and provides structure information about a resource.

Material Exchange Format (MXF): Object-based file format that wraps video, audio, and other bitstreams optimized for content workflow, distribution, and archiving.

Section 508: An Amendment to the Rehabilitation Act of 1973 that requires Federal agencies to make their electronic and information technology accessible to people with disabilities.

4. Core Metadata Set

The Core Set is the minimum complement of required metadata elements for NASA imagery content necessary to meet NARA requirements for Federal records preservation.

4.1 Core Metadata Elements

This section contains the element name and a brief description. All NASA still and motion imagery shall have these elements. For a list of the elements and examples see Appendix A.

- 4.1.1 Copyright: Information about rights held in and over the resource. The rights information includes a statement about the property rights associated with the resource, including intellectual property rights.
- 4.1.2 Creator: The entity primarily responsible for making the resource. Examples of a Creator can include a person, an organization or a service.
- 4.1.3 Date Taken: Point in time associated with the capture or origin of the resource.
- 4.1.4 Description: The explanation of the resource. It may include but is not limited to: an abstract, a table of contents, a graphical representation, or a free-text account of the resource.
- 4.1.5 File Format: The Internet Media Type or Multipurpose Internet Mail Extensions (MIME) file format, physical medium, or dimensions of the resource.
- 4.1.6 Image Type: Describes the visual representation of the file. Identifies resource as a moving or still image with a description such as 35mm motion picture color film.
- 4.1.7 Location: Named place specified by its geographic position of the subject matter in the image. Where appropriate, named places or time periods can be used in preference to numeric identifiers such as sets of coordinates or date ranges. Latitude and longitude coordinates are not required.
- 4.1.8 Resource Identifier: The unique identifier associated to each image resource. The naming convention, Appendix C, describes the identifier for the image resource.
- 4.1.9 Source: Defines the specific content, i.e. still image or motion image footage that makes up the resource. The present resource may be derived from the Source in whole or in part.
- 4.1.10 Title: Name given to the resource.
- 4.1.11 Use Restrictions: Information about who can access the resource or an indication of its security status. Can include information regarding access or restrictions based on privacy, security, or other policies.

5. Extended Metadata Set

The Extended Set is recommended metadata elements that help imaging service personnel with the imagery workflow and provide additional elements for the search and retrieval of content that are not required for Federal records preservation.

Exchangeable Image File Format (EXIF) metadata elements are considered optional. The EXIF elements will not be listed here because they are defined by other standards and the use of EXIF elements can vary by manufacturer. However, it does need to be noted that elements in both the core and extended sets may be embedded into the resource through the use of customizable EXIF features by the device that captures the imagery asset.

5.1 Extended Metadata Elements

This section contains the element name and a brief description. All NASA still and motion imagery may have these elements. For a list of the elements and examples see Appendix B.

- 5.1.1 Additional ID: Supplementary identifiers for the image resource.
- 5.1.2 Color Space: The description of the range of colors, or gamut, that a camera can see, a printer can print, or a monitor can display.
- 5.1.3 Creator Contact Information: All necessary information to get in contact with the creator of the resource.
- 5.1.4 Creator Tool: The name of the first known tool used to create the resource.
- 5.1.5 Disposition: Instructions for the disposition of the imagery resource per the NASA Records Retention Schedule.
- 5.1.6 Instructions: Any of a number of instructions from the provider or creator to the receiver of the item.
- 5.1.7 Keywords: An index of terms or subject classifications.
- 5.1.8 Language: Language of the resource.
- 5.1.9 Publisher: The entity responsible for making the resource available. Examples of a Publisher include a person, an organization, or a service.
- 5.1.10 Rights Statement: A web URL for a statement of the ownership and usage rights for this resource.
- 5.1.11 Scene List: An inventory of the scenes that comprise the image resource.
- 5.1.12 Script: Dialogue and instructions for a film or television program.

Appendix A: Core Set Table

Element Name	Example	NARA Requirement	DCMI Term
Copyright	No copyright protection is asserted for this photograph.	36CFR1237.28; 36CFR1237.30	rightsHolder
Creator	NASA/KSC/Adam Baum	36CFR1237.28; 36CFR1237.30	creator
Date Taken	7/1/2008	36CFR1237.20;	date
Description	Space Shuttle Atlantis, atop the mobile launcher platform, rolls back into high bay 1 of the Vehicle Assembly Building from Launch Pad 39A.	36CFR1237.28; 36CFR1237.30	description
File Format	RAW, JPG, MOV, AVI, Other	36CFR1237.26; 36CFR1237.28	format
Image Type	Digital still image, Digital motion image, 35mm motion picture film	36CFR1237.12;	type
Location	Vehicle Assembly Building, KSC, FL.	36CFR1237.28; 36CFR1237.30	coverage
Resource ID	KSC-20080701-ABAU01-1234	36CFR1237.20; 36CFR1237.30	identifier
Source	Original Digital File, BetaCam tape, 35mm color negative	36CFR1237.12; 36CFR1237.28	source
Title	STS-117 Space Shuttle Atlantis roll back.	36CFR1237.20;	title
Use Restrictions	Unrestricted Still Image, Restricted Motion Image	36CFR1237.20; 36CFR1237.28	rights

Appendix B: Extended Set Table

Element Name	Examples	DCMI Terms
Additional ID	KSC-2012-2913, iss031e065030	isVersionOf
Color Space	Adobe 1998, sRGB, CMYK	isFormatOf
Creator Contact Information	NASA Headquarters, 300 E Street SW, Washington DC 20024-3210	contributor
Creator Tool	Adobe Photoshop, Apple FinalCut Pro	accrualMethod
Disposition	Temporary record, destroy/delete between 5 and 30 years after program/project termination.	provenance
Instructions	Use embedded ICC Profile when printing.	instructionalMethod
Keywords	STS-117, Shuttle, Atlantis, VAB, MLP	subject
Language	English, Spanish, French, Chinese	language
Publisher	Published by NASA	publisher
Rights Statement	Using NASA Imagery and Linking to NASA Web Site.	accessRights
Scene List	STS-133 launch from pad surface, STS-134 launch from VAB roof	isReferencedBy
Script	Link to content	(Link)

Appendix C: Naming Convention

One of the primary issues with managing imagery is being able to provide a unique identifier for each imagery asset. The naming convention will provide a means for each organization that creates and manages imagery for NASA to assign a unique resource identifier for each image.

KSC- 20120529- ABAU01- 1234
 NASA Center- Date- Media ID- Item Number

NASA Center: The center location or affiliate site where the image resource was initially captured. Use the official acronym of the NASA Center or location. Here are a few examples;

AMES RESEARCH CENTER	ARC
DRYDEN FLIGHT RESEARCH CENTER	DFRC
GLENN RESEARCH CENTER	GRC
GODARD SPACE FLIGHT CENTER	GSFC
IV AND V FACILITY	IVV
JET PROPULSION LABORATORY	JPL
JOHNSON SPACE CENTER	JSC
KENNEDY SPACE CENTER	KSC
LANGLEY RESEARCH CENTER	LRC
MARSHALL SPACE FLIGHT CENTER	MSFC
MICHOUD ASSEMBLY FACILITY	MAF
NASA HEADQUARTERS	NHQ
SPACE TELESCOPE SCIENCE INSTITUTE	STSI
STENNIS SPACE CENTER	SSC
WALLOPS FLIGHT FACILITY	WFF
WHITE SANDS TEST FACILITY	WSTF

Date: Date resource was captured written as yyymmdd.

Media Identifier: Use the creator's first initial and the first three letters of their last name with a two digit number that will represent the job number of the day. For example, photographer Adam Baum's first job of the day would be ABAU01.

Item Number: Sequential number for each resource which would start at zero for each job.

Appendix D: Best Practice Guidelines

The “Best Practice” guidelines presented will demonstrate how metadata can be integrated into the image lifecycle in order to assist organizations managing NASA assets to comply with the metadata standard and Federal record retention schedule.

To make the process effective, it is best to look at how the metadata can be associated or embedded with the imagery during the lifecycle of the content. Having the metadata process built into the imagery lifecycle provides an efficient means to manage and preserve image content.

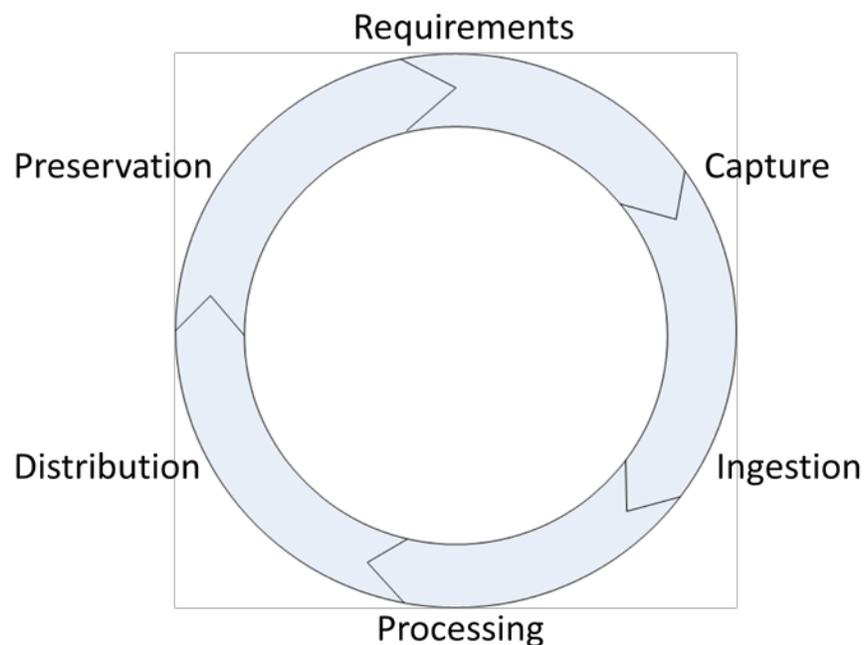


Figure D- 1 Image Lifecycle

The process of acquiring metadata starts when the customer requests a service at the beginning of the image lifecycle, see Figure D-1. The who, what, why, when and where of the task from the customer requirements along with the metadata created when the imagery is captured, has to be ingested with the resource. During the processing the metadata is verified before the imagery is distributed and entered into a Content Management System (CMS). With the imagery and metadata entered into a CMS it can be made available for use by the entire NASA community. The imagery will be preserved in accordance with the NRRS and is retrievable for future projects as required.

When the lifecycle breaks down, imagery is distributed and stored in a way that increases the cost while reducing the value of the resource. The guidelines are intended to help organizations develop and maintain an image lifecycle to properly capture, ingest, process, distribute and preserve imagery.

Motion Imagery Guideline

Digital motion imagery is used to capture a variety of content from live TV and web streams to Hollywood productions that can take a year or more to finish. There are also a large variety of cameras and file formats being used to capture video to meet every demand. For the motion image guideline, the workflow will be described using the MXF file format. Please refer to Figure D-2 for more details on the metadata workflow.

There are a variety of cameras on the market that use MXF files for the recording video. It is a generic container that allows for a variety of data to be wrapped with the motion image content. Part of that data is the metadata that is used throughout the image lifecycle.

The videographer has the option with MXF supported video cameras to add or import name of the task, creator, location etc... along with other metadata directly into the device to be recorded with imagery content when it is being captured.

After the imagery is ingested into a secured storage area, additional metadata can be added during post production. As the motion imagery clips are being edited, metadata tags can be added to describe what is taking place in the video and make future search and retrieval easier. The technician/editor enters the remaining required core metadata elements, see Section 4.

The imagery can then be transcoded into the appropriate format for distribution as required and entered into a CMS. The workflow may vary for live events with the imagery content being tagged during playout and the remaining required metadata entered when the imagery is loaded into the CMS for preservation.

The CMS makes the imagery available to the customer as well as retrievable for future productions. The content can also be transferred to NARA in accordance to the record retention schedule.

Still Imagery Guideline

Digital still cameras have a variety of features that can facilitate the capturing of metadata along with the image file. For the still image guideline, the workflow will be described using the Nikon D3x camera and the features it provides. Please refer to Figure D-2 for more details on the metadata workflow.

The process of gathering metadata begins with the first discussion with the customer. Whether it's through an email request or phone call the customer service person receiving the requirements transfers all pertinent information to the photographer to assist with the capture of the imagery.

Before the photographer leaves for the job, the customizable metadata elements in the camera such as the file name, copyright, image comment etc... along with time and date are set to ensure the data is captured along with the image file. The image file format is set to camera RAW to allow for the TIF file to be created and transferred to NARA as part of the retention process.

While the images are being taken, the photographer has the option of audio tagging images with additional information when required. The photographer can add the names of any VIPs in the field of view or if taking images for engineering purposes could name and describe the item or part that is being photographed.

Once the photographer has acquired the images they are downloaded to a secured work area on a server. The photographer batch renames the images if required to provide for a consistent image naming or Resource ID, as well as ensuring the creator, description, and location metadata is entered with the image files along with any pertinent data that was captured with the imagery.

A photo lab technician checks to make sure the appropriate metadata from the job has been entered by the photographer. If the data is not present the lab technician contacts the photographer to have them update the image files.

The lab technician then retrieves the images from the photographer's folder and transfers them to the lab folder on the server. The technician prepares the imagery to meet the customer requirements and as part of the process enters the remaining required core metadata elements, see Section 4. The imagery is then entered into a content management system for distribution so the customer can review the imagery and make selections for other products as required.

Once the imagery is in the content management system it can be searched for and retrieved. The proper retention schedule can be applied to resource for transfer to NARA.

Figure D-2, Metadata Workflow

