

# MCST All Hands Meeting Minutes 28OCT93

Chair: Bruce Guenther/GSFC/925 Branch Head/MCST

## ATTENDEES:

Name	Phone	Organization
Anuta, Paul	X69412	RDC
Ardanuy, Phil	982-3714	RDC
Baden, Joan Recorder	X61378	RDC
Barker, John	X69498	925
Braun, Charles	982-3754	RDC
Bryant, Tom	982-3769	RDC
Burelbach, Jon	X66166	RDC
Guenther, Bruce Chair	X65205	925
Knight, Edward	X62382	RDC
Knowles, Dan	X61378	RDC
Kvaran, Geir	X62382	RDC
Montgomery, Harry	X67087	GSFC/925

## MINUTES:

Every Friday at 12 p.m. there will be brown-bag seminars given by MCST technical personnel in building 22, G95. If you would like to give a talk yourself, please contact Tom Bryant (982-3769). Refer to enclosed Agenda for Friday, November 12th.

Charles Braun has been asked to give a Brown Bag seminar (would like Jim Butler to attend) in the near future on "Optics of Metal Codings and Interface Filters".

Braun is currently reviewing the Cal/Val Module from old EOS MOU (See 22OCT93 enclosure).

Bruce Guenther stated that on November 1st and 2nd, Phil Slater will be visiting GSFC to discuss the review of the Cal ATBD, UAz ATBD, Calibration Plan Inputs and Status, and the 28MAR93 Cal WG Action Items.

Guenther also stated that he is diligently working on a WBS-"Work Breakdown Structure" (with P. Anuta's input & task leaders) for the 4 tasks, and presented a WBS description for MICC (enclosure). A MODIS Staffing structure was presented as well (enclosure).

Ed Knight noted that SBRC put out a SRCA Calibration Algorithm memo (#1510 in MCST archive) this past week and would like for it to be reviewed.

There will not be a All-Hands Meeting (AHM) November 11th (Veteran's Day). The next AHM will be held on November 18th.

Phil Ardanuy stated that SDST and MCST should collaborate on the Beta delivery. He said that he is currently developing a Beta algorithm prototype plan with Al Fleig and there are three issues of concern:

- 1) Porting the L-2 Algorithms
- 2) Geolocation
- 3) L-1B Calibration - Believes that the different issues on the part of the Science Team can be solved by prototyping.

Email recipients: If you would like to receive a copy of the minutes with enclosures, please contact Joan Baden (286-1378)

**ACTION ITEMS:**

Braun coordinate with Tom Bryant on a date for his presentation.

Geir Kvaran to present Beta delivery to Guenther, upon review of the delivery with Joann Harnden.

Kvaran to give 15 minute status (BETA) presentation at the November 18th meeting.

Tom Goff: Please review SRCA (#1510) memo.

# The MODIS brown bag Seminars

Paul Anuta, 925/R.D.C. will describe

## An Overview of In-flight Sensor Calibration Using a Solar Diffuser

One of the calibration sources on the MODIS instrument is the Solar Diffuser, which will provide a radiance and reflectance reference for the 20 reflective bands. The critical property of the solar diffuser (SD) is its bi directional reflectance function (BDRF) and the solar diffuser stability monitor (SDSM) is provided to determine BDRF degradation in-flight. Similar diffuser references have been used on Solar Backscatter Ultraviolet instruments since 1970 and most recently SeaWiFS will employ a diffuser reference. The talk will overview methods of calibration processing and lessons learned from the SBUV, SBUV/2 and SSBUV projects and SEAWiFS relative to plans for SD processing for MODIS.

Seminar will be at 12:00 noon on Friday, Nov. 12 in  
Bldg 22, room G95.

Attendance is open to all.

! The return of the \$2.50 seminar lunch!

Chicken  
Soda  
Salad

Lunch will be provided for those who desire it. Please call:

Joan Baden	286-1378 or
Tom Bryant	982-3769

for reservations.

Bruce

TOTAL #  
PAGES: 7

FAX

22 October 1993

TO: Charles Braun  
Research and Data Systems  
Phone: 301/982-3768  
Fax: 301/982-3749

FROM: Mary Blazek *Mary*  
BDM Engineering Services  
Phone: 202/863-9949  
Fax: 202/863-8407

SUBJECT: Cal/Val Module from old EOS MOU

Dear Charles,

Here is the information you requested on cal/val. As background, you will note that the cal/val module dates back to 1991 when the Earth Observation-International Coordination Working Group (EO-ICWG) was considering a multilateral MOU for agencies participating in the International Earth Observing System (IEOS). That idea was abandoned for a series of bilateral MOUs tied together by an IEOS Implementation Plan. The IEOS Implementation Plan is in draft form at present and the EO-ICWG is to consider whether a cal/val section is required for the Plan at their next meeting (November 3-4, 1993). A good technical point of contact for the Plan is Matt Schwaller at GSFC, 301/286-0523. Matt has the lead for preparing the Plan.

Yours truly,  
Mary

Enclosure

CALIBRATION/VALIDATION

1.0 Calibration and Validation

Calibration refers to the measurement and verification of the performance of an instrument as judged against the design specifications of the expected instrument performance. Calibration of the instrument is generally evaluated using data from "onboard" internal subsystems and ground targets. The ground targets may be natural surfaces or special purpose equipment such as reflectors or transponders. In this document, the term calibration is applied only to engineering parameters related to instrument and system performance, and includes pre-launch calibration as well as quality control assessment of the calibration of the instrument throughout the lifetime of the mission. This relates to the raw data and Levels 0 and 1 products, and includes both Operational and Scientific Instruments.

Validation refers to the confirmation of the degree of accuracy of measurements made by a particular sensor or system as related to the generation of specific geophysical products, whose level of processing and characteristics have been specified on the basis of expected instrument performance. Validation also includes the evaluation of a sensor product as related to the measurement of the physical properties of the material observed. This latter normally requires a substantial surface data collection campaign to determine the values of the geophysical parameters at the time of sensor observation against which the sensor product can be evaluated. Validation as defined in this document includes the verification of the qualities of the product itself as well as the assessment of the derived geophysical parameters, and pertains to those products defined as Levels 2 and higher. Geophysical Validation Plans for Operational Instruments will be included in the Science Plan for the instrument, as applicable.

Instrument calibration and validation requirements shall be driven by the derived geophysical parameters which the instrument is intended to support. Instrument observables should be defined in terms of physical standards and standard processes. All pre-launch instrument calibration should be performed in conditions as similar as possible to the actual environmental conditions in which the instrument will operate. For example, the test environment should simulate the variety of spatial and spectral conditions, as well as vacuum and thermal conditions, of actual instrument operation.

Calibration capability must support routine production of standard data products from the instrument no later than 13 weeks after launch.

Each Instrument Provider (IP) will be responsible for the calibration of the instrument over the lifetime of the mission, and for the preparation of the Instrument Calibration and Geophysical Validation Plans, including the cross calibration with other instruments, as required.

The Platform Operator (PO) will be responsible for the harmonisation of the Instrument Calibration and Geophysical Validation Plans for all the instruments on the Platform of responsibility, for the preparation of the Platform Calibration and Geophysical Validation Plans, and for scheduling the data collection necessary to carry out the plans as proposed.

The Partners, through the ICWG, will be responsible for ensuring that the Platform Calibration and Geophysical Validation Plans are harmonised to meet all the Partners' needs, will approve and adopt the Platform Calibration and Geophysical Validation Plans, and will provide contingency guidelines for conflict resolution and rescheduling of data collection.

## 2.0 Calibration Plan

The Instrument Calibration Plan for each instrument will be prepared by the IP and the Instrument Team, and will include the pre-launch calibration, and the cross calibration of the instrument with others on the same platform and within the Polar Platform system. It will also include data collection over the lifetime of the mission, for quality control, and a plan for monitoring the instrument reliability. The calibration shall conform to international standards, such as those proposed by the CEOS WGD Cal/Val Group and included in Annex XXX. The Instrument Calibration Plan will be discussed with, and approved by, the PO in conjunction with the IP for each instrument.

The IP will be responsible for forming an Instrument Calibration Team to write the Instrument Calibration Plan and to carry out the work necessary to the instrument calibration as stated in the plan. Each Instrument Calibration Team must include an individual designated as the spokesperson for instrument calibration, The Instrument Calibration Team Leader, and this individual will be tasked with ensuring that calibration requirements are met according to the international standards adopted by the ICWG and agreed among the Partners.

The Platform Calibration Plan will be prepared by the PO and will include a harmonisation of the Instrument Calibration Plans as proposed by the IPs for the Platform of responsibility. This shall include the scheduling of the data collection necessary to complete the Instrument Calibration Plans as proposed, within the limitations of the platform operations. The IP's Instrument Calibration Team Leader will be included in the discussion of the harmonisation of the calibration requests for the complete suite of instruments on the Platform of responsibility, and will participate in the preparation of the Platform Calibration Plan.

Each IP will be responsible for the actual calibration and verification of the instrument performance over the lifetime of the mission. The PO will be responsible for ensuring that the data collection necessary to meet these objectives is scheduled and obtained, within the limitations of the Platform

performance, and that the data is passed to the IP as required for the calibration of the instrument.

The IP will notify both the sponsoring agency and the PO when each stage of the calibration has been completed, and will prepare a report on the Instrument Calibration according to milestones agreed with the PO, and will provide relevant instrument characteristics to the centre responsible for the collection and/or processing of the instrument data.

## 2.1 Data collection for Instrument Calibration

Data collection for the Instrument Calibration Plan will occur as early as possible in the mission, and will have precedence over routine data collection by the same instrument until such time as the instrument calibration needs have been met. Instrument calibration and performance verification data collection necessary throughout the lifetime of the mission will be regularly scheduled, and will have precedence for data collection at these times. In the event that previously unscheduled data calibration collection is necessary, i.e., in the event of an instrument malfunction, the IP will prepare a plan for the PO, who will evaluate the feasibility of incorporating the plan into the overall Mission Operations Plan according to guidelines prepared by the ICWG, and within the operating limits of the platform.

Routine data collection by an instrument which has not yet met its calibration objectives will be considered by the PO based on the source of the request for the data. These requests will be evaluated by the PO based on guidelines prepared by the ICWG, and a decision made by the PO regarding the priority for scheduling the data take.

The PO will notify the IP of any difficulties in data collection, including transmission and/or reception, and quality control, among others, which might affect the collection of the instrument calibration data as agreed upon in the Instrument Calibration Plan. The IP will then have the right to request a re-take of the missing data, on a priority basis TBD by the PO, using guidelines prepared by the ICWG.

The PO will notify the IP when the data collection, as agreed in the Platform Calibration Plan, has been obtained. The IP will, in turn, notify the PO if the data collected does not meet the needs of the calibration effort and will include an explanation as to the reason that the initial Instrument Calibration Plan must be amended. The IP will then have the right to request additional data within the contingencies of the Mission Operation Plan, but the decision to collect data rests with the PO.

## 2.2 Processing of Calibration data

Data collected for instrument calibration shall have priority for data processing over other forms of data. The calibration data will be processed on a "no-backlog" basis, therefore, processing of all data shall be scheduled to maintain this status for calibration data. Data collected before the completion of the instrument calibration will have a lower priority for data processing than data needed for the calibration itself.

In instances where the routine data have been collected prior to the completion of the instrument calibration, this data shall have a lower priority for processing than calibration data for the same instrument, calibration data for another instrument, and routine data processing for a calibrated instrument, unless indicated otherwise in guidelines issued by the ICWG.

Data collected before the completion of the instrument calibration will be released only with a disclaimer attached to the data indicating that the data quality may be questionable, the reason why, and the statement that the data may be subject to substantial change in the future.

### 3.0 Geophysical Validation Plan

Each IP will prepare an Geophysical Validation Plan for Level 2 and higher products for the instrument at the same time that Instrument Calibration Plans are formulated. This Geophysical Validation Plan is considered to be part of the complete calibration/validation requirement for all instruments. This plan will include an estimate of the total amount of data necessary to validate the geophysical parameters derived from the instrument in question and will clearly indicate the interdependence of the instrument calibration data collection to the geophysical validation data collection. It will also include an explanation of the algorithms to be used to generate the data products, and a plan for the validation of these products. This plan will be presented to the PO, and the centre where the data processing is to take place.

Geophysical validation will involve the extensive use of ground campaigns, and could involve synergistic efforts among teams of investigators working on different instruments. For this reason, Geophysical Validation Teams will be formed based on the work to be performed. Each IP will be responsible for nominating members to this Geophysical Validation Team. The final Geophysical Validation Team will be formed by the PO, and may include individuals outside the Instrument Teams. An Instrument Geophysical Validation Team Leader will be named for each Instrument, and a Geophysical Validation Team Leader will be chosen for each Platform. The level of responsibility of each of the Partners to support the validation effort will be determined on the basis of the Teams approved for the Geophysical Validation.

The PO, in conjunction with the Geophysical Validation Team Leader, will prepare a harmonised Platform Geophysical Validation Plan for all the instruments on the Platform, and all of the standard data products at levels 2

and higher, including scheduling the data takes necessary to meet the geophysical validation needs of all the instruments on the Platform. This plan will be discussed and agreed upon with the IPs and the Instrument Geophysical Validation Team leaders, and approved by the Partners. This plan should be integrated with overall research plans of national and multinational groups participating in the WCRP, IGBP, and similar efforts. The data collection campaigns in support of the Platform Geophysical Validation Plan will be coordinated by the PO. Actual validation of the data products including ground-based measurements, space-based measurements outside the platforms and payload of ICWG, the provision of algorithms and any special equipment or support necessary is the collective responsibility of the international research community.

The Final Geophysical Validation Plan will be a cooperative effort among all the Partners, and will comprise the data collection plan for all the Platforms. The Partners will share the responsibility for supporting the scientists involved in performing the geophysical validation, and will formalise the Teams for the Geophysical Validation Plan. The final Geophysical Validation Plan, and the responsibilities of the Partners for its implementation, will be endorsed by the ICWG.

The final Geophysical Validation Plan will be presented to the Ground Segment Operators by the POs. The plan will include details of the algorithms to be used to process the data, the field investigations to be conducted, the nature of the validation to be performed, the expected results, the method for evaluating the geophysical parameters, and the synergistic studies required. The PO will be in contact with the Geophysical Validation Team Leader, who will have the responsibility of coordinating the geophysical validation effort, and who will serve as the point of contact for the POs, the IPs, and the scientists. The PO will serve as the point of contact for all the Geophysical Validation Teams to the ICWG.

### 3.1 Data Collection for Geophysical Validation

Data collection for Geophysical Validation will occur as early as possible in the mission. Validation data collection will have precedence over routine data collection by the same instrument to ensure that instrument calibration and data validation needs have been met.

In a case where data from one instrument is needed to support another, this data collection will be considered as part of the Final Geophysical Validation Plan, and the data collection will have precedence over routine data collection for another instrument, should a conflict arise.

The PO will notify the IP of any difficulties in data collection, including transmission and/or reception, and quality control, among others, which might affect the collection of the validation data as agreed upon in the Geophysical

Validation Plan. The IP will then have the right to request a re-take of the missing data, on a priority basis within the guidelines established by the ICWG.

The PO will notify the IP when the data collection, as stated in the Geophysical Validation Plan, has been completed. The IP will, in turn, notify the PO if the data collected does not meet the needs of the geophysical validation effort, and will include an explanation as to the reason that the approved Geophysical Validation Plan must be amended. The IP will then have the right to request additional data, but this data will be scheduled into the mission planning consistent with guidelines established by the ICWG.

### 3.2 Processing of Geophysical Validation Data

Data collected for geophysical validation shall have priority for data processing over other forms of data, except instrument calibration data. Data collected before the completion of the instrument validation will have a lower priority for data processing than data needed for the geophysical validation itself.

In instances where the routine data have been collected prior to the completion of the geophysical validation, this data shall have a lower priority for processing than validation data for the same instrument, calibration data for another instrument, and routine data processing for a calibrated instrument, unless indicated otherwise in the guidelines prepared by the ICWG.

Data collected and processed before the completion of the Geophysical Validation Plan will be released only with a disclaimer attached to the data indicating that the data quality may be questionable and could be changed in the future.

## WBS TASK DESCRIPTIONS

### MODIS INSTRUMENT TASK 1.0 Instrument Development Support

This task provides ongoing support to the Weber Engineering Team during the development of the instrument. Duties include: responding to action items; reviewing SBRC calibration plans, documents, tests, and algorithms; determining impact of engineering changes on science products; and providing an interface to the science team as needed.

### MODIS INSTRUMENT TASK 2.0 Engineering Model

These tasks are directed towards the calibration and characterization of the Engineering Model (EM).

#### 2.1 Reviewing Test Procedures and Software

At the CDR, SBRC will deliver a complete set of the algorithms intended for use in testing the Engineering Model. This task would review, evaluate, and provide feedback on the validity, appropriateness, and pitfalls of these algorithms and procedures. The intent would be to identify any problems or concerns in the testing procedures and algorithms before implementation.

#### 2.2 Testing Algorithm coding.

MCST's review of the EM tests will require the use of the SBRC testing algorithms and software. This task is responsible for: 1., verifying the compatibility between SBRC and GSFC hardware, 2., transferring and operating the code.

#### 2.3 Analysis of Engineering Model data.

Upon completion of the Engineering Model tests, MCST needs to analyze the data. Goals of this include: validation of instrument design; validation of testing procedures; recommendations for changes to testing procedures for Proto-Flight Model; verification of calibration algorithms; and recommendations for changes for calibration of the Proto-Flight Model.

## 2.4 Draft L-1B Algorithms for Algorithm Task (CAD&MUM)

The MCST Instrument Task is required to provide the MCST Algorithm Task with the instrument and spacecraft algorithms necessary for the Level 1B Calibration Algorithm. Using the results of the Engineering Model tests, this task will provide updated algorithms to the MCST Algorithm Task.

MODIS INSTRUMENT TASK 3.0 Proto-Flight Model (AM-1)

MODIS INSTRUMENT TASK 4.0 Flight Model PM-1

MODIS INSTRUMENT TASK 5.0 Flight Model AM-2

### STAFF DESCRIPTIONS

SENSOR ENGINEER	an instrument hardware expert
SCIENCE PROGRAMMER	a lower level programmer
SYSTEMS ANALYST	an expert in both computer hardware and software

# MODIS STAFFING (10/25/93)

TASK	BEGIN DATE	END DATE	STAFF-SKILL
1. Instrument Support	ON-GOING NOV 1993 APRIL 1994 APRIL 1994	ON-GOING ON-GOING ON-GOING ON-GOING	1 - SENSOR ENGINEER 1/2-SCIENCE PROGRAMMER 1/2-SCIENCE PROGRAMMER 1/2-SYSTEM ANALYST
2.0 Engineering Model(1)			
2.1 Test Procedures and Software	JAN 1994 JAN 1994	MARCH 1995 MARCH 1995	1 - SENSOR ENGINEER 1/2 - SCIENCE PROGRAMMER
2.2 Algorithm Code to Process SBRC Test Data	JAN 1994 JUL 1994 OCT 1994	JUN 1995 JUN 1995 JUN 1995	1/2 - COMPUTER SYSTEM ANALYST 1/2 - SCIENCE PROGRAMMER 1/2 - SCIENCE PROGRAMMER
2.3 Analysis of Engineering Model Data	JULY 1994 APRIL 1995 APRIL 1995	1996 1996 1996	1 - SYSTEM ANALYST 1 - SENSOR ENGINEER 1 1/2 - SCIENCE PROGRAMMER
2.4 Assimilation of Items 2.1-2.3 and Draft Level-1B Algorithm for CAM & MUM	OCT 1994 APRIL 1995 JULY 1995	1996 1996 1996	1 - SYSTEM ANALYST 1 - SCIENCE PROGRAMMER 1 - SCIENCE PROGRAMMER

## NOTES:

- (1) ENGINEERING MODEL DELIVERY TO THERMAL VACUUM - APRIL 1995  
ENGINEERING MODEL THERMAL VACUUM TESTING COMPLETE - JUNE 1995