

MAY 1980

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VLA LIBRARY VERY LARGE ARRAY PROGRAM

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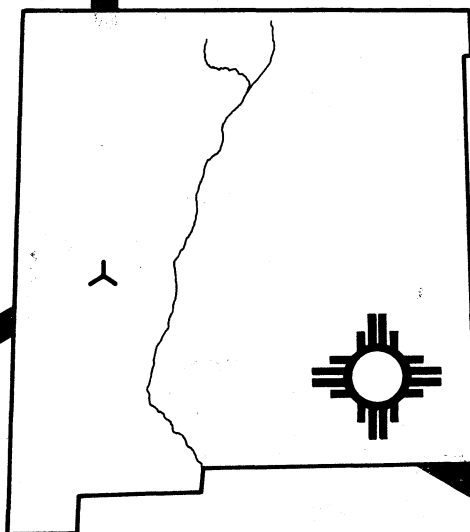
JUL 18 1980

NATIONAL RADIO ASTRONOMY OBSERVATORY

MAY PROGRESS REPORT

VLA PROGRAM

MAY 19, 1980



**NATIONAL RADIO ASTRONOMY OBSERVATORY
P.O. Box 0, Socorro, New Mexico 87801**

**OPERATED BY ASSOCIATED UNIVERSITIES, INC.
UNDER CONTRACT WITH THE NATIONAL SCIENCE FOUNDATION**

NATIONAL RADIO ASTRONOMY OBSERVATORY

MAY PROGRESS REPORT

VLA PROGRAM

MAY 19, 1980

NATIONAL RADIO ASTRONOMY OBSERVATORY

MONTHLY PROGRESS REPORT

VLA PROGRAM

MAY 1980

SYSTEM INTEGRATION DIVISION

The array was scheduled for 66 percent of the time; 51 percent went to astronomical programs and the remaining 15 percent went to tests. The average downtime for the month was approximately 11.2 percent.

Antenna 2 was moved to the Antenna Assembly building for overhaul on May 1. Antenna 11 was returned to observing on May 12. Antennas 23 and 25 were declared operational on April 30 and May 20, respectively. The maximum number of antennas used for an astronomical observing program during the month of May was 23. Antennas 1 and 2 are currently unavailable for observation. Antenna 26 is in the shakedown stage. The test array consists of Antennas 3, 5 and 11.

The furthest station on each arm occupied by operating antennas are currently located at a distance of 6.9, 10.5 and 17.2 km from the array center along the north, southeast and southwest arms respectively. Our longest astronomically usable baseline is approximately 24 km.

ELECTRONICS DIVISION

In the Front End area the Front End for Antenna 11 was reinstalled, tested and this antenna is now in operation. An automatic test system for Front End rack is in process. AIL's last delivery of paramps was May 19, 1980. Of the last four units delivered, three units were found to be defective, one unit was returned and an attempt to repair the other two units on site was approved by AIL. AIL shipped two upconverters in May. One unit was accepted and the other unit was found to be defective and returned to them. The last Dewar, (stainless steel type) for Antenna 28 was received, installed and leak tested.

In the local oscillator area the "B" rack for Antenna 27 was installed and Antenna 25 was declared operational. Phase stability tests on Antenna 5 are continuing, along with the assembly of the new back-up master LO system.

In the Monitor and Control area, the new design F/R module is set up with a sterling mount and is undergoing lab test. Modifications are proceeding to the Serial Line controller to include a user interface.

In the Delay and Multiplier area, the integrator control chassis was rewired to eliminate cross talk, and several minor modifications were made to the delay line units. All of the components for the Delay and Multiplier B & D channels have been assembled and are undergoing system integration and preliminary testing.

In the waveguide area, installation of waveguide on Antenna 28 was completed. Loss measurement of the waveguide from station AN6 to AN8 (a distance of 6.02 km) were completed with a measured loss of 1.04 dB/km at 50 GHz. Measurements of the cathodic protection is continuing.

The Assembly Group in Charlottesville has shipped all of the A & C channel for the IF subsystem. They have completed 40 percent of this subsystem.

COMPUTER DIVISION

The program which calculates the antenna gains (ANTSOL) has been further enhanced to allow the fluxes of calibrators of unknown strength to be derived from the fluxes of known calibrators and the computed antenna gains. This simplifies the data calibration procedure and should help to ease the pressure on the DEC 10.

Until the pipeline processor becomes fully operational, memory capacity on the ModComp computers dictates a maximum of 5000 for the product of the numbers of baselines and the numbers of spectral channels. To allow the use of more antennas at the narrow bandwidths, an option has been added to select only a subset of the spectral channels from the correlator for further processing.

In an effort to evaluate the performance of the DEC 10, some benchmarks have been run. These comprise a controlled mix of the programs that are normally in use. Initial indications are that, as expected, the system performance is best with a light load. However, it appears that with a large number of simultaneous users the total system performance is only degraded by about 20 percent.

The tape drives for the PDP 11's still do not work correctly. It is hoped that our updated version of the controller, which should meet our specifications adequately, will be available next month.

ANTENNA DIVISION

Antenna Moves

Three antennas were moved during the month.

Outfitting

Continued outfitting Antenna No. 28.

Major Overhaul

Started overhaul of Antenna No. 2 on May 2, 1980.

Transporter No. 2

Logemann Brothers Co. completed the assmebly and testing on May 15, 1980. The Antenna Division started the transporter outfitting, including addition of a diesel generator, air compressor, exhaust stacks wheel grounding brushes, etc.

SITE AND WYE DIVISION

Waveguide Installation

Installed approximately 3,590 feet of waveguide. To AN9 on the North arm and 487 feet on East arm. Trenched approximately 1,100 feet on East arm.

Phase IV

Overall completion 99.5 percent. Track modification on the West arm is 100 percent complete. Main track work on the East arm is 100 percent complete to AE8 and interchanges are 100 percent complete. All antenna spur tracks have been installed. Final grading work is 100 percent complete. Electrical work is 99.5 percent complete.

Phase V

Overall completion of the total contract is 91 percent. Track rough layed to AW9 and first lift of ballast is placed on 3/4ths of the trackage. All ballast is in place on the North arm except on antenna spur tracks A7, A8 and A9. 70 percent of track materials have been layed out to A9 on the East arm. Maintenance vehicle spur track is ballasted. Electrical work is 97 percent complete.

P.O. S-11480, Casco Fire Protection Systems

Installation of the sprinkler system for the Technical Services Building Shop, Warehouse, Library Building and VSQ 1 and 2 continued during the month and is 90 percent complete.

The purchase order was amended to add sprinkler systems to VSQ 3 and Library Building addition. Work was commenced on this installation and is 40 percent complete.

VSQ #3 and VAX Addition to Library Office Building

Subcontract for the prefabrication of the two buildings was awarded to Total Services Co. on May 1, 1980 in the amount of \$123,500. It is expected that both buildings will be delivered during June. In the meantime, work on excavation and foundations is proceeding.

PROJECT MANAGEMENT

General

No hearing date has yet been set for the U.S. Tenth District Court of Appeals to hear the New Mexico appeal on the Gross Receipts Tax case decision.

All rail, ties and track accessories are now on order. The freeze placed on Defense Department surplus rail supplies and the necessity of purchasing these items on the open market has resulted in an over-run of these cost accounts totalling in excess of \$140,000.

The hearing before the New Mexico Public Service Commission concerning an increase in electric utility rates for the Socorro Electric Cooperative, and hence the VLA, has been scheduled for June 17, 1980. NRAO will be represented at the hearing.

Personnel

The personnel changes as of May 31, 1980 are as follows:

Division	Budgeted 6/30/80 Level	4/30/80 Level	Additions	Reductions	5/31/80 Level
Site & Wye	10	10	0	0	10
Antenna Division	16	16	0	0	16
Electronics	52	49	0	0	49*
Site Management	6	5	1	1	5
Computer Division	17	15	1	0	16
Operations Div.	12	10	0	0	10
Project Mgmt.	26	24	3	4	23*
TOTAL	139	129	5	5	129

*Does not include two part-time employees

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5/31/80

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-345 Amendment	G. C. Dean	Labor Hour (Waveguide Installation)	3/19/79	335,000	Two years completing 2/28/81	
VLA-346	Wm. A. Smith Contract- ing Co., Inc.	Phase V Construction	4/26/79	2,820,000	July, 1980	Work progressing satisfactorily.
P.O. S-09849	BWH/CVA Joint Ventures	A/E Service Phase V	5/16/79	39,000	July, 1980	
P.O. S-11638	DEC	Computer Maintenance	2/13/80	90,024	CY '80	Monthly expenditure rate estimated at \$7,500.
P.O. S-06827 Amendment #2	C.T.I. Cryogenics	Cryocooler	5/23/78	239,760		Complete.
VLA-325	Pacific Railroad Constructors, Inc.	Phase IV Construction	6/23/78	2,916,080		Complete.
VLA-344 P.O. S-08595	Wheeler Construction Co.	Crushed Stone	1/08/79	670,043		Complete.
P.O. S-11264	Floating Point Systems, Inc.	Array Processors	12/10/79	201,092		Complete
VLA-354 P.O. S-11480	CASCO Fire Protec- tion Systems	Fire Protection System for VLA Site Buildings	2/20/80	57,840	9/15/80	
P.O. S-11481	Century Data Systems	Disk Drives	2/15/80	64,078	8/15/80	
P.O. S-11478	Digital Equipment Corp.	Computer Systems	2/27/80	74,635	9/2/80	

5/31/80

VLA PROGRAM

MAJOR SUBCONTRACT 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-6 Amend. #21	E-Systems, Inc.	28 Radio Telescopes	10/18/73	\$ 18,156,054		Deliveries are complete, but final paper work must be issued.
VLA-256	New Mexico State University	Archaeological Excavation	9/20/77	\$ 107,000	2/20/79 Completion	\$91,245 invoice thru 2/29/80. Final reports expected in July 1980..
P.O. S-07990	AIL Division Cutler-Hammer	Parametric Amplifiers	9/21/78	\$ 212,800	Complete by 1/21/80	11 sets received. 17 sets remain for completion of order.
P.O. S-08085	AIL Division Cutler-Hammer	Parametric Upconverters	10/23/78	\$ 102,525	4/13/79 thru 8/13/79	12 units received. 12 units are at AIL for repair. 3 will ship in June to complete order.
P.O. S-08329	Contact Systems, Inc.	Various Wiring Modules	10/31/78 1/19/79	\$ 30,486		On schedule. NRAO owes them additional components for assembly.
VLA-323	Logemann Bros.	Transporter	1/17/79	\$ 788,758		Work complete - final paper work pending.
S-11731	Information Prod. Systems	Tape System	4/11/80	\$ 119,700		Complete.
S-12394 VLA-355	Total Systems	Motel/Office	5/1/80	\$ 123,500	7/5/80	

NATIONAL RADIO ASTRONOMY OBSERVATORY

VERY LARGE ARRAY
STATUS AS OF MAY 31, 1980

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 AND WYE	26,637,172	328,265	25,291,203	11,506,186	13,785,017	943,507	26,234,710	402,462
12000	ANTENNA	22,721,203	22,768	22,121,535	17,940,920	4,180,615	512,905	22,634,440	86,763
13000	ELECTRONICS	17,982,546	99,934	17,038,468	7,913,761	9,124,707	235,577	17,274,045	708,501
14000	COMPUTER	6,111,066	185,142	4,726,355	2,874,739	1,851,616	310,326	5,036,681	1,074,385
16000	SYSTEMS INTEGRATION	201,022	---	201,022	200,965	57	---	201,022	---
17000	PROGRAM MANAGEMENT	2,098,809	7,548	1,932,243	1,782,794	149,449	3,044	1,935,287	163,522
18000	COMMON COST	2,100,371	30,565	1,845,767	1,699,308	146,459	11,031	1,856,798	243,573
19000	CONTINGENCY/RESERVE	400,000	---	---	---	---	---	---	400,000
	SUB TOTAL	78,252,189	674,222	73,156,593	43,918,673	29,237,920	2,016,390	75,172,983	3,079,206
30000	RETIREMENTS	(67,979)	---	(67,979)	(67,979)	---	---	(67,979)	---
	TOTAL PROGRAM	78,184,210	674,222	73,088,614	43,850,694	29,237,920	2,016,390	75,105,004	3,079,206

Note: Project allocation excludes \$325,811 withheld and paid directly to other agencies by the NSF in prior years.
Project allocation includes \$4,500,000 for CY-1980 Funding.

NATIONAL RADIO ASTRONOMY OBSERVATORY

VERY LARGE ARRAY

STATUS AS OF MAY 31, 1980

CY - 80

<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	1,998,942	263,165	894,581	1,305	893,276	725,074	1,619,655	379,287
12000	ANTENNA	160,000	9,820	55,543	---	55,543	19,629	75,172	84,828
13000	ELECTRONICS	1,153,000	63,725	348,153	---	348,153	103,858	452,011	700,989
14000	COMPUTER	1,291,000	23,716	117,643	---	117,643	139,941	257,584	1,033,416
17000	PROGRAM MANAGEMENT	207,000	7,548	40,433	---	40,433	3,044	43,477	163,523
18000	COMMON COSTS	401,063	30,565	146,459	---	146,459	11,031	157,490	243,573
19000	CONTINGENCY	400,000	---	---	---	---	---	---	400,000
	TOTAL PROGRAM	5,611,005	398,539	1,602,812	1,305	1,601,507	1,002,577	2,605,389	3,005,616

Note: Project allocation for CY-80 consists of \$4,500,000 in new funding plus \$1,111,005 in prior year funds re-allocated in February, 1980.

NATIONAL RADIO ASTRONOMY OBSERVATORY
PROGRAM

FINANCIAL STATUS REPORT
(in thousands)

As of: May 31, 1980

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Item	Program Ceiling	(A) Allocation to Date (C)			Un-Allocated Balance	Outlook (B)			Not
		Allocated	Expended and Committed	Allocated Balance		Estimate to Complete	Estimate Total	(Over) Under Ceiling	
Site and Wye	27,860	26,930	26,528	402	930	402	26,930	930	
Antennas	20,400	22,721	22,634	87	(2,321)	87	22,721	(2,321)	
Electronics	17,000	17,999	17,290	709	(999)	709	17,999	(999)	
Computer	4,850	6,111	5,037	1,074	(1,261)	1,074	6,111	(1,261)	
Systems Integration	400	201	201	-	199	-	201	199	
Program Management	2,650	2,116	1,952	164	534	164	2,116	534	
Common Cost	-	2,100	1,857	243	(2,100)	243	2,100	(2,100)	
Subtotal	73,160	78,178	75,499	2,679	(5,018)	2,679	78,178	(5,018)	
Contingency	2,840	400	-	400	2,440	400	400	2,440	
TOTAL	76,000	78,578	75,499	3,079	(2,578)	3,079	78,578	(2,578)	

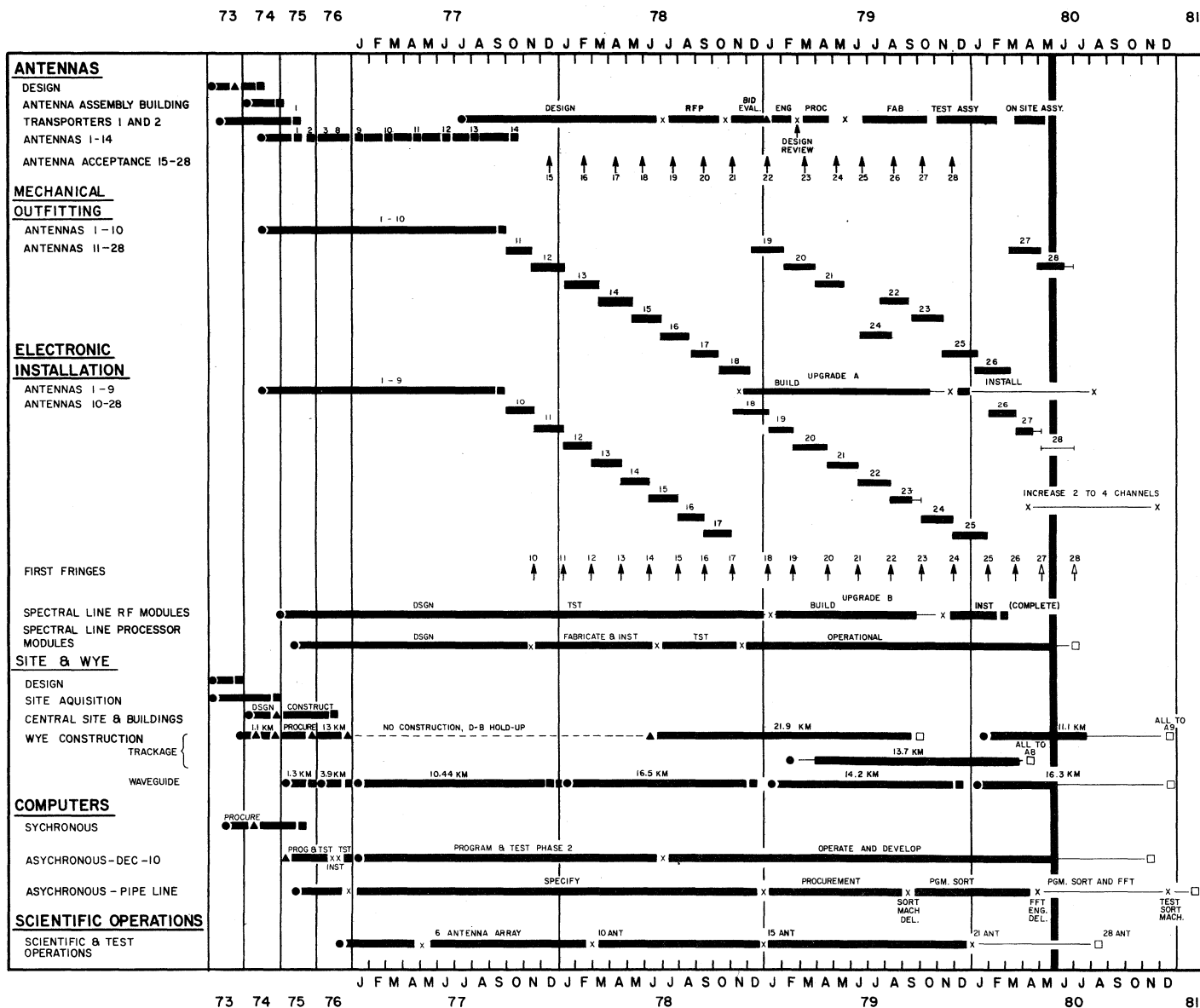
NOTES: (A) Includes \$293K for site acquisition, \$15.7K for ECAC Study, and \$17.1K for NSF Ad Hoc Advisory Panel. Allocated and Expended includes \$68K in assets which were retired in prior years.

(B) Estimate to complete is as of March 14, 1980.

(C) Includes \$4,500K in CY-80 Funding.

NATIONAL RADIO ASTRONOMY OBSERVATORY VLA ACTIVITY SCHEDULE

UPDATE DATE: 06/02/80



TASKS	
UPGRADE A	RECEIVER FRONT-END FILTERS, MODULES F4, F7, F8. INSTALL 5 ANT/MO. (25 MODULES)
UPGRADE B	SPECTRAL LINE IF MODULES T3, T4, T5, T6. INSTALL 4 SYSTEMS (24 MODULES) PER MONTH. (COMPLETED 03/03/80)
INCREASE 2 TO 4 CHANNELS	ADDITIONAL MODULES OF ABOVE TYPES. TOTAL 224. INSTALL 36 PER MONTH.

ABBREVIATIONS	
DSGN - DESIGN	TST - TEST
LAB - LABORATORY	PRELM - PRELIMINARY
INST - INSTALL	OPNS - OPERATIONS
ANT - ANTENNA(S)	PGM. - PROGRAM
	DEL. - DELIVERY

SYMBOLS	
O - START OF A PHASE	△ - CONTRACT AWARD
X - END OF AN ACTIVITY	□ - END OF A PHASE
↑ - SCHEDULED	↑ - COMPLETED

REV. NO.	REV DATE	DESCRIPTION
1	12/1/78	UPDATE PROGRAM PLAN '79
2	11/1/79	UPDATE PROGRAM PLAN '80
3	2/1/80	MISC. PLAN CHANGES.