

**DRAFT NRAO RESPONSE
NSF MMA OVERSIGHT COMMITTEE
REPORT OF THE MEETING OF AUGUST 4, 1998**

R. L. Brown
November 23, 1998

[Charges to the committee presented in italics; summary committee report comments in text type; NRAO response in bold type]

NRAO has submitted the report Recommended Site for the Millimeter Array to NSF, requesting that the Foundation approve the selection of Llano de Chajnantor as the site for the Millimeter Array. Does the MMAOC concur with the NRAO's recommendation of the Chajnantor site?

A. Report: The MMAOC concurs with the NRAO's recommendation.

Please provide a critique of MMA project planning and organization, as proposed by NRAO in the Millimeter Array Management Plan, the Millimeter Array Project Book (Version 1.0), and as described at today's MMAOC meeting. In doing so, please provide answers to the following questions:

1. Does the MMAOC believe that the proposed management plan and work breakdown structure will lead to successful completion of the MMA project's design and development goals?

B. Report: The MMA project team should capitalize on its good start and proceed to vigorously develop the WBS description and cost estimate for the entire MMA project. MMA management should continue to place high priority on this activity to insure that adequate staff attention is directed to complete this important exercise.

Response: The WBS for the MMA Design and Development (D&D) phase is complete. It is available on-line for use by people in the MMA Project or for review by interested others. It includes a dictionary, schedule, resource allocation, and a table of deliverables and project milestones. The budget for the D&D phase is derived from this WBS. There is only one commercial contract in the \$26M D&D project, the approximately \$5M contract for the initial prototype antenna.

Completion of the WBS for the entire project is a task for which the greatest utility is (1) to permit the NSF to request FY2001 construction funds in a timely way (Spring 1999) and (2) to serve as the cost/reward basis for the negotiations expected to lead to multi-national participation in, and enhancement of, the basic MMA project. Delivery of the Preliminary WBS for the entire project is scheduled for 31 January 1999. Work has begun in collaboration with the European group on an extension of that WBS to the combined project.

C. Report: [However] the process by which the MMA configuration will evolve and be revised under control is not yet defined.

Response: The MMA System Engineer has defined the process by which changes are to be made to the Project baseline. This process has been adopted by the project and is now in routine use.

D. Report: For this formative period in the MMA effort, the Project Book should provide a clear statement of the technical baseline, as opposed to a listing of alternatives without definition of the default baseline.

Response: The Project Book has been wholly revised in response to this comment and other concerns. Each level-1 task is a chapter and each chapter now begins with a summary statement of the baseline for that task.

2. Are there issues which have been incompletely treated or omitted from the Management Plan or the Project Book?

E. Report: Both the Management Plan and the Project Book are rapidly developing drafts. We list below issues and topics to be included in subsequent drafts. In many cases, the NRAO has stated its intention to develop these areas and to include them in the documents.

The Management Plan should include:

F. Report: a. A clear list of top level milestones that represent commitments to the NSF. These milestones should be reported on in all regular reports to NSF. Projected delays in achieving these milestones should be matters of significant discussion with the NSF.

Response: A detailed list of Project milestones and deliverables is included in the WBS. The same list is highlighted in Chapter 19 of the Project Book. It will be copied in each month's report to the NSF along with notation of when each milestone was met or the delivery made so that there is no ambiguity regarding progress being made or progress lacking. All this material may be referenced on-line.

G. Report: A summary of the complete, bottom-up cost estimate for the entire MMA Project baseline.

Response: See above.

H. Report: c. A configuration management plan that includes how the technical baseline is defined, documented and controlled, and how technical, schedule and cost baseline changes are initiated, documented, reviewed and incorporated in the controlled project configuration.

Response: The technical baseline is defined and documented in the Project Book. Technical, schedule and cost changes to the baseline are controlled, reviewed and

documented by the procedure established by the System Engineer. As noted above, that procedure has been implemented.

I. Report: d. A statement of how major subcontracts are planned, entered into, reviewed and managed.

Response: A contracting procedures statement is now included in the Management Plan. It emphasizes that as an initiative of AUI/NRAO the MMA contracting will be done in accord with the AUI/NRAO procurement procedures that have been established by the AUI and NSF.

J. Report: e. A statement of how the project management will coordinate this project with its many sites in the United States and Chile.

Response: Such a statement is now included in the Management Plan. Note that multi-site coordination of projects and operations among the different NRAO sites has been a routine part of NRAO observatory operations for more than 30 years. The management challenge that is new is the non-US site in Chile. The management plans for construction and operation in Chile are outlined in Chapters 17 and 18 of the Project Book.

K. Report: f. A statement of how responsibility for environment, safety, health and quality assurance will be assured and managed.

Response: Such a statement is now included in the Management Plan. Note that all MMA activities in the U.S. take place at established NRAO sites where procedures exist for responsible management of environment, safety, and health issues. The new activities are those in Chile which do not begin until the construction phase of the project. Discussions are now in progress with CONICYT to establish responsibility for environment, safety and health on the site that CONICYT manages.

Report: The Project Book should include:

L. Report: a. For each subsystem, a clear statement of the technical baseline that underpins design, planning and cost estimating. This should include key controlled parameters and specifications.

Response: As noted above, this recommendation was adopted and the Project Book has been rewritten to highlight the technical baseline.

M. Report: b. For each subsystem, a clear statement of remaining design options to the baseline, the criteria governing the possible choice of the option and the schedule point at which the choice must be made.

Response: Such options, where they exist, are noted in the Project Book and the decision dates are marked as milestones on the WBS.

3. *Is the proposed management structure matched to the project's goals?*

N. Report: The proposed management structure is generally well matched to the project's goals. The MMAOC feels that two issues warrant attention.

Report: a. The System Engineer is critical to assuring the technical functionality, to the successful integration and to establishing, controlling, and resolving interface and configuration definitions. To these ends, the System Engineer should be placed in the organization above all the subsystem leaders and report directly to the Project Manager.

A sound recommendation, adopted.

O. Report: b. The geographic dispersion of the MMA in the U.S. and at several sites in Chile is a substantial management challenge...

Response: As noted above, this is a challenge of long-standing at the geographically-diverse NRAO. There is no perfect solution to the problem that one can implement and forget. The best approaches derive from the suggestions of those most affected and these necessarily change as the project matures. This problem will require constant attention.

4. *Has NRAO responded satisfactorily to the MMAOC's previous recommendations?*

P. Report: The NRAO has taken positive steps to respond to many of our recommendations....

Response: The MMA Management and the MMAOC are in good agreement regarding the priorities for needed future action.

5. *Are there any other management issues which the MMAOC deems relevant?*

O. Report: The major challenge that separates the MMA from lesser projects is the enormous quantity of the hardware, the parts and pieces, which make the MMA a unique telescope and a system engineer's daunting challenge. The sheer size and complexity of the project forms the major challenge and it is of course precisely in that aspect that a proper management becomes ever more essential.

Response: Careful planning for the fabrication and acquisition of the MMA hardware in FY2001 and beyond is essential. We expect to expand the MMA project management team with appointment of a production engineer once it is clear that the NSF intends to continue the project into construction.

Based on the LSA/MMA Feasibility Study, as well as information presented by NRAO at today's meeting, does the MMAOC have comments or recommendations regarding the process of obtaining partners for the MMA project?

R. Report: The NSF and NRAO should vigorously pursue the negotiation with potential partners with a view to definite agreement by the middle of 1999. These negotiations will require give and take and should be driven primarily by the goal to achieve the best outcome for millimeter wavelength science...

Response: Securing partnership of the Europeans in an enlarged project that subsumes the MMA has been a central activity of the MMA project staff over the past year. It now appears to be both feasible and beneficial.

Are there any other issues which the MMAOC deems relevant?

S. Report: The MMAOC suggests that NSF consider scheduling subsequent reviews at the several NRAO project sites. Our reviews could then incorporate time to permit breakout sessions with the staff carrying out the work of the MMA project...

Response: The NRAO welcomes the next committee meeting at the Array Operations Center in Socorro, NM.