

Operations Coordination Plan Status

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Operations Coordination Plan Update

- *The Operations Coordination Plan For The Morning and Afternoon Constellations* document expires in May 2020.
- At the last MOWG meeting in June 2019, we presented a summary of proposed updates.
- Discussions ensued regarding the scope of the MOWG in the future.
- As a result, we decided to delay the document update until a consensus is reached.

The following slides summarize the document changes made thus far

Operations Coordination Plan History

YEAR	EVENT
2002	Landsat-7 and Terra publish their <i>Morning Train Coincident Observations Implementation and Operations Plan</i>
2003	A-Train Mission Operations Working Group (MOWG) formed. Agreements begin to be developed between MOWG teams.
2005	A-Train MOWG agreements published : <ul style="list-style-type: none">• <i>Afternoon Constellation Operations Coordination Plan</i>• <i>Afternoon Constellation Contingency Procedures</i>
2008	Published Revision #1 of both documents (<i>A-Train missions only</i>)
2011	Published Revision #2 of both documents (<i>A-Train missions only</i>)
2015	Published the <i>Operations Coordination Plan For The Morning and Afternoon Constellations</i> (Document # 428-PLAN-011)

The current 2015 version expires in May 2020

Operations Coordination Plan

Change Summary (1 of 2)

- **Envelope size change – Constellation Change Request (CCR) #17**
- **Personnel changes**
- **Constellation Coordination System (CCS) screen updates**
- **Constellation evolution**
 - Earth Observing-1 (EO-1) decommissioning
 - CloudSat exit
 - Cloud Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) exit
 - C-Train creation
 - Global Change Observation Mission 1st – Water (GCOM-W1) relocation

Operations Coordination Plan Change Summary (2 of 2)

- **In this document update, the C-Train is still considered to be a part of the Afternoon Constellation.**
 - Still crosses the equator in the afternoon
 - Has periodic coincident science opportunity periods with other A-Train satellites
 - Follows precedent set by the Polarization and Anisotropy of Reflectances for Atmospheric Science coupled with Observations from a Lidar (PARASOL) mission which was not in the *A-Train orbit* after December 2009 but was considered *part of the A-Train* through their decommissioning in December 2013.
- **Many of the original requirements for A-Train constellation flying no longer apply to the C-Train, so the C-Train specific information was moved to a newly created Section 3.**

Specific Document Changes

Front Matter

SECTION	CHANGE
Signature page	<ul style="list-style-type: none">• Updated to list the current signatories
Preface	<ul style="list-style-type: none">• Eliminated reference to pre-2015 versions. Updated contact name and address.

Specific Document Changes

Section 1 – *Constellation Coordination*

SUBSECTION	CHANGE
1.1 (“ <i>Purpose</i> ”):	<ul style="list-style-type: none"> Brought history up-to-date (e.g., new envelope definition, EO-1 decommissioning, GCOM-W1 relocation, C-Train)
1.2 (“ <i>Scope</i> ”)	<ul style="list-style-type: none"> Added a reference to the new Section 3 (“C-Train”)
1.3 (“ <i>Definition of Terms</i> ”)	<ul style="list-style-type: none"> Added “C-Train”. Added a note about the C-Train in the “Afternoon Constellation” definition. Updated the “Constellation Envelope” definition per CCR #17 by changing the Margin from 2 km to 0.5 km.
1.4 (“ <i>Documentation</i> ”)	<ul style="list-style-type: none"> Updated with the latest Applicable and Reference document versions. Removed some old documents.
1.5 (“ <i>Operations Coordination</i> ”)	<ul style="list-style-type: none"> Updated the <i>MOWG Executive Board</i> contacts
1.7.1 (“ <i>Launch and Early Orbit Analysis</i> ”)	<ul style="list-style-type: none"> Updated text to clarify launch execution errors, per Ted Sweetser’s comment.
1.8 (“ <i>Anomaly and Conflict Resolution Process</i> ”)	<ul style="list-style-type: none"> Updated Figure 1-4 to remove EO-1
1.9 (“ <i>Constellation Exit Planning</i> ”)	<ul style="list-style-type: none"> Updated text to require Exit Plans “<i>at least 18 months</i>” prior to expected exit, per MOWG action item #1706-01.

Specific Document Changes

Section 2 – *Afternoon Constellation (1 of 2)*

SUBSECTION	CHANGE
2.1 (“ <i>Afternoon Constellation Coordination</i> ”)	<ul style="list-style-type: none"> Updated the science and operations leads.
2.2. (“ <i>Afternoon Constellation Overview</i> ”)	<ul style="list-style-type: none"> Updated text due to the C-Train creation Updated Figure 2-1 to show the current configuration Removed CALIPSO and CloudSat from Tables 2-1 and 2-2
2.3.1 (“ <i>Afternoon Constellation Placement Strategy</i> ”):	<ul style="list-style-type: none"> Updated Figure 2-2 to show the current control box configuration Removed CALIPSO and CloudSat info from text and Table 2-3. Relocated Table 2-3 to be near the start of the section. Updated text and table entries to reflect GCOM-W1’s new location
2.3.1.4 (“ <i>OCO-2 Placement Strategy</i> ”)	<ul style="list-style-type: none"> Updated OCO-2 mean local time of the ascending node (MLTAN) wording, per Mark Vincent.

Specific Document Changes

Section 2 – *Afternoon Constellation (2 of 2)*

SUBSECTION	CHANGE
2.3.2. (“ <i>Afternoon Constellation Drag Makeup Maneuvers</i> ”)	<ul style="list-style-type: none">• Removed CALIPSO and CloudSat
2.3.3 (“ <i>Afternoon Constellation Inclination Adjust Maneuvers</i> ”)	<ul style="list-style-type: none">• Added list of inclination adjust maneuvers (IAMs) conducted since 2015
2.4.1.2 (“ <i>Constellation-Related Flags</i> ”) and 2.5 (“ <i>Afternoon Constellation Contingency Procedures</i> ”)	<ul style="list-style-type: none">• Updated figures 2-6, 2-9, and 2-10 using more recent CCS screen captures

Specific Document Changes

Section 3 – *C-Train*

SUBSECTION	CHANGE
All subsections	<ul style="list-style-type: none">• New section created to capture the C-Train information

Specific Document Changes

Section 4 – *Morning Constellation*

SUBSECTION	CHANGE
4.1 (“ <i>Morning Constellation Coordination</i> ”)	<ul style="list-style-type: none">• Updated the science and operations leads in Table 4-1
4.2 (“ <i>Morning Constellation Overview</i> ”)	<ul style="list-style-type: none">• Deleted EO-1 from the text, Figure 4-1, and Table 4-2
4.3 (“ <i>Morning Constellation Derived and Operational Requirements</i> ”)	<ul style="list-style-type: none">• Updated text for EO-1 to reflect decommissioning. Deleted EO-1 from Table 4-3 and description of its maneuvers.

Document Update Schedule

- **The expiration date on the current document is May 2020**
- **To publish a signed replacement by then, we will need to agree on the scope of the MOWG and the document changes by no later than February or March 2020**

Questions and suggestions?

Arigatou Gozaimasu

Merci

Thank you

Acronyms and Abbreviations

AM	ante meridiem
ASRC	Arctic Slope Regional Corporation
AM	ante meridiem
CALIPSO	Cloud Aerosol Lidar and Infrared Pathfinder Satellite Observations
CCR	configuration change request
CCS	Constellation Coordination System
CNES	Centre National D'Etudes Spatiales
EO-1	Earth Observing-1
ESMO	Earth Science Mission Operations
GCOM-W1	Global Change Observation Mission 1st - Water
GSFC	Goddard Space Flight Center
IAM	inclination adjust maneuver
JAXA	Japan Aerospace Exploration Agency
km	kilometer
LaRC	Langley Research Center
MLTAN	mean local time of the ascending node
MOWG	Mission Operations Working Group
NASA	National Aeronautics and Space Administration
OCO-2	Orbiting Carbon Observatory-2
PARASOL	Polarization and Anisotropy of Reflectances for Atmospheric Science coupled with Observations from a Lidar
USGS	United States Geological Survey

Reference Section

History of the Constellation agreements (2003-2015)

(Originally presented June 2015)

Afternoon Constellation MOWG 1st Group Meeting (Goddard Space Flight Center, March 2003)



**MOWG was formed and began
developing agreements and guidelines.**

Operations Coordination Plan History (1 of 4)

YEAR	EVENT
2002	Landsat-7 and Terra publish their <i>Morning (AM) Train Coincident Observations Implementation and Operations Plan</i>
2003 - 2004	A-Train MOWG formed. Agreements developed between MOWG teams.
2005	A-Train MOWG published agreements: <ul style="list-style-type: none"> • <i>Afternoon Constellation Operations Coordination Plan</i> • <i>Afternoon Constellation Contingency Procedures</i>
2008	REVISION #1 published (A-Train missions only)
2010	<ul style="list-style-type: none"> • A-Train / Landsat 5 passings highlighted the need for closer coordination between the 2 constellations. • Subsequent discussions at MOWG meetings reinforced the need for <i>one</i> MOWG and one set of agreements.
2011	REVISION #2 published (still A-Train missions only)

Operations Coordination Plan History (2 of 4)

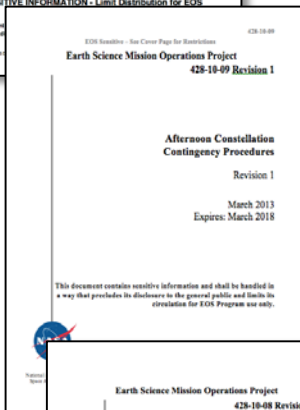
YEAR	EVENT
2012 - 2013	<ul style="list-style-type: none"> • Extensive effort spent to standardize Definitions (e.g., <i>safe exit orbit</i>, <i>Constellation Envelope</i>, etc.). • <i>Operations Coordination Plan</i> and the <i>Contingency Procedures</i> merged. Document also expanded to encompass both the Morning and Afternoon Constellations. • Drafts issued to teams in July and December 2013.
2014	<ul style="list-style-type: none"> • April 11 – Updated document presented at MOWG meeting at GSFC. • July 21 – Interim update issued to add Morning Constellation and OCO-2 information • September 19 – Interim update issued to fix some orbital configuration entries in Table 2-3, Figure 2-2, and Section 2.2. • October 31 – Final document issued for signature approval. This contained some minor updates based on feedback received at the MOWG meeting in October 2014 at NASA Langley Research Center (LaRC).

Operations Coordination Plan History (3 of 4)

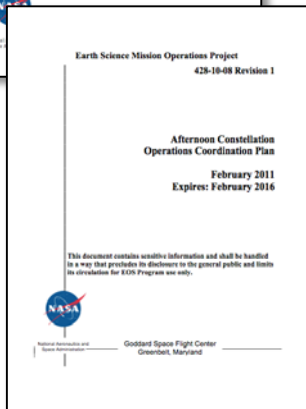
Merging documents



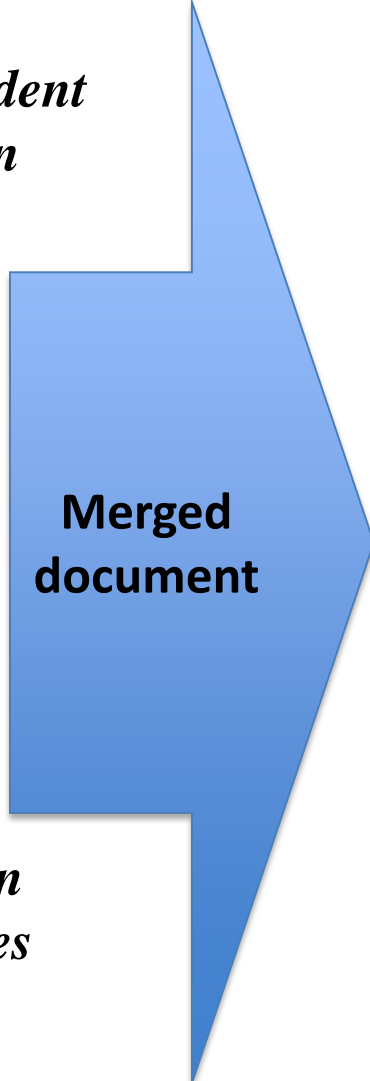
Morning (AM) Train Coincident Observations Implementation and Operations Plan (September 2002)



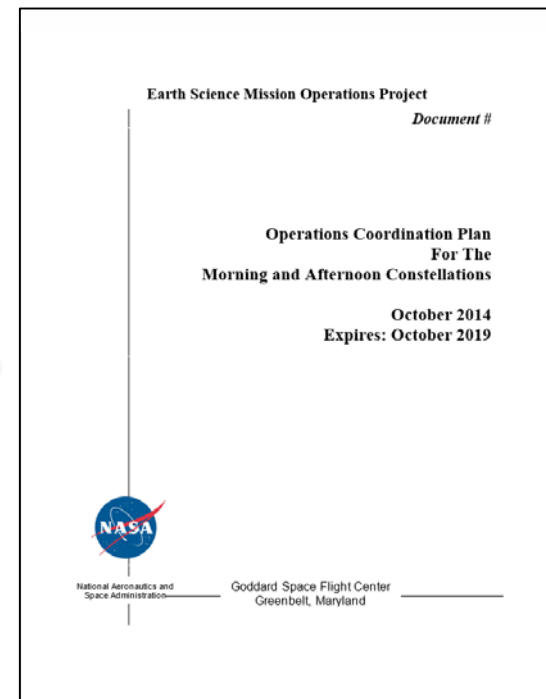
Afternoon Constellation Operations Coordination Plan (February 2011)



Afternoon Constellation Contingency Procedures (February 2011)



Merged document



“New” Operations Coordination Plan (May 2015)

Operations Coordination Plan History (4 of 4)

YEAR	EVENT
2015	<ul style="list-style-type: none">• March – Final signature received from the mission teams• March 31 – Document submitted to Earth Science Mission Operations (ESMO) Project Configuration Management process• May 13 – Document approved and distributed to all teams