

AUGUST 1979

NATIONAL RADIO ASTRONOMY OBSERVATORY

AUGUST PROGRESS REPORT

VLA PROGRAM

September 14, 1979

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NATIONAL RADIO ASTRONOMY OBSERVATORY

MONTHLY PROGRESS REPORT

VLA PROGRAM

AUGUST 1979

SYSTEMS INTEGRATION DIVISION

The array was scheduled for 52 percent of the time; 35 percent went to astronomical programs and the remaining 17 percent to tests. The average downtime for the month was approximately 15 percent.

The twenty-one antennas currently outfitted with electronics are located at stations N14, W32, E1, W16, E2, W24, E4, W40, W48, E3, E8, E16, E12, W56, W64, E18, W8, N4, N6, N2, and W12. These stations are positioned approximately 1.14, 5.22, 0.08, 1.59, 0.04, 3.19, 0.15, 7.66, 10.47, 0.09, 0.48, 1.59, 0.97, 13.64, 17.16, 1.95, 0.48, 0.15, 0.27, 0.05, and 0.97 km respectively from the array center. Our longest astronomically usable baseline is approximately 18 km. The total number of operational antennas is 19. Antenna 11 was removed from service and Antenna 5 was returned to the observing array on August 13, 1979. Antennas 1, 9 and 11 are currently unavailable for observation. Antennas 20 and 21 are in the shakedown stage. The test array consists of Antennas 3 and 5.

ELECTRONICS DIVISION

During the month redesign of the windows for all feeds was completed. Considerable reliability problems have been experienced with the .005 inch milar windows on the 20-cm and 6-cm wavelength feeds and the .002 inch milar windows on the 2-cm and 1.3-cm feeds. The new windows will be .026 inch Esscolam 6 radome material for the 20-cm and 6-cm feeds and half-wavelength tuned slabs of Teflon for the 2-cm and 1.3-cm feeds. Material to retrofit all feeds has been ordered.

In the front end area, front end 05 has been reinstalled on the antenna after having its paramps and cryogenics retrofitted. This front end also includes a complete 4 channel new F4-F7-F8 IF system. The front end from Antenna 11 was returned to the lab for its cryogenic's retrofit.

A new two-level calibration noise source scheme has been installed on Antenna 17 to improve calibration accuracy for solar observers. When observing the sun it will be possible to switch in a larger calibration noise signal so that the system noise temperature can be continuously measured during the solar observation.

The B-Rack was installed on Antenna 24 ready for first fringes in early September.

COMPUTER DIVISION

Various improvements and repairs in the DEC-10 database constructor, FILLER, have been effected. These are needed in anticipation of making a spectral line version. Work on a spectrum plotting program is also underway.

We have moved one of the Century Data Systems disks to the PDP-11 Display System, and have connected the DEC-RP06 disk which used to be on that system to the DEC-10 controller, increasing the DEC-10 data storage areas by more than 35%. Additional disks and controllers will be purchased from Century to replace this one, and to free another RP06 for the DEC-10.

Improvements are underway in the polarization calibration procedures, and some software changes are underway for solar calibration applications.

ANTENNA DIVISION

Work of the Antenna Division at the end of the month stood as follows:

Antenna No. 22

Moved to maintenance and outfitting foundation on August 10 and outfitting started.

Antennas No. 23 & 25

Awaiting mechanical outfitting.

Antenna No. 24

Outfitting completed on August 8, 1979 and antenna moved to station CW5 for electronic completion, first fringes and initial operation

Antenna No. 26

Servo installation final alignment and inspection completed and antenna accepted from E-Systems on August 13, 1979. Antenna Servo tests showed a natural frequency in elevation at 2.25 Hz and in Azimuth of 2.45 Hz. Antenna was moved on August 24 to station CE7 to await outfitting.

Antenna No. 27

Antenna reflector mated on August 16 to antenna pedestal and panel installation started. Panel installation and alignment completed on August 29 with an rms of 0.0115 inches. Antenna moved on August 31 to master pad for servo installation and final alignment.

Antenna No. 28

Reflector assembly started on August 20. Pedestal and yoke arms complete at fabricators, ready for shipment to site.

SITE AND WYE DIVISION

Waveguide Installation

Installed approximately 4600 feet of waveguide, set to line and grade and backfilled between BN9 and AN5. Trenched 4040 feet on North Arm. Completed waveguide installation on East Arm from Highway 78 to BE5 (331 ft.) and 96 ft. at BE6.

Phase IV

Overall completion 92%. Track work on the West Arm is still 98% complete with small modifications required before final acceptance. Track work on the East Arm is partially complete to AE8, interchange at BE6 is complete. Ballast has been placed to Highway 52. Round Place Construction is 99% complete with the earthwork. Electric work is 90% complete. Power system to station BE6 was tested and accepted.

Phase V

Overall completion 38%. Mountain States, the dirt work subcontractor has completed all of the excavation work on the North and West arms and has completed the subgrade prep work to AN8. He has completed all cleaning and grubbing work. Track materials layed out to AN5 and rough layed track to BN5. Electric work has progressed with grounding work at 5 antenna stations and installation of power and communication casements at 5 stations.

PROJECT MANAGEMENT

General

Land Acquisition: Two defendants requested the Court, on or about September 4th, for an additional 14 days in which to answer the objections filed by the U. S. Attorney to the Land Commission's report. Latest due date is now September 18th. One defendant did file his response to the U. S. Attorney's objections. In this response he tried to prove that the objections were not valid and asked the Court to approve the Commission's report. This rancher did not ask the Court for a higher settlement.

New Mexico Gross Receipts Tax: There has been no action on this matter since the State filed its appeal on June 15th.

Right-of-Way Over BLM Lands: As far as we know the documents requesting the right-of-way are still at the Foundation.

Procurement: Little movement has occurred during the month on the manufacture of AIL parametric amplifiers. AIL has received 20 Varactors from one source which seem acceptable from a frequency basis but there have not yet been tested under cryogenic cycling. NRAO is continuing to send Engineers and Business people to the AIL plant to ensure work continues on our order.

As an alternate solution, should AIL fail to complete their order for parametric amplifiers, NRAO is constructing two cooled GaSa FET amplifiers at Green Bank which can be used as a second stage behind one set of parametric amplifiers in each front end. This is a developmental project and much testing will be necessary before it is known if this solution will be practical.

Personnel

The personnel changes as of August 31, 1979 are as follows:

Division	Budgeted 12/79 Level	7/30/79 Level	Additions	Reductions	8/31/79 Level
Site & Wye	9	9	0	0	9*
Antenna	17	13	0		13
Electronics	54	53	0	1	52*
Operations Management	4	3	1	0	4
Computer	15	14	0	0	14
Array Operations	11	9	0	0	9*
Program Management	27	27	0	2	25**
Total	137	128	1	3	126

* Does not include one part-time employee

** Does not include two part-time employees

8/31/79

VLA PROGRAM
MAJOR SUBCONTRACTS AND PURCHASE ORDERS PLACED

NUMBER P.O. SUBCONTRACT	VENDOR	ITEM DESCRIPTION	DATE PLACED	DOLLAR AMOUNT	DELIVERY DATE	CURRENT STATUS - ALL FIRM FIXED PRICE CONTRACTS EXCEPT WHERE NOTED
VLA-5 Amend. #12	BWH/CVA Joint Venture	E/A Title I and II	6/11/73	\$ 1,090,684		Title I -Completed Title II -Completed Title III -Completed Title IV -VLA-325 Supervision
VLA-6 Amend. #21	E-Systems, Inc.	28 Radio Telescopes	10/18/73	\$ 18,156,054		Delivery in Progress.
VLA-70 P.O. 52322 CO. #7	Sumitomo Electric USA, Inc.	3000 pieces of wave- guide and 3900 pieces of coupling sleeves.	11/03/78	\$ 3,215,847	10/31/79 and 1/31/80	Next 1000 pieces of waveguide and coupling sleeves to arrive Oakland port by 10/31/79.
VLA-233 P.O. S-02611	Silicon Systems, Inc.	Custom Integrated Circuits	12/12/76	\$ 206,375	5/31/79	Complete except for 468 each of Item 4.
VLA-256 P.O. S-07990	New Mexico State University AIL Division Cutler- Hammer	Archaeological Exca- vation Parametric Amplifiers	9/20/77 9/21/78	\$ 107,000 \$ 197,600	2/20/79 Completion Complete by 1/21/80	\$88,450 invoiced thru 7/31/79 Final reports expected in October. 6 sets received. No additional delivery information available at this time.
P.O. S-08085	AIL Division Cutler- Hammer	Parametric Upconverters	10/23/78	\$ 102,525	4/13/79 thru 8/13/79	
P.O. S-08510	RLC Electronics, Inc.	Switch filter assemblies and filters	12/12/78	\$ 193,943	Start 4/3/79	
P. O. S-08329	Contact Systems, Inc.	Various Wiring Modules	10/31/78 1/19/79	\$ 30,486	Complete by 9/30/79	

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MAJOR SUBCONTRACTS AND PURCHASE ORDERS PLACED

NUMBER P.O. SUBCONTRACT	VENDOR	ITEM DESCRIPTION	DATE PLACED	DOLLAR AMOUNT	DELIVERY DATE	CURRENT STATUS - ALL FIRM FIXED PRICE CONTRACTS EXCEPT WHERE NOTED
P. O. S-06387 Amend. #2	Milliflect	Subreflectors	10/23/78	\$ 61,200	Will ship complete week of 9/16/79	
P. O. S-08423	Rimo Manufacturing, Inc.	C Band Horns	11/17/78	\$ 36,600	Complete by 10/01/79	On schedule.
VLA-323	Logemann Bros.	Transporter	1/17/79	\$ 788,758	1/17/80	
P.O. S-08684	A & K Railroad Materials, Inc.	Wood Cross Ties	1/17/79	\$ 375,000	Complete by 10/79	
P.O. S-08685	Standard Pipe- protection	Coating of Waveguides	2/2/79	\$ 61,793	Complete by 2/15/80	
VLA-345	G. C. Dean	Labor Hour (Waveguide installation)	3/19/79	\$ 170,000	One Year Completing 3/18/80	
VLA-346	Wm. A. Smith Contract- ing Co., Inc.	Phase V Construction	4/26/79	\$ 2,820,000	June, 1980	
P.O. S-09818	Dataram Corp.	Very Large Memory	5/22/79	\$ 161,625	9/28/79	
P.O. S-09849	BWH/CVA Joint Venture	A/E Service Phase V	5/16/79	\$ 39,000	June, 1980	
P.O. S-08645	DEC	Computer Maintenance	1/08/79	\$ 90,063	CY '79	Monthly expenditure rate estimated at \$7,500.
P.O. S-06827 Amend. #2	C.T.I. Cryogenics	Cryocooler	5/23/78	\$ 239,760	2/15/80	
VLA-325	Pacific Railroad Constructors, Inc.	Phase IV Construction	6/23/78	\$ 2,916,080	9/16/79	Work progressing satisfactorily.

VLA PROGRAM
MAJOR SUBCONTRACTS AND PURCHASE ORDERS PLACED

NUMBER P.O. SUBCONTRACT	VENDOR	ITEM DESCRIPTION	DATE PLACED	DOLLAR AMOUNT	DELIVERY DATE	CURRENT STATUS - ALL FIRM FIXED PRICE CONTRACTS EXCEPT WHERE NOTED
VLA-326 P.O. S-08191 C.O. #1	California Computer Products, Inc.	Data Storage Subsystem	11/12/78 12/18/78	\$ 221,190	2/01/79	99% complete.
VLA-344 P.O. S-08595	Wheeler Construction Co.	Crushed Stone	1/08/79	\$ 668,660	Complete by 4/01/80	

NATIONAL RADIO ASTRONOMY OBSERVATORY
 VERY LARGE ARRAY
 STATUS AS OF AUGUST 31, 1979

CY - 79

<u>PROJECT NUMBER</u>	<u>DESCRIPTION</u>	<u>ALLOCATION</u>	<u>EXPENDED MONTHLY</u>	<u>TOTAL EXPENDED</u>	<u>TRANSFER TO FIXED ASSETS</u>	<u>BALANCE CONSTRUCT. IN PROGRESS</u>	<u>TOTAL COMMITTED</u>	<u>TOTAL EXPENDED & COMMITTED</u>	<u>NET BALANCE</u>
11000	SITE/WYE	5,356,050	757,870	1,943,466	3,695	1,939,771	2,971,079	4,914,545	441,505
12000	ANTENNA	1,549,000	100,206	580,097	23	580,074	740,800	1,320,897	228,103
13000	ELECTRONICS	2,764,000	305,846	1,571,252	34,279	1,536,973	746,156	2,317,408	446,592
14000	COMPUTER	1,392,000	12,227	103,734	---	103,734	399,807	503,541	888,459
17000	PROGRAM MANAGEMENT	120,000	10,767	78,511	---	78,511	2,047	80,558	39,442
18000	COMMON COSTS	487,752	41,187	304,000	---	304,000	11,870	315,870	171,882
19000	CONTINGENCY	524,821	---	---	---	---	---	---	524,821
	 TOTAL PROGRAM	 12,193,623	 1,228,103	 4,581,060	 37,997	 4,543,063	 4,871,759	 9,452,819	 2,740,804

Note: Project allocation consists of \$11,500,000 in new funding, \$7,752 in Common Cost commitments carried forward, and \$685,871 in prior years funds.

NATIONAL RADIO ASTRONOMY OBSERVATORY
VERY LARGE ARRAY
STATUS AS OF AUGUST 31, 1979

TOTAL PROGRAM

<u>PROJECT NUMBER</u>	<u>DESCRIPTION</u>	<u>ALLOCATION</u>	<u>EXPENDED MONTHLY</u>	<u>TOTAL EXPENDED</u>	<u>TRANSFER TO FIXED ASSETS</u>	<u>BALANCE CONSTRUCT. IN PROGRESS</u>	<u>TOTAL COMMITTED</u>	<u>TOTAL EXPENDED & COMMITTED</u>	<u>NET BALANCE</u>
11000	SITE/WYE	24,543,959	871,149	20,724,296	7,226,663	13,497,633	3,377,995	24,102,291	441,668
12000	ANTENNA	22,587,553	99,550	20,750,260	11,783,289	8,966,971	1,609,190	22,359,450	228,103
13000	ELECTRONICS	16,938,061	327,104	15,465,436	6,887,488	8,577,948	1,026,034	16,491,470	446,591
14000	COMPUTER	5,125,674	12,194	3,817,516	2,529,107	1,288,409	419,699	4,237,215	888,459
16000	SYSTEMS INTEGRATION	201,022	---	201,022	179,370	21,652	---	201,022	---
17000	PROGRAM MANAGEMENT	1,904,999	10,471	1,863,072	1,676,390	186,682	2,484	1,865,556	39,443
18000	COMMON COST	1,723,100	41,187	1,539,348	1,235,347	304,001	11,870	1,551,218	171,882
19000	CONTINGENCY/RESERVE	524,821	---	---	---	---	---	---	524,821
	SUB TOTAL	73,549,189	1,361,655	64,360,950	31,517,654	32,843,296	6,447,272	70,808,222	2,740,967
30000	RETIREMENTS	(10,820)	---	(10,820)	(10,820)	---	---	(10,820)	---
	TOTAL PROGRAM	73,538,369	1,361,655	64,350,130	31,506,834	32,843,296	6,447,272	70,797,402	2,740,967

Note: Project allocation excludes \$325,811 withheld and paid directly to other agencies by the NSF in prior years.
Project allocation includes \$11,500,000 for CY-79 funding.

NATIONAL RADIO ASTRONOMY OBSERVATORY
VLA PROGRAM

FINANCIAL STATUS REPORT
(in thousands)

As of: August 31, 1979

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Item	(A) Program Ceiling	Allocation to Date (C)			Un- allocated Balance	Outlook- (B)			Note
		Allocated	Expended and Committed	Allocated Balance		Estimate to Complete	Estimate Total	(Over) Under Ceiling	
Site and Wye	27,860	24,544	24,102	442	3,316	2,865	26,967	893	
Antennas	20,400	22,587	22,359	228	(2,187)	340	22,699	(2,299)	
Electronics	17,000	16,938	16,492	446	62	1,180	17,672	(672)	
Computer	4,850	5,126	4,237	889	(276)	1,482	5,719	(869)	
Systems Integration	400	201	201	-	199	-	201	199	
Program Management	2,650	1,905	1,866	39	745	339	2,205	445	
Common Cost	-	1,723	1,551	172	(1,723)	556	2,107	(2,107)	
Subtotal	73,160	73,024	70,808	2,216	136	6,762	77,570	(4,410)	
Contingency	2,840	525	-	525	2,315	1,000	1,000	1,840	
TOTAL	76,000	73,549	70,808	2,741	2,451	7,762	78,570	(2,570)	

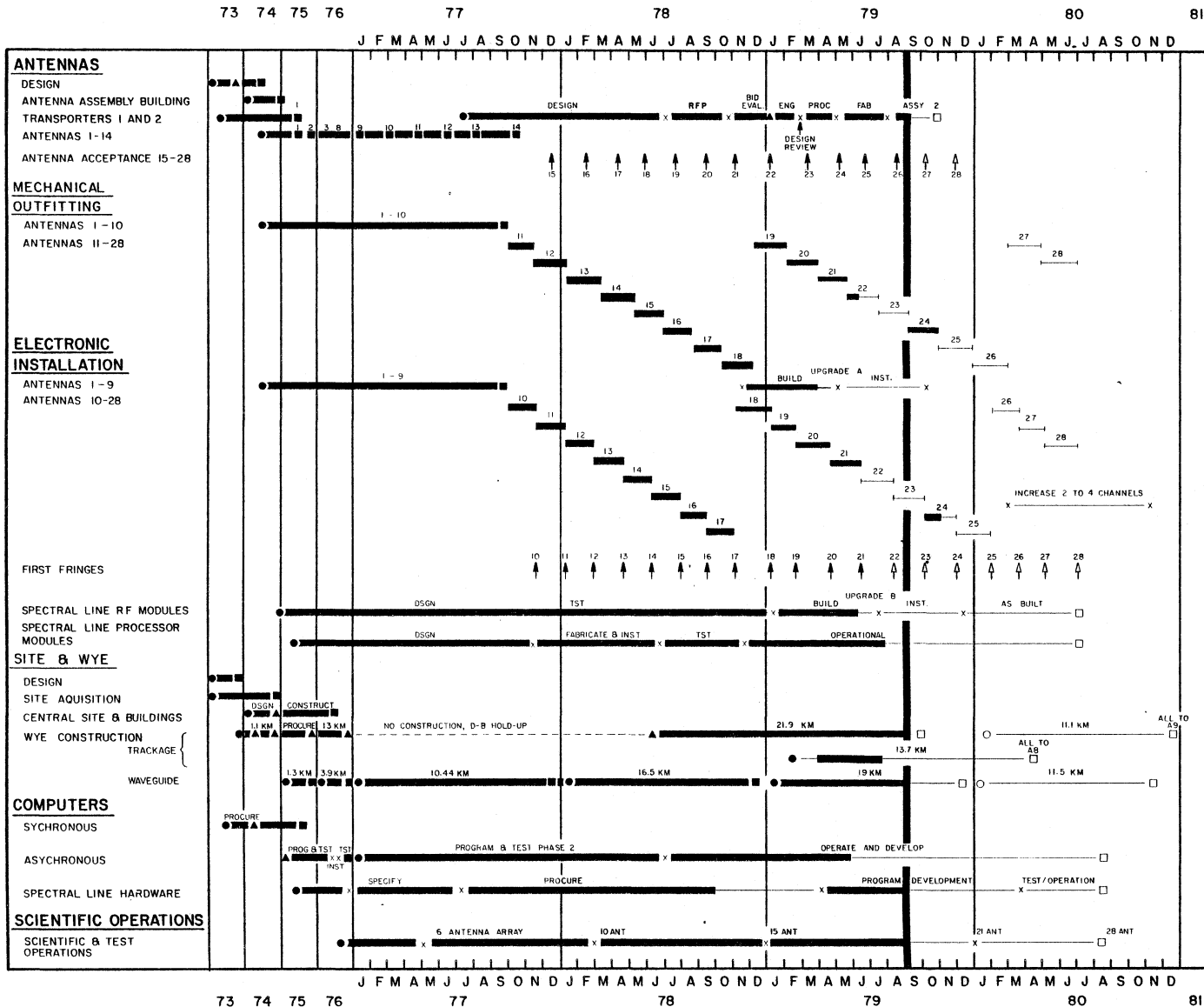
NOTES: (A) Includes \$293K for site acquisition, \$15.7K for ECAC Study, and \$17.1K for NSF Ad Hoc Advisory Panel. Allocated and Expended includes \$11K in assets which were retired in prior years.

(B) Estimate to complete is as of March 1979 and it excludes \$172K for airstrip. Escalation included for future years for Site/Wye work (8%); NRAO labor (6%); and certain electronic elements (8%). Antenna estimate is based upon the existing contract costs for fabrication of the antennas.

(C) Includes \$11,500K of CY-79 Funding.

NATIONAL RADIO ASTRONOMY OBSERVATORY VLA ACTIVITY SCHEDULE

UPDATE DATE: 8/31/79



REV. NO.	REV DATE	DESCRIPTION
1	12/1/78	UPDATE PROGRAM PLAN