



# ***NPP System Integration & Test (SI&T)***

**CERES**

THREE  
AGENCIES

ONE  
MISSION

**2/28/08**

**NPP**

NPOESS PREPARATORY PROJECT



**NPP web site:**

**<http://jointmission.gsfc.nasa.gov>**



# Background

- **ACTION ITEM assigned 7/18/07 to assist the CERES instrument team in identification of level of support required for NPP SI&T Activities**
- **Introductory email sent to CERES Data Management Team, (Michael Little) on July 20, 2007 providing reference materials and brief overview of NPP SI&T Test Activities**
  - **NPP SI&T Plan, NPP SI&T Test Timeline, NCT 2C Test Plan, NCT 2C Staffing Profile (NSOF & BATC Factory), NCT 2C Schedule**
- **Met with CERES Data Management Team (via telecon) August 8, 2007.**
  - **Attendees**
    - > **NPP SI&T: Shannon Thompson, Rick Scannell**
    - > **CERES: Mike Cisewski, Kory Priestly, James Miller, Bill Vogler, Jim Bailey**
  - **Provided a detailed overview of NPP SI&T Activities based on plans and actual event execution of EEO's, FTTs, ICTs, NCTs and SPTs**
    - > **Planning & Coordination**
    - > **Length and duration of activities**
    - > **Support required (NSOF and BATC factory)**
    - > **Post-Test Analysis and Reporting**
- **Supported CERES study Sep 07 outlining CERESS support for NPP Mission System I&T activities**



# *NPP SI&T Roles and Responsibilities*

- **Test Manager (NASA)**
  - Coordinates System Integration and Test activities and has overall responsibility for ensuring all NPP segments associated with the test are prepared to support System Integration and Test activities
- **Test Director (NASA)**
  - Has overall test authority and is responsible for verifying test objectives
- **CERES Representative(s)**
  - Working Group support for planning, execution, and reporting of tests that involve CERES
  - Responsible for ensuring instrument and/or ground readiness to support testing
  - Depending on test event being supported, personnel located at NSOF, BATC Factory, and LaRC



# Planning and Coordination Mechanism

- **Working Group**
  - Assist in defining objectives
  - Definition of Prerequisites
  - Definition of Success Criteria
  - Weekly Meetings (and technical meetings as needed)
  - Stakeholder Inputs and Reviews
    - > Test Plan Inputs – CERES HW/SW to be exercised during testing activities
    - > Procedure inputs and reviews (CERES specific)
    - > Test Data (CERES specific)
    - > Provide support for PROC development (CERES specific)
    - > Review of PROCs (CERES specific)
    - > Provide inputs for Quick-look test Report (1 day following test)
    - > Provide inputs for Formal Test Report (30 days following test)
    - > Participate in daily pre-test / post-test briefings conducted
    - > Provide TRR Inputs and participation
    - > Post Test Review (OK to Break)



# Test Execution

- **Test Readiness Review**
  - Conducted prior to the start of Early Engineering Opportunities
  - Test Inputs / Status required from all stakeholders
  - Verifies all prerequisites, dependencies, and/or known issues are identified and addressed
  - ALL test participants required to participate
  - System is ready for testing
- **Early Engineering Opportunities**
  - Daily pre-test and post-test de-brief meetings
  - Opportunities with the Segments to be tested (prior to Dry Runs & RFR)
  - Provides opportunity to exercise timing, functionality, products, etc.
  - Functionality to be exercised defined in groupings (i.e. not all will involve CERES)
  - EEO's involving CERES instrument will require Segment Representatives at both NSOF and BATC Factory
  - Provide Technical expertise during trouble-shooting and anomaly resolution
  - Proven to be valuable risk reduction



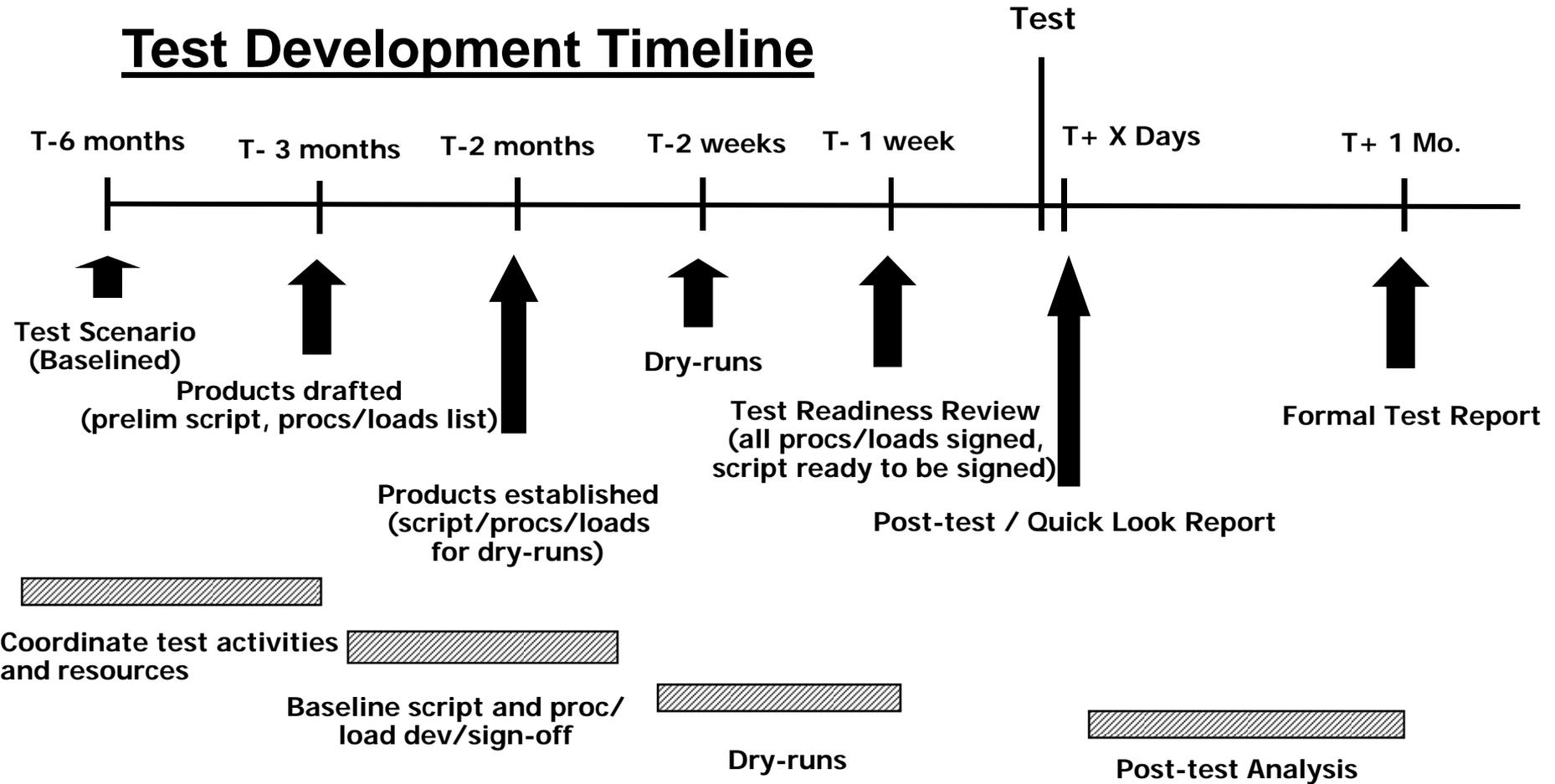
# Test Execution

- **Dry Runs**
  - Daily pre-test and post-test de-brief meetings
  - Conducted following EEO's
  - Includes Lessons Learned and Redlines from EEO's
  - Updated Version of Test Plan
  - Provide Technical expertise during trouble-shooting and anomaly resolution
  - Requires CERES Segment Representatives at both NSOF and BATC Factory
- **Run For Record (RFR)**
  - Daily pre-test and post-test de-brief meetings
  - Conducted following Dry Runs
  - Includes Lessons Learned and Redlines from EEO's
  - Updated Version of Test Plan
  - Provide Technical expertise during trouble-shooting and anomaly resolution
  - Requires CERES Segment Representatives at both NSOF and BATC Factory
- **OK to Break**
  - Follows RFR
  - All stakeholders polled for "OK to Break" Configuration



# Test Development Time-line

## Test Development Timeline





# System Level Test Definition

- **Functional Thread Tests (FTTs)**
  - Verification of basic NPP System functionality and representative threads through the system
  - Verify Level 2 mission system requirements
  - May serve as prerequisites to NCTs or be included in an NCT
- **Interface Confidence Tests (ICTs)**
  - Verification of interfaces across segments, developers and organizations
  - Verify interfaces as documented in IRDs/ICDs and/or the Data Format Control Books (DFCBs)
- **NPP Compatibility Tests (NCTs)**
  - Exercise the flight and ground interactions
  - Verifies the ability of the flight and ground to communicate and handle data, commands, and formats throughout the system
- **System Performance Tests (SPTs)**
  - Series of normal operations, including real-time commanding, execution of stored commands, and routing of satellite-generated data and test data through the system
  - Focus on performance of data throughput



# Events Requiring CERES Support

- **Early NCT 3 EEO (1/21/09)**

Early Engineering Opportunity with CERES, OMPS, CrIS, and ATMS. The primary objective of this EEO is to exercise commanding and confirm receipt of instrument telemetry by the deployed C3S located at the NSOF.

- **NCT 3 (6/9/09)**

This 72hr continuous operations test exercises the flow of data from the satellite, including using offline test files representing the satellite, through C3S, IDPS, SDS, ADS, and to LaRC with the appropriate products being generated at each stage. The test exercises command & telemetry operations, preprocessing of SMD by C3S, ingest and processing of SMD at IDPS (NESDIS and AFWA), generation of RDR (and any other products if algorithms are ready), and archiving at ADS. This test will also exercise available mission management functions. Real-time telemetry and SMD are played back from local storage at the Svalbard station to C3S and IDPS using the operational links

- **NCT 4 (12/2/09)**

This test exercises mission configuration, 3 days in the mission life with all elements of ground segment. This is the final test opportunity with the satellite before shipment to launch facility. Real-time telemetry and SMD may be played back from local storage at the Svalbard station to C3S and IDPS using the operational links.

- **Interface Confidence Tests (ICTs)**

ICT 23 verifies the interface from LaRC to C3S

ICT 24 verifies the interface from SDS to LaRC (leverage SDS development)

- **Functional Thread Tests (FTTs)**

Modify existing FTTs to include CERES data

- **SPT 1 & 2 (Post NCT 4)**

Verify nominal operations over a 24 hr period (SPT 1) and 72 hr period (SPT 2) where we demonstrate the performance of the NPP System End-to-End for data rates, volumes, and timeliness.

ICT's and FTT's negotiated with stakeholders and currently being updated



# *NPP SI&T Points of Contact*

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# *Wrap-up*



# Back-up Charts



# SI&T Overview

- **System Integration and Test (SI&T) is a phase of the overall mission integration process**
  - Space/Ground System Level integration
  - Mission System Level integration
  - Mission Schedule Integration
- **Accomplished by**
  - Coordination of facilities/site integration activities
    - > Coordination meetings underway
  - SI&T Test Types
    - > Functional, interface, system performance, NPP Compatibility Tests (NCTs), and informal testing (engineering opportunities), System Performance Tests
    - > NCTs (flight/ground compatibility tests) are the anchor points of the mission integration effort



# SI&T Overview

- **SI&T is responsible for Mission System I&T**
  - SI&T performs verification of Level 2 requirements including interfaces
  - Monitoring of integration activities at the element/segment level
    - > Monitoring status of Level 3 & 4 requirements
    - > Verification assessment (method, what test, effectivity) of Mission Requirements Spec and IRDs/ICDs
  - Performance Verification Plan (PVP) provides basis for verification approach
  - System Integration and Test Plan identifies tests to be performed
    - > Utilizes the operational scenarios as basis for tests
    - > Individual, detailed test plans/procedures are developed for each test
  - Overall mission integration schedule coordination
    - > Coordination of system level (cross-segments, agencies, contractors) using a federated team approach
    - > Element/segment deliveries, dependencies, and durations captured in an integrated mission schedule to launch
    - > Test objectives and pre-launch activities are based on functionality on a per build basis

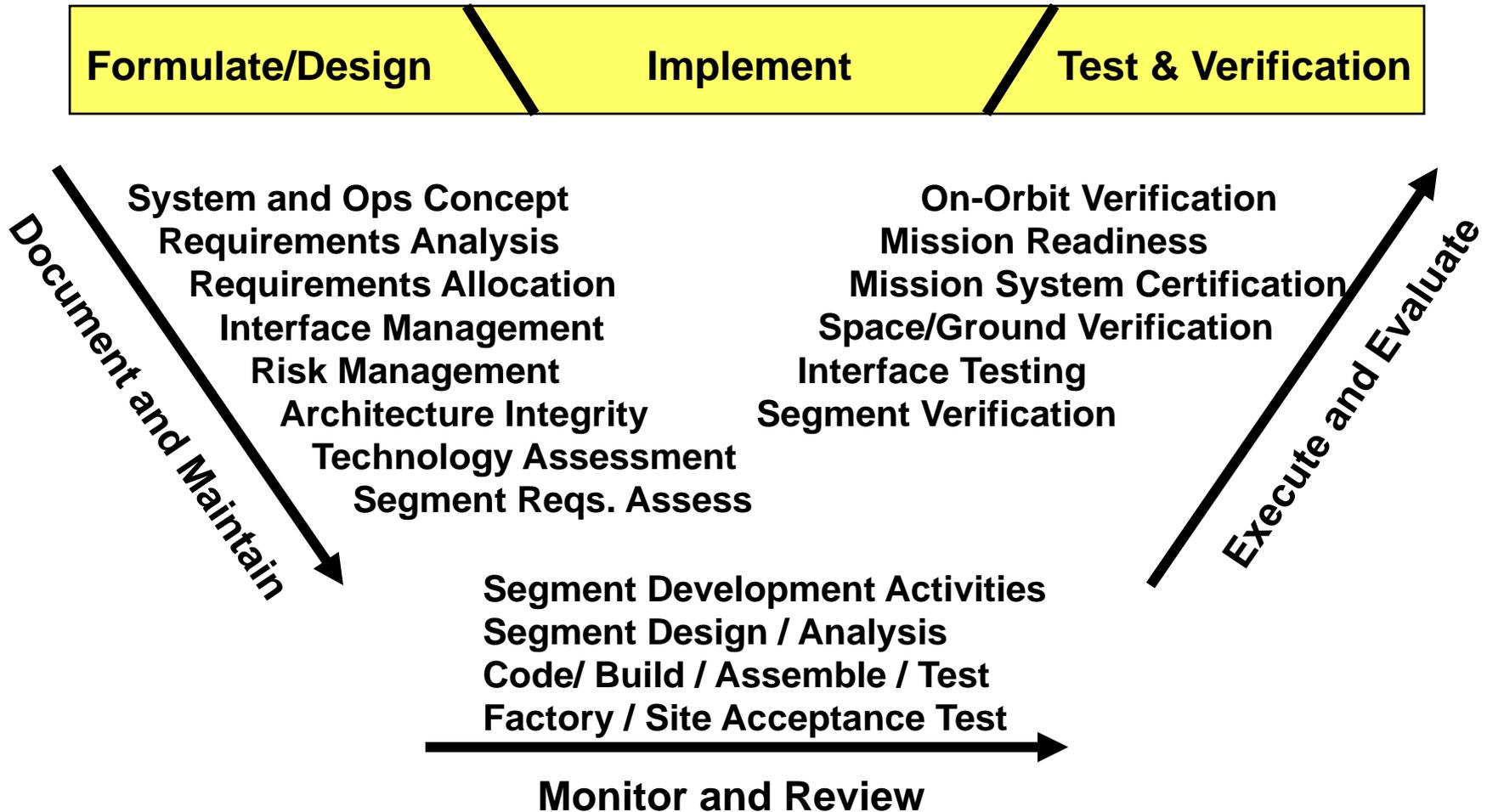


# SI&T Overview

- **System Integration and Test Working Group (SITWG)**
  - Led by NASA
  - Established to address planning and coordination
    - > Schedule, functional capabilities and detailed test planning
    - > Insight of all integration levels
  - Chaired by NASA SI&T Manager, co-chaired by IPO Test Lead
  - Participation by reps from development through operations & institutions
  - Scheduling integration and deconfliction
  - Focus groups (FGs) established for each test or group of tests
    - > Detailed test planning / preparation
    - > Coordination of early engineering opportunities (sub-set of test run as lead-in for the actual test execution)
    - > Test resource coordination
    - > Conduct test readiness review/test execution
    - > Generate/maintain discrepancy reporting
    - > Prepare test reports
    - > Eroom location: [My eRooms](#) > System Test & Evaluation > ST&E meetings materials and briefings > meetings > SITWG



# NPP System Engineering, Integration & Test Approach





# SI&T Methodology

## System Hierarchy

### NPP System

- Segments
- Elements
- Components

