NASA GSFC Mission Application Branch (Code 583)

ASSET SYSTEM REQUIREMENTS SPECIFICATION

May 13, 2003

System Requirements Specification for ASSET

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Document Summary

Document Title	System Requirements Specification for ASSET
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Status	Draft

Document Change History Log

Date of Change	Ver	Summary of Change
	1.0	Initial Release

Approvals

Title	Name	Signature	Date

Table of Contents

1 Introduction

1.1 Purpose

The purpose of this document is to describe the enhancements/modifications to be made to the Advanced SSR Scheduling Tool (ASSET) tool. The tool formerly known as the SSR Playback Automation Tool (SPLAT) was renamed ASSET post delivery of the initial system. This document describes the functionality of the changes and modifications/enhancements for the ASSET tool and will be used to drive the design and implementation of the features.

1.2 Scope

The focus of this document is to describe the requirements for the ASSET follow-on work including enhancements and modifications to the system through Use Case diagrams. The requirements presented in this document were derived from the following:

1. SPLAT System Requirements Specification, April 2002.

2. Discussions with Bill Muscovich and Chris Kilzer regarding bullet proofing and flexibility enhancements for SPLAT.

3. Slides from Raytheon MMS/ASSET interface demonstration

4. MMS Users Guide, Rev. C, September 2001

1.3 Definition, Acronyms, and Abbreviations

Acronyms and abbreviations that are used throughout this document and a Glossary of selected terms are included in Appendix A.

1.4 Project Phasing

The development of the ASSET follow-on work has been divided into several iterations. Each iteration builds upon the functionality provided in earlier versions. The iterations for the ASSET follow-on work are as follows:

- ***Release 1*** – The first release of the tool will contain all functionality available in the original and bulletproofing enhancements to better suit it's use by junior level engineers.

- ***Release II*** – The second release of the ASSET tool will contain all the functionality in the first release plus modifications and enhancements that increase the flexibility of the tool.

- ***Release III*** – The third release of ASSET will contain all the functionality in releases I & II and will provide an interface to MMS for automated report retrieval.

- ***Release IV*** – The final release of the ASSET tool will contain any modifications/bug fixes identified during user testing for Release III.

Refer to Section 2.4 for a description of the Use Cases corresponding to the different release.

1.5 Overview

The remainder of this document consists of:

Section 2: System Description – A description of the ASSET tool developed to simplify the procedure for generating SSR Buffer dumps for special events, and the enhancements/modifications to the system. This section also presents the Use Case model from which functional requirements for the enhancements will be derived. The section finishes with a discussion of assumptions, constraints, and dependencies.

Section 3: System Requirements – presents the functional requirements for the ASSET system in the form of Use Case reports and includes a subsection containing non-functional requirements not covered by the Use Cases.

2 System Description

2.1 General System Overview

The ASSET tool partially automates the task of generating buffer dump schedules for the Terra SSR in response to special, non-standard events and difficult planning periods that preclude standard scheduling of buffer playbacks via the Mission Management System (MMS). Prior to the development of ASSET, buffer dump scheduling for these events was a time consuming, error prone activity performed by a single member of the Flight Operations Team (FOT) using manual procedures supported by Microsoft Excel spreadsheets.

2.2 Operations Overview – Current System

Normal planning for SSR buffer dumps is part of the overall planning and scheduling process for Terra and occurs within MMS. However, special events (reduced TDRS time due to Space Shuttle Missions and the recent Ground Network Tests for Aqua) and difficult planning periods (special processing requested by Instrument Engineers) occur which preclude the use of MMS procedures to schedule SSR buffer dumps. For such periods, a manual method of scheduling the SSR buffer dumps is required.

The process of scheduling for difficult planning periods or special events begins with the identification of a difficult scheduling period. A member of an Instrument Operations Team (IOT) or a scheduler for the Terra spacecraft, while performing their normal duties, will identify a period of time for which they believe the MMS procedures are not sufficient for developing an SSR buffer dump schedule.

After such a period is identified, the Spacecraft Engineer responsible for managing the SSR is notified of the event. The Spacecraft Engineer then performs an analysis of the event to determine whether or not special event planning is required. If so, the Spacecraft Engineer begins the process of creating a buffer dump schedule for the planning period. If not, the Spacecraft Engineer notifies the reporting individual that the MMS procedures will be able to create a valid dump schedule for the SSR.

If the Spacecraft Engineer determines that a special schedule is required, approximately 1 week prior to the special event, the process of creating the SSR dump schedule begins. The first step in generating the SSR buffer dump schedule for the special event is gathering the appropriate reports. In order to gather the needed reports, the Spacecraft Engineer logs into a workstation connected to MMS, and starts an MMS session. A new time line is created in MMS and the Spacecraft Engineer displays the current Terra operations schedule for review. After examining the time line data to ensure the correctness of the TDRS contacts and SSR buffer activities, the Spacecraft Engineer executes a series of utility programs to extract the reports required to schedule the special event from the MMS database. These utility programs extract report data for a user specified time period from the MMS database into flat text files. Data is extracted for

TDRS Contact periods and SSR Buffer States. Once the reports are extracted from MMS, the Spacecraft Engineer then changes directory to the orbital events directory in the MMS distribution tree and makes an electronic copy of the 1-week or 7-week AM1 Orbital Events file. Note that the file selected is dependent on how far in the future the Spacecraft Engineer is planning. Additionally note that if the Spacecraft Engineer is planning playbacks that require ground contacts (X-band), an electronic copy of the Ground Network (GN) report is obtained from the FOT.

The SSR Scheduler returns to their personal computer and starts the ASSET tool. Within ASSET, the SSR Scheduler enters the start and stop times for the planning window, selects a mode of operation for ASTER modeling, selects an ASTER modeling percentage if ASTER data is not available, and selects whether the required reports are to be retrieved from a local directory or from the MMS database. The SSR Scheduler then browses the local machine, identifying the input reports required for schedule generation. After the user confirms the scheduling options, depending on the selected report retrieval mode the system either retrieves the needed reports from a local directory (TDRS Contact Report, AM1 Orbital Events, and the SSR Buffer States Reports) for the specified planning window.

Once the reports have been specified, the SSR Scheduler selects the “Create Contacts” icon from the ASSET tool bar. Asset then parses the individual reports, extracting contact periods, day/night events, SSR Buffer states, and possibly ASTER buffer usages, if applicable. At this point, ASSET uses the extracted contact information and the extracted SSR buffer states to determine candidate dump windows for all contacts and a candidate synchronization point. The system initially selects dump windows only at Acquisition of Signal (AOS). The system then selects the synchronization point at which scheduling will begin. When all reports have been parsed and candidate dump windows and a synchronization point have been determined, ASSET displays the contact periods, dump windows, and sync point on the timeline for user review.

The SSR Scheduler then reviews the contact and dump window information displayed by the system and if desired edits the dump windows modifying, adding or deleting dump window entries. After the dump windows have been edited, the SSR scheduler reviews and modifies, as needed, the synchronization point determined by ASSET. The SSR Scheduler then selects the “generate schedule” icon from the ASSET toolbar to create an SSR buffer dump schedule. ASSET creates a schedule containing entries for each of the dump windows specified by the user based on buffer usages, day/night events, and dump window durations, and maximum buffer dump percentages.

Once created, the SSR dump schedule is displayed on the ASSET timeline for review and modification by the SSR Scheduler. At this point the SSR Scheduler may choose to save, print, or cancel the currently displayed schedule. If the SSR Scheduler determines that the schedule is acceptable, it is saved to a text file and/or a hardcopy of the schedule is printed, and manually delivered to the Online Personnel for review, approval, and execution.

2.2.1 Process Improvement Opportunities

Several opportunities for improving the ASSET tool and the SSR special event playback generation process have been identified by the Terra FOT. These include further automating the process of generating schedules by allowing the operator to select the number and types of contacts in which to dump data. Making the tool easier to use and better suited to junior level personnel by amending ambiguous error dialogs, changing some of the mode names and event types to be more intuitive, and increasing the flexibility of the tool so that it can be used to generate schedules for a wider range of special situations.

The following improvements to the tool are proposed:

1. Report Retrieval – ASSET will provide an option to automatically retrieve the necessary files directly from MMS rather than requiring the user to go to the FOT area and manually retrieve the required reports from MMS.

2. Better fit for junior level personnel – Changes referred to as “bullet proofing” will allow the tool to be more easily used and understood by junior level engineers and other FOT personnel thus removing the reliance on senior staff to generate schedules.

3. Increase Tool Flexibility – Additionally, changes will be made to the tool to provide additional flexibility in terms of scheduling playbacks and will allow the tool to be used for a wider range of special situations.

2.2.2 Proposed Operations

The ASSET tool as it currently exists will operate in much the same way that it currently operates. However several key modifications will be made. They are detailed in the sections that follow.

2.2.2.1 Fit to Junior Level Operator

For release 1 of the tool, the modifications and enhancements will center on making the tool easier to use for junior level personnel. These modifications will further reduce the reliance on senior personnel when generating special event schedules and allow FOT personnel, perhaps on-on-line engineers, the ability to generate schedules. The following short list details the modifications to be made:

1. Change ASTER modeling modes “Automatic” to “ATC” and “Manual” to “Fixed Rate”.
2. Modify the “Edit” button label associated with a dump window to reflect any user changes.
3. Change the “SYNC_POINT” event name to “SYNC_PB”.
4. Add and display all pertinent playback related data to the “SYNC_PB” event.

5. Add a line containing the sync point formation to the printed schedule standard header.
6. Modify the printed schedule so that the additional text field is read from a standard template file.
7. Modify the tool such that users can specify columns widths for the printed schedule.
8. Prompt and notify the user when they have selected an invalid sync point (i.e. one too short to empty the buffers).
9. Modify the print preview dialog to fix an error noticed in mouse focus.
10. Add Red and Yellow limit checks for both the playback safety margins and durations between playbacks.

2.2.2.2 Enhance Tool Flexibility

The second series of modifications, provided in release 2, are designed to enhance the flexibility of the tool making it both easier to use and allowing the tool to be used in a greater number of special event situations. The following list details the modifications made for this release are:

1. Provide a mechanism to allow users to save and reload existing schedules.
2. Allow the user to specify a list of TDRS and GN contacts and specify which are to be used for data replay.
3. Modify the synchronization point algorithm to search forward in time for the specified sync point rather than back in time from the start of the schedule. Per the FOT, this is more intuitive.
4. Add user modifiable modeling parameters for the dump window offsets within a contact period.
5. Change the input report specification and parsing algorithms to allow selection and parsing of multiple overlapping reports.
6. Add support for identifying the conditions of and modeling the MODIS 4000 procedure.
7. Modify scheduling algorithm to support overlapping ground contacts.

2.2.2.3 Automated Report Retrieval from MMS

The final modification to be made to the ASSET tool under this development effort is the addition of an interface to the MMS scheduling tool. As previously described, the Spacecraft Engineer responsible for generating the special event schedules must manually extract the required files from the MMS database. As part of this effort, an automated interface to the MMS system for report retrieval will be developed. This interface will allow the operator to automatically retrieve the necessary files to their computer without the need to manually execute procedures on the MMS workstation.

2.3 Assumptions, Constraints, and Dependencies

The ASSET tool is designed to operate on a scheduler's desktop PC. The system requirements assume that the Terra FOT includes personnel whose normal duties encompass the roles defined by the various system Actors.

ASSET expects specific data inputs from MMS, the GN Report if applicable, and an Orbital Events report. The expected inputs and their contents are identified in Section 3.2.

2.4 Use Case Model Survey

Table 2-1 lists the modified/new Use Cases for ASSET and the releases to which they apply.

Table 2-1: Modified/New Uses Cases

Use Case Name	Description	Release(s)
Determine Dump Windows	This use describes the process of determining the initial dump windows for each contact in the scheduling window. Modifications were made to support user specified dump window offsets and user specified station scheduling.	Release II
Determine Sync Point	This use case describes the steps required for selecting the synchronization point. Modifications were made to the sync point selection algorithm for search forward from plan start.	Release II
Edit Dump Windows	This use case documents the process of editing the dump windows. Changes were made to support specification of Partial 4000 playbacks.	Release II
Edit Modeling Parameters	This use case describes the steps performed by the user to modify the parameters used in schedule creation. Changes were made to support specification of Partial 4000 playback flag.	Release II
Generate SSR Buffer Dump Schedule	This use case describes the process the user must follow to create an SSR buffer dump schedule from the extracted report entries. Additional requirements to support Partial 4000 Playbacks	Release II
Print Dump Schedule	This use case describes the steps a user must follow to print an SSR buffer dump schedule.	Build I

Process Input Reports	This use case describes the parsing of the input reports. It is kicked off by the user entering a start and stop time for special event. Changes were made to the names of the ASTER modeling modes.	Release I
Retrieve Reports	This use case describes the operations needed to retrieve the input reports needed by the system. Changes were made to describe the new automated MMS retrieval mechanism	Release III
Save Dump Schedule	This use case describes the steps the user must follow to save a generated SSR buffer dump schedule to a text file. Changes were made to describe the binary schedule save.	Release II
Edit TDRS & GN Station List	This use case describes the steps a user must follow to modify the list of TDRS and GN contacts used for scheduling in ASSET.	Release II
Edit Dump Window Offsets	This use case describes the steps performed by the user to modify the offsets used by the tool during dump window determination.	Release II
Restoring a Saved Schedule	This use case describes the steps a user must perform to reload a saved binary schedule.	Release II

2.4.1 Actors

Table 2-2 describes the users and external systems (or actors) that interface with the system.

Table 2-2: List of Actors

Actor	Actor Description
File Server	This actor represents the file server to which the MMS software will store requested reports. ASSET will interface to this server via FTP to retrieve the required reports.
MMS	This actor represents the Mission Management Software (MMS). MMS is an external system that provides the reports needed to schedule SSR Buffer dumps for special events. The following reports are provided by/extracted from the MMS: the TDRS Contact report, AM1 Orbital Events report, SSR Buffer States report, and the ATC Load Report.
SSR Scheduler	The SSR Scheduler is the main actor in the system and controls the operation of the tool. The SSR Scheduler reviews, monitors and supports command activity, spacecraft activity log, spacecraft recorder management, and clock maintenance. The SSR Schedule may be a Spacecraft Engineer, Flight Engineer, or other member of the FOT.

2.4.2 Use Case Diagrams

Figure 2-1 depicts a detailed diagram of the ASSET system including the p enhancements/modifications. The primary actors are described in detail in section 2.4.1 and the use cases of the complete system including the enhancements and those modified as part of the follow-on effort are described briefly in section 2.4, with more detail provided in Section 3.1.

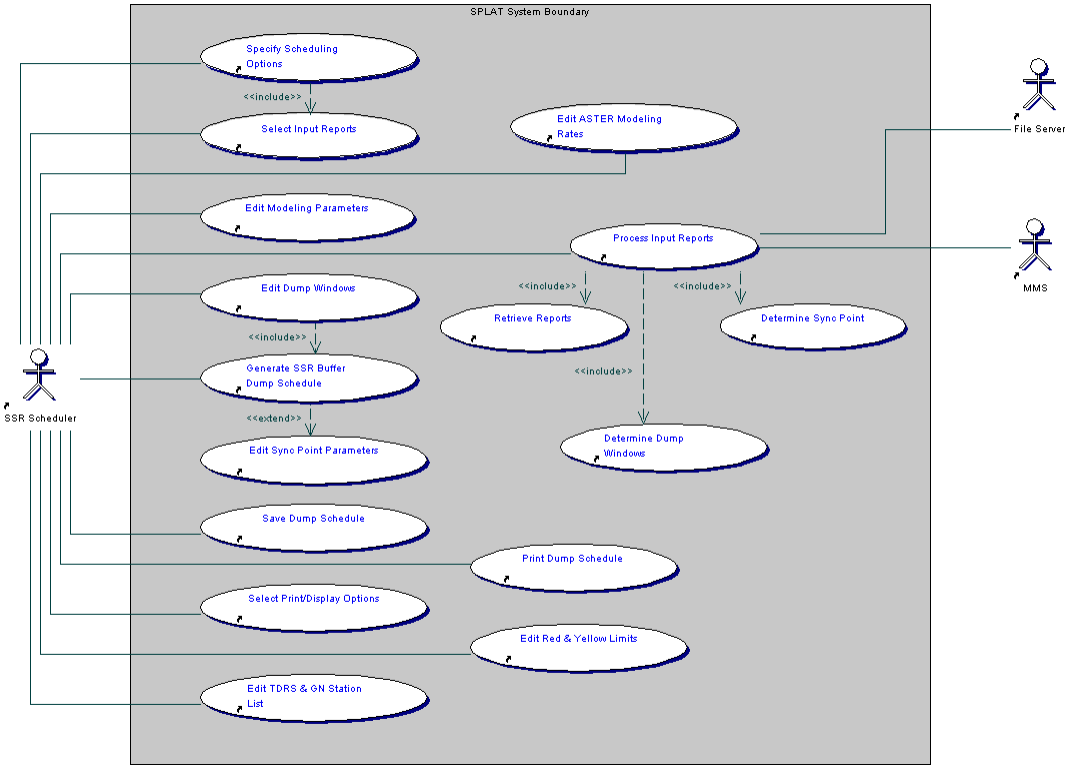

Figure 2-1: Use Case Diagram for ASSET

3 System Requirements

Section 3.1 presents the Use Case scenarios for the Use Cases identified in Section 2.4. These scenarios specify the functional requirements for the system. Section 3.2 documents additional requirements of a non-functional nature such as performance, reliability, interfaces, environment, etc.

3.1 Use Case Reports

3.1.1 Determine Dump Windows

Name:	Determine Dump Windows
Description:	This Use Case documents the process of determining the initial dump windows for each contact in the planning horizon.
Pre-Conditions:	Use Case: Determine Sync Point.
Post Conditions:	None
Primary Actor:	None
Risk:	None

Normal Flow

Actor Actions			System Responses
		1	The system examines the extracted contact information and assigns dump windows at the start of each contact (AOS) for each of the contact periods in the planning window based on the user provided dump window offsets and contact scheduling list.
		2	The system displays the dump windows and contact periods for user review.

Alternate Flow

Actor Actions			System Responses
	None		

3.1.2 Use Case: Edit ASTER Modeling Rates

Name:	**Determine Dump Windows**
Description:	This Use Case documents the steps a user must follow to modify the automated ASTER modeling modes.
Pre-Conditions:	None
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		**System Responses**
1	The user selects the Edit ASTER Rates option.	2	The system retrieves and displays the currently defined ASTER modeling modes for review and modification.
3	The user selects an existing mode and changes the settings.		
4	The user selects the save option	5	The system stores the modified ASTER modes.

Alternate Flow

	Actor Actions		**System Responses**
3	The user selects enters values for a new ASTER modeling rate.		
4	The user selects the ADD option.	5	The system updates the display to include the added modeling rate.
6	The user reviews the new mode and selects the SAVE option.	7	The system stores the modified modeling rates.

3.1.3 Use Case: Determine Sync Point

Name:	Determine Sync Point
Description:	This Use Case describes the steps required for selecting the synchronization point.
Pre-Conditions:	All required reports must be retrieved and parsed.
Post Conditions:	None
Primary Actor:	None
Risk:	None

Normal Flow

	Actor Actions		System Responses
		1	The system examines the extracted contact information and the buffer states entries extracted from the SSR Buffer states report to locate the earliest contact after the start of the scheduling period long enough to completely empty the SSR buffers.
		2	The system saves the synchronization point values.

Alternate Flow

	Actor Actions		System Responses
	None		

3.1.4 Use Case: Edit Dump Windows

Name:	Edit Dump Windows
Description:	This Use Case documents the process of editing the dump windows.
Pre-Conditions:	Use Case: Process Input Reports.
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user selects the edit dump windows option.	2	The system displays the current dump windows.
3	The user adds, deletes or modifies dump window entries one at a time. Each entry contains the dump start and stop times, a flag indicating the location within the contact (AOS or LOS), a flag indicating whether partial playbacks are allowed and buffer playback amounts for the ASTER, MISR, and MODIS buffers.		
4	The user confirms the modifications.	5	The system saves the dump windows and regenerates the schedule.

Alternate Flow

	Actor Actions		System Responses
	None		

3.1.5 Use Case: Edit Modeling Parameters

Name:	Edit Modeling Parameters
Description:	This Use Case describes the steps performed by the user to modify the parameters used in schedule creation.
Pre-Conditions:	Permission to edit the modeling parameters.
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user selects the edit modeling parameters option.	2	The system displays the modeling parameters for review/modification.
3	The user modifies one or more of the values. Each entry consists of a parameter name and value pair.		
4	The user confirms the modifications	5	The system saves the parameters.

Alternate Flow

	Actor Actions		System Responses
2a	The user selects the advanced option.	3a	The system displays the infrequently modified modeling parameters for review/modification..
4a	The user modifies one or more of the values.		
5a	The user confirms the modifications	5a	The system saves the parameters.

3.1.6 Use Case: Edit Red & Yellow Limits

Name:	Edit Modeling Parameters
Description:	This Use Case describes the steps performed by the user to modify the Red & Yellow limit settings for buffer limits and playback durations.
Pre-Conditions:	Permission to edit the Red & Yellow limits.
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user selects the edit Red & Yellow limits option.	2	The system displays the Red & Yellow limit settings for user review/modification.
3	The user modifies the Red & Yellow limits.		
4	The user confirms the modifications	5	The system saves the parameters.

Alternate Flow

	Actor Actions		System Responses
	None		

3.1.7 Use Case: Generate SSR Buffer Dump Schedule

Name:	Generate SSR Buffer Dump Schedule
Description:	This Use Case describes the process the user must follow to create an SSR buffer dump schedule from the extracted report entries.
Pre-Conditions:	Use Case: Select Scheduling Options Use Case: Process Input Reports.
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user reviews the contact information displayed on the timeline.		
2	The user selects the edit sync point options if a different sync point is desired(See Edit Sync Point Parameters Use Case).		
3	The user selects the Dump windows option to change one or more dump windows. (see Use Case Edit Dump Windows).		
4	The user selects the generate option.	5	The system iterates through each dump window in the dump windows file and creates SSR buffer dumps for each dump window based on MISR, MODIS, and ASTER usage as well as contact duration, and day/night events.
		6	The system displays the SSR buffer dump schedule for user review and acceptance.
7	The user saves the current schedule. (See Use Case Save Dump Schedule)		

Alternate Flow

	Actor Actions		System Responses
		1a	After user modification of sync point or dump windows, the system triggers schedule generation.

Alternate Flow

	Actor Actions		System Responses
7a	The user prints the current schedule. (See Use Case Print Dump Schedule).		

3.1.8 Print Dump Schedule

Name:	Print Dump Schedule
Description:	This Use Case describes the steps a user must follow to print a playback schedule.
Pre-Conditions:	Use Case: Generate Playback Schedule.
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user selects the print option.	2	The system displays a dialog for entering header information.
3	The user modifies or accepts the existing header information and selects the preview button.	4	The system displays a preview of the schedule.
4	The user selects the print option	5	The system prompts for a printer or file.
3	The user selects the required printer options.	4	The system spools the currently visible dump schedule to the selected printer.

Alternate Flow

	Actor Actions		System Responses
	None		

3.1.9 Use Case: Process Input Reports

Name:	Process Input Reports
Description:	This Use Case describes the processing of the required input reports. It is initiated by the user entering a start and stop time for planning window.
Pre-Conditions:	Use Case: Specify Scheduling Options.
Post Conditions:	None
Primary Actor:	SSR Scheduler, MMS
Risk:	None

Normal Flow

Actor Actions			System Responses
		1	The system extracts contact information and day/night events from the retrieved reports.
		2	The system combines the events extracted from the reports, sorts the events by date and time and displays the information to the user for review.

Alternate Flow

Actor Actions			System Responses
		1a	If the user selected ATC for the ASTER modeling mode, the system parses the ATC Load Report, extracting ASTER imaging events.
		1b	If the user selected ground contacts, the system parses the Ground Network (GN) Report, extracting X-band contact periods.

3.1.10 Use Case: Retrieve Reports

Name:	Retrieve Reports
Description:	This Use Case describes the operations required to retrieve the input reports needed by the system.
Pre-Conditions:	Use Case: Specify Scheduling Options All data needed to generate MMS reports must be available in MMS database.
Post Conditions:	None
Primary Actor:	MMS, SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
		1	If the report retrieval mode is set to local, the system retrieves the reports from the user specified directory. (See Use Case: Specify Input Reports).

Alternate Flow

	Actor Actions		System Responses
		1a	If the report retrieval mode is set to MMS, the system generates a query file requesting the appropriate reports from MMS.
		2a	The system sends the request MMS.
3a	The MMS system executes the requests and creates the requested reports.		
4a	The MMS system transfers the files to an accessible file server.		
		5	The system retrieves via FTP the requested input reports and stores them in a user specified location.

3.1.11 Use Case: Select Input Reports

Name:	Specify Scheduling Options
Description:	This Use Case describes the steps performed by the user to specify the names and locations of the input reports used during schedule generation.
Pre-Conditions:	Use Case: Edit Scheduling Options.
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user selects the Select Reports option from the Scheduling options dialog.	2	The system displays the input reports dialog.
3	The user browses for and/or specifies an input report(s) for the SSR Buffer States Report, Orbital Events Report, and TDRS Contact Report..		
4	The user selects the save option.	5	The system saves he selected reports.

Alternate Flow

	Actor Actions		System Responses
3a	If the ground contacts are to be used, the user specifies the name and location of the Ground Contact Report in addition to the other required reports.		

Alternate Flow

	Actor Actions		System Responses
		2a	If the user selected ATC for the ASTER modeling mode , the system displays an additional entry in the report dialog for an ATC Load Report.
3a	The user specifies an ATC Load Report(s) in addition to the other required reports.		

3.1.12 Use Case: Save Dump Schedule

Name:	Save Dump Schedule
Description:	This Use Case describes the steps the user must follow to save a generated SSR Playback schedule to a text file.
Pre-Conditions:	Use Case: Generate SSR Buffer Dump Schedule.
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user selects the save dump schedule option.	2	The system prompts the user for a name and location for the saved schedule.
3	The user specifies the ".txt" file extension, a name and location for the schedule and confirms the save.	4	The system saves the currently active dump schedule in a text file.

Alternate Flow

	Actor Actions		System Responses
3a	The user specifies the ".asset" file extension and selects a name and location for the saved schedule.	4a	The system stores a binary copy of the schedule in the user specified directory and filename.

3.1.13 Use Case: Select ASTER Modeling Mode

Use Case:	Select ASTER Modeling Mode
Description:	This Use Case describes the steps a user must follow when selecting the ASTER buffer modeling mode and percentage.
Pre-Conditions:	None
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user selects the fixed ASTER modeling mode.	2	The system enables the ASTER modeling percentage option.
3	The user enters a specific modeling percentage.		
3	The user confirms the selection.		

Alternate Flow

	Actor Actions		System Responses
1a	The user selects the automatic ASTER modeling option.	2a	The system zeros and disables the ASTER modeling percentage option.

3.1.14 Use Case: Select Print/Display Options

Use Case:	Select Print/Display Options
Description:	This Use Case describes the steps performed by the user to select available report fields to display and print in hardcopy reports.
Pre-Conditions:	None
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user selects the option to edit the print/display options.	2	The system displays fields and event types available for display and printing
3	The user selects the fields or events to be displayed and printed to hardcopy reports.		
4	The user confirms the selection.		

Alternate Flow

	Actor Actions		System Responses
	None		

3.1.15 Use Case: Specify Scheduling Options

Name:	Specify Scheduling Options
Description:	This Use Case describes the steps performed by the user to specify information needed to extract the necessary events from the input reports and ensure that the correct reports are used.
Pre-Conditions:	Use Case: Edit Modeling Parameters.
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user chooses to modify the scheduling options.	2	The system displays the scheduling options.
3	The use enters a start and stop time and date for the special event.		
2	The user selects the appropriate time delta to apply to the beginning of the special event window.		
3	The user selects the ASTER calculation method. (ATC or Fixed rate. See Use Case: Select ASTER Modeling Mode).		
4	The user disables ground contact scheduling.		
5	The user selects the report retrieval mode (local or MMS. See Use Case Specify Input Reports - Manual)		
6	The user selects the save option.		

Alternate Flow

	Actor Actions		System Responses
	None.		

3.1.16 Use Case: Edit Sync Point Parameters

Name:	Edit Sync Point Parameters
Description:	This Use Case describes the steps a user must follow to modify the synchronization point for buffer dump scheduling.
Pre-Conditions:	None
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user selects the edit sync point option.	2	The system displays the current sync point values.
3	The user reviews the selected sync point and either selects a different synchronization point from the displayed list, accepts the selected sync point or chooses to enter a manual sync point.		
4	The user confirms the entered values.		
		5	The system stores the synchronization point parameters.
		6	The system regenerates the schedule.

Alternate Flow

	Actor Actions		System Responses
	None		

3.1.17 Use Case: Edit TDRS & GN Station List

Name:	Edit Sync Point Parameters
Description:	This Use Case describes the steps a user must follow to modify the list of available TDRS and Ground (GN) stations and the scheduling status of each.
Pre-Conditions:	None
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user selects the edit TDRS & GN Stations option.	2	The system displays the current list of TDRS and GN contacts along with the scheduling status of each.
3	The user reviews and/or modifies the scheduling status of one or more stations.		
4	The user confirms the entered values.		
		5	The system stores the modified contact information.

Alternate Flow

	Actor Actions		System Responses
3a	The user creates a new TDRS or GN contact entry.		

3.1.18 Use Case: Edit Dump Window Offsets

Name:	Edit Sync Point Parameters
Description:	This Use Case describes the steps a user must follow to modify the Dump Window Offset values used by the ASSET tool during creation of dump windows for schedulable contact periods.
Pre-Conditions:	None
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user selects the dump window offsets option.	2	The system displays the current dump window offsets for TDRS and ground contacts.
3	The user reviews and/or modifies one or more of the offset values.		
4	The user confirms the entered values.		
		5	The system stores the modified contact information.

Alternate Flow

	Actor Actions		System Responses
	None		

3.1.19 Use Case: Restoring a Saved Schedule

Name:	Edit Sync Point Parameters
Description:	This Use Case describes the steps a user must follow to modify the list of available TDRS and Ground (GN) stations and the scheduling status of each.
Pre-Conditions:	None
Post Conditions:	None
Primary Actor:	SSR Scheduler
Risk:	None

Normal Flow

	Actor Actions		System Responses
1	The user selects the edit TDRS & GN Stations option.	2	The system displays the current list of TDRS and GN contacts along with the scheduling status of each.
3	The user reviews and/or modifies the scheduling status of one or more stations.		
4	The user confirms the entered values.		
		5	The system stores the modified contact information.

Alternate Flow

	Actor Actions		System Responses
3a	The user creates a new TDRS or GN contact entry.		

3.2 Supplemental Requirements

This section documents non-functional requirements in addition to those functional requirements that are not captured by the use cases.

3.2.1 Functional Requirements

The scheduling algorithms shall allocate playback time in one of two ways. For PBFLEX playbacks, the time is allocated based on a user specified buffer priority. For non-flex playbacks, the system shall allocate time based on availability.

In addition to the parameters mentioned in [1], the system shall maintain the following user modifiable modeling parameters:

Red & Yellow Limits for ASTER, MISR, and MODIS buffers.
Red & Yellow Limits for Playback safety margins
Red & Yellow Limits for delta to previous Playback
ASTER Modeling rates for the most frequently used ASTER procedures in MMS.
Offsets for dump window starts and stops within S, K, and X-band contacts.
Column widths for each available column in a hardcopy display.
A list of TDRS and GN contact types and whether or not to schedule in these contacts

Time shall be displayed with a resolution of seconds.

3.2.2 Usability Requirements

Refer to [1].

3.2.3 Reliability Requirements

Refer to [1]

3.2.4 Performance Requirements

Average time to retrieve reports (when grabbing reports automatically from MMS), parse data and generate the contact display shall be less than 15 minutes. This is completely dependant on MMS usage and network traffic.

Average time to generate a special event schedule shall be less than 2 minutes.

3.2.5 Supportability Requirements

Refer to [1].

3.2.6 Documentation and Help System Requirements

Refer to [1].

3.2.7 Purchased Components

No requirements pertaining to purchased components have been identified.

3.2.8 Interfaces

3.2.8.1 User Interfaces

The system shall provide a GUI that will allow system access from a desktop PC.

The main system GUI shall contain a tabular display window capable of displaying a list of color-coded contacts, mode changes, playback events, and buffer usages.

3.2.8.2 Hardware Interfaces

No requirements pertaining to hardware interfaces have been identified.

3.2.8.3 Software Interfaces

The system shall interface to the MMS system and will communicate using an MMS defined request file format.

The system shall communicate (via FTP) with a file server to provide access to MMS generated reports.

3.2.8.4 Communications Interfaces

The system shall connect to, and be accessible from, the EOC LAN.
The system shall have network access to the file server on which MMS will store the generated reports.

The system shall request the following data from the EOC MMS and/or retrieve it from a common directory:

- **ATC Load Report**

The ATC Load Report defines every Absolute Time Command (ATC) and every Relative Time Command Sequence (RTCS) that will be uplinked to the spacecraft. The content of interest to the system is the list of ASTER specific RTCSs.

- **TDRS Contact Report**
  The TDRS Contact Report details every TDRS contact during the planning period. The system will use it to identify the S-Band contact windows and K-Band contact windows.

- **Downlink Report (SSR Buffer States Report, Buffer Predicts)**
  The Downlink Report contains SSR Buffer % full predicts and planned playback duration keyed to TDRS K-Band contacts in the TDRS Contact Report.

The system shall read the following data from a common directory:

- **GN Report**
  The GN Report contains ground network contact periods for Ground stations in Alaska and Svalbard, Norway.

- **Orbital Events Report**
  The Orbital Events Report contains spacecraft day/night crossing events needed to properly model MODIS and MISR behavior.

3.2.9 Legal, Copyright, and Other Notices

Developed software and documentation shall comply with NASA/GSFC standards for labeling.

3.2.10 Applicable Standards

Applicable standards will be identified during the requirements refinement.

4 Supporting Information

5 Appendix A: GLOSSARY

Acronym / Abbreviation	Term	Definition
AOS	Acquisition Of Signal	The time at which the signal for the TDRS or Ground contact is acquired.
ASSET	Advanced SSR Scheduling Tool	The new name for SPLAT.
ASTER	Advanced Spaceborne Thermal Emission and Reflection	Instrument on-board TERRA owned and operated by the Japanese space agency.
	Aqua	The second EOS spacecraft. Formerly known as EOS PM. The focus for the Aqua satellite is the multidisciplinary study of the Earth's interrelated processes (atmosphere, oceans, and land-surface) and their relationship to Earth system changes.
	Aura	The third EOS spacecraft. Formerly known, as EOS Chem. Aura is a NASA mission to study the Earth's ozone, air quality and climate. This mission is designed exclusively to conduct research on the composition, chemistry and dynamics of the Earth's upper and lower atmosphere employing multiple instruments on a single satellite.
	actors	Actors are classes that define roles that objects external to a system may play. They are used in Use Cases to model users outside of a system that interact directly with the system. They can be humans or other systems.
EOC	EOS Operating Center	This is the center from which the Terra and, in the future Aqua and Aura, satellite(s) are operated from.
EOS	Earth Observing System	The overall system that contains the currently operating Terra and future Aqua and Aura satellites.
GN	Ground Network	The network of Ground stations (Alaska and Norway) which provide ground contacts for data downlink (X-Band)
GSFC	Goddard Space Flight Center	

Acronym / Abbreviation	Term	Definition
MISR	Multi-angle Imaging Spectro-Radiometer	An instrument on the Terra spacecraft.
MMS	Mission Management System	Unique to EOS, this system is the primary mission planning system for Terra. Among other products, it creates the TDRS Contact Report, and includes basic models for generating command loads.
MODIS	Moderate Resolution Imaging Spectrometer	An instrument on the Terra spacecraft.
NASA	National Aeronautics and Space Administration	
SPLAT	SSR Playback Automation Tool	The tool developed as part of this effort to assist in the development of Terra SSR Playback schedules during special events.
SSR	Solid State Recorder	This is Terra's on-board storage device. It operates using buffers wherein data from each instrument (4 buffers total) and housekeeping data are stored for later downlink to a ground station.
	SSR Playback	An SSR Playback is the downlink of stored instrument and spacecraft housekeeping data. This can also be referred to as an SSR Dump.
SWIR	Short Wave Infrared	A subsystem of the ASTER instrument.
	Terra	The first EOS spacecraft. Formerly known as AM1. It provides global data on the state of the atmosphere, land, and oceans, as well as their interactions with solar radiation and with one another.
TDRS(S)	Tracking and Data Relay Satellite (System)	This is a geo-synchronous satellite system used by NASA for satellite communications. It functions using a "bent-pipe" through White Sands, NM through the NASA Communications SYSTEM (NASCOM) at NASA GSFC. The Terra Spacecraft uses the K-Band antennas for downlink of SSR data and the S-Band antennas for commanding.
TIR	Thermal Infrared	A subsystem of the ASTER instrument

Acronym / Abbreviation	Term	Definition
	use case model	A use case model is a set of use case diagrams that describe a system's functionality.
	use case diagram	Use case diagrams depict the user view of a system. They describe the functionality provided by a system or class to external actors.
VNIR	Visible and Near Infrared	A subsystem of the ASTER instrument.