

FEBRUARY 1979

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J. B. ...

NATIONAL RADIO ASTRONOMY OBSERVATORY

FEBRUARY PROGRESS REPORT

VLA PROGRAM

MARCH 15, 1979

NATIONAL RADIO ASTRONOMY OBSERVATORY

MONTHLY PROGRESS REPORT

VLA PROGRAM

FEBRUARY 1979

SYSTEMS INTEGRATION DIVISION

The array was scheduled for 67 percent of the time; 53 percent went to astronomical programs and the remaining 14 percent to tests. The average downtime for the month was approximately 16 percent.

On February 15 Antenna 18 was moved to DN4; we now have two operating antennas on the North arm. The eighteen antennas currently outfitted with electronics are located at stations W8, W32, E1, W16, E2, W24, E4, W40, W48, E3, E8, E16, E12, W56, W64, E18, N8, and N4. These stations are positioned approximately 0.48, 5.2, 0.08, 1.6, 0.05, 3.2, 0.15, 7.7, 10.5, 0.09, 0.48, 1.6, 0.97, 13.6, 17.2, 1.95, 0.44, and 0.13 km respectively from the array center. Our longest astronomically usable baseline is approximately 18 km. The total number of operational antennas is 15 (1 through 15). Antennas 5 and 7 are presently decommissioned for electronic retrofits. Antennas 16, 17 and 18 are in the shakedown stage. The test array consists of Antennas 3, 5 and 11.

ELECTRONICS DIVISION

The front end for Antenna 19 has been completed but its installation on the antenna is being delayed because of difficulty in locating and sealing a very small leak in the vacuum Dewar. Front end 20, using the first stainless steel Dewar has had its first cool down. AIL has advised us unofficially that they have discovered a design problem in their original 4.5-5.0 GHz parametric amplifiers, of which the VLA has 6 sets. In these early paramps the circulator ferrites are too thin and after many warm ups and cool downs the ferrites demagnetize. This causes the paramps to develop an overcoupled response. The importance of this problem to the VLA is under investigation.

The cryogenics group has constructed and run a 3 HP helium compressor. This compressor, which is partially constructed from parts of unserviceable Air Products and Cryomech compressors, will be used as a laboratory compressor and as a training machine.

An initial review of the problem of modifying the VLA front end to allow more convenient solar observing has been completed, with an aim of making some modifications before the start of the Solar Maximum which begins in late 1979. On all antennas the necessary gain reduction will be accomplished by turning off the paramps by either turning off the Gunn pump source, installing a waveguide switch in the pump waveguide or by biasing the paramp varactors off. On one of two antennas, stronger injected noise calibration signals will be provided by installing tighter couplers in the input waveguides so that a noise temperature measurement can be made while observing the sun.

Except for those few modules whose design is not yet finalized (modules F8, T3, T4, T5, T6), the Charlottesville construction group has now ordered components to complete all modules needed for the VLA. The final build of modems has begun using an in-house assembler at the Site.

COMPUTER DIVISION

PDP-11/70 mapping software has been opened for general use. Clean software is progressing.

Work on making the IMPs image processing and display system more generally useful is progressing.

The on-line portion of the interim spectral line system is now progressing. The programs for the correlator Modcomp and the array processor are written and mostly debugged - that is, a cross spectral function can now be displayed in the screen room.

The hardware for the spectral line sorting system will be delivered in March (Calcomp/Xerox disks connected to a PDP-11/70 CPU). Some effort is going into preparing for this.

ANTENNA DIVISION

Progress in the Antenna Division area reached this status at the end of February:

Antenna No. 19

Mechanical outfitting and touch-up painting completed on February 13, 1979 and on February 14, the antenna was moved to station CW6 for electronic installation.

Antenna No. 20

Moved on February 14 to maintenance foundation and mechanical outfitting started.

Antenna No. 21

Awaiting mechanical outfitting.

Antenna No. 22

Servo installation and checkout completed on Master pad on February 13 with a natural frequency exhibited at 2.35 Hz in azimuth and 2.36 Hz in elevation. Final alignment and inspection completed on February 20 the antenna was accepted from E-Systems.

Antenna No. 23

Reflector assembly and pedestal assembly completed and on February 22, the reflector was mated to the pedestal. The antenna was returned to the assembly foundation for panel installation and elevation axis alignment.

Antenna No. 24

Reflector assembly parts on Site. Pedestal and yoke assembly due mid-March.

Miscellaneous

Antenna 18 moved on February 15, 1979 to station DN4. Contract for transporter No. 2 placed.

SITE AND WYE DIVISION

Waveguide Installation

All 60 mm waveguide work was suspended during the month except for digging 1900 feet of deep trench on both sides of foundation AE5. 20 mm waveguide was installed and backfilled at antenna stations DN4 and DN5.

Phase IV - Site & Wye Construction

Track work on the West arm is 99% complete with small modifications required before final acceptance. Track work has started on the East arm and is partially complete to BE8. Round Place Construction has stopped all earthwork due to the inclement weather. Antenna foundation concrete tie beams have been poured at BE8, BE9 and AE6. Overall the work is now 64% complete.

A locomotive and 5 ballast railroad cars have been placed on the VLA tracks by Pacific Railroad to be used to haul ballast to the construction area.

Phase V - Site & Wye Construction

On February 14 the Davis-Bacon Wage Determination was received from the Department of Labor.

On February 19 Phase V plans and specifications were issued to bidders. To date over 50 sets of documents have been issued. It appears that approximately 15 General Contractors are interested in bidding the work.

A pre-bid meeting will be held on March 14, and the bids are due March 27. Estimated cost of the work is \$3,000,000.

PROJECT MANAGEMENT

General

On February 1 the Washington legal firm of Steptoe & Johnson was retained to review the labor provisions of AUI Subcontract VLA-345. A first draft of the legal opinion was received February 28 and will be forwarded to the Foundation early in March.

On February 9 the three Commissioners, appointed by Federal Judge Bratton to assess the damage done to the Taylor, Ake, and Dunlap ranches, visited the Site. The Commission will make recommendations to the Judge who will establish a value for the land taken and the inconvenience to ranching operations caused by the existence of the VLA. At the end of the month no report had been filed.

Representatives of the New Mexico State Division of Taxation and Finance have visited Socorro and the Site a number of times during the last two months to gain data for the State's Gross Receipts Tax Case which is due for trial in April.

Personnel

The personnel changes as of February 28, 1979 are as follows:

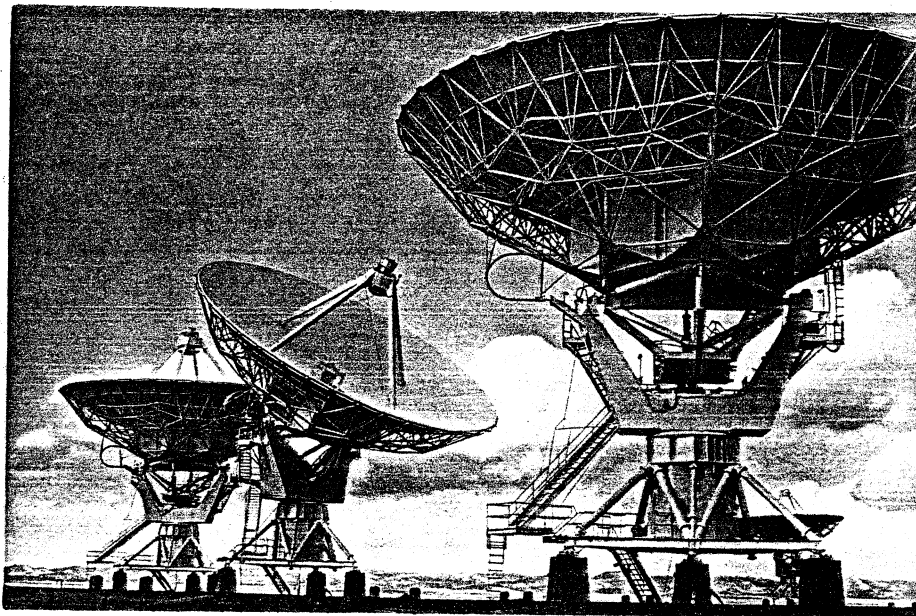
Division	Budgeted 12/79 Level	1/31/79 Level	Additions	Reductions	2/28/79 Level
Site & Wye	9	9	0	0	9*
Antenna	17	15	0	1	14
Electronics	54	49	1	0	50**
Operations Management	3	3	0	0	3
Computer	14	13	0	1	12
Array Operations	11	9	0	0	9***
Program Management	28	27	3	3	27****
Totals	136	125	4	5	124

* Does not include one part-time employee

** Does not include one part-time employee

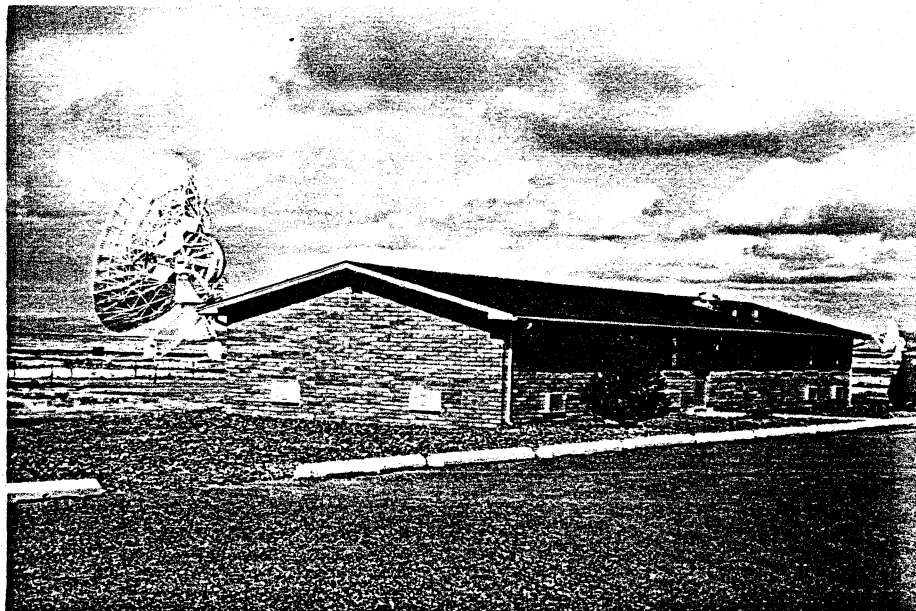
*** Does not include one part-time employee

**** Does not include three part-time employees



p3-79-1

Antennas Near Center of Wye



p3-79-2

Office - Library Building

2/28/79

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-29 Amend. #5	Sterling-Detroit	Focusing Feed Mounts thru Antenna 28 plus spares	6/17/74	\$ 1,002,380		Delivery in Progress. (Mounts for Antennas 23-28 complete by 7/13/79. Amend. #5 issued 11/9/78.
VLA-70 P.O. 52322 C.O. #6 C.O. #7	Sumitomo Electric USA, Inc.	1060 pieces of waveguide 3000 pieces of waveguide and 3900 pieces of coupling sleeves	9/27/78 11/03/78	\$ 3,215,847	4/30/79; 7/31/79; 10/31/79; and 1/31/80	Next 1060 pieces to arrive Oak- land port by 4/30/79.
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-04886	New Mexico State University	Archaeological Exca- vation	9/20/77	\$ 107,000	2/20/79 Completion	\$80,633 invoiced thru 12/31/78 Final reports due 2/20/79.
P.O. S-07990	AIL Division Cutler- Hammer	Parametric Upconverters	9/23/77	\$ 79,702	Complete	
P.O. S-08085	AIL Division Cutler- Hammer	Parametric Amplifiers	9/21/78	\$ 197,600	Complete by 1/21/80	2 received. On schedule.
P.O. S-08510	AIL Division Cutler- Hammer	Parametric Upconverters	10/23/78	\$ 102,525	4/13/79 thru 8/13/79	
P.O. S-08535	RLC Electronics, Inc.	Switch filter assemblies and filters	12/12/78	\$ 193,943	Start 4/3/79	
P.O. S-08557	RF Systems, Inc.	Ku and K Band Feed Horns	12/14/78	\$ 71,554	4/15/79	
P.O. S-08558	Federated Metals Corp.	Diamond Line Zinc Ribbon	12/8/78	\$ 59,412	Complete 3/6/79	
P.O. S-08558	Allen Avionics	L.C. Filters	1/08/79	\$ 67,040	Complete by 6/30/79	

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
P.O. S-08645	DEC	Computer Maintenance	1/08/79	\$ 90,063	CY'79	Monthly expenditure rate estimated at \$7,500.
VLA-316 Amend. #1	Midstate Cartage	Labor-Hour	3/28/78 12/28/78	\$ 175,000	Complete by 3/27/79	Total expenditure thru 2/25/79 is \$164,884.
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-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	Partial quantities received 3/9/79.
VLA-340 P.O. S-08227 C.O. #1	Digital Equipment Corp.	Computer System	11/06/78 12/08/78	\$ 102,977	2/09/79	
VLA-344 P.O. S-08595	Wheeler Construction Co.	Crushed Stone	1/08/79	\$ 668,660	Complete by 4/01/80	
P.O. S-06084 C.O. #1	Structures, Inc.	Walkways & Platforms	9/27/78	\$ 33,740	Complete by 3/15/79	
P.O. S-08222	Structures, Inc.	Transition & Towers for K, Ku and C-Band Horns, L-Band Towers	10/19/78	\$ 23,955	Complete by 6/01/79	L-Band Towers complete.
P.O. S-08230	Structures, Inc.	Feed Support Structures	10/23/78	\$ 26,855	Complete by 6/01/79	
P.O. S-08269	Superior Electric Co.	Motors & Translators	10/26/78	\$ 30,643	1/29/79	Complete by 3/31/79.

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
P.O. S-08329	Contact Systems, Inc.	Various Wiring Modules	10/31/78 1/19/79	\$ 30,486	Complete by 9/30/79	
P.O. S-06387 Amend. #2	Milliflect	Subreflectors	10/23/78	\$ 61,200	Complete by 8/01/79	
P.O. S-08422	Rimo Manufacturing, Inc.	L Band Horns	12/7/78	\$ 71,190	Complete by 9/1/79	
P.O. S-08423	Rimo Manufacturing, Inc.	C Band Horns	11/17/78	\$ 36,600	Complete by 10/01/79	
P.O. S-08443	Avantek, Inc.	Transistor Ampli- fiers	11/17/78	\$ 23,636	Complete by 4/15/79	
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 Pipeprotection	Coating of Waveguides	2/2/79	\$ 61,793	Complete by 2/15/80	

VLA PROGRAM

2/28/79

PROCUREMENT ACTIVITIES INITIATED

<u>RFP NUMBER</u>	<u>ITEM DESCRIPTION</u>	<u>ESTIMATED COST</u>	<u>ISSUE DATE</u>	<u>PROPOSAL/BID DUE DATE</u>	<u>SUBMISSION TO NSF DATE</u>	<u>AWARD DATE</u>	<u>CURRENT STATUS</u>
VLA-345	G. C. Dean (Labor Hour)	\$170,000			1/10/79	Estimate 3/31/79	
VLA-346	Phase V Construction	\$3,000,000	2/19/79	3/27/79			

NATIONAL RADIO ASTRONOMY OBSERVATORY
VERY LARGE ARRAY
STATUS AS OF FEBRUARY 18, 1979

CY - 1979

<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	5,320,000	117,494	143,065	3,695	139,370	2,039,442	2,182,507	3,137,493
12000	ANTENNA	1,549,000	146,712	181,511	23	181,488	1,038,173	1,219,684	329,316
13000	ELECTRONICS	2,764,000	145,186	242,593	3,020	239,573	811,306	1,053,899	1,710,101
14000	COMPUTER	1,392,000	16,580	25,632	---	25,633	18,649	44,281	1,347,719
17000	PROGRAM MANAGEMENT	120,000	9,392	19,156	---	19,156	100	19,256	100,744
18000	COMMON COSTS	487,752	35,974	64,537	---	64,537	12,462	76,999	410,753
19000	CONTINGENCY	504,004	---	---	---	---	---	---	504,004
	 TOTAL PROGRAM	 12,136,756	 471,338	 676,494	 6,738	 669,757	 3,920,132	 4,596,626	 7,540,130

Note: Project allocation consists of \$11,500,000 in new funding, \$7,752 in Common Cost commitments carried forward, and \$629,004 in prior years funds. A portion of the prior year funds were re-allocated in February, 1979.

NATIONAL RADIO ASTRONOMY OBSERVATORY

VERY LARGE ARRAY

STATUS AS OF FEBRUARY 28, 1979

TOTAL PROGRAM

PROJECT NUMBER	DESCRIPTION	ALLOCATION	EXPENDED MONTHLY	TOTAL EXPENDED	TRANSFER TO FIXED ASSETS	BALANCE CONSTRUCT. IN PROGRESS	TOTAL COMMITTED	TOTAL EXPENDED & COMMITTED	NET BALANCE
11000	SITE AND WYE	24,541,144	371,371	17,631,265	7,219,143	10,412,122	3,773,211	21,404,476	3,136,668
12000	ANTENNA	22,600,391	160,906	19,807,111	11,781,632	8,025,479	2,463,948	22,271,059	329,332
13000	ELECTRONICS	16,947,720	240,685	13,661,920	6,850,784	6,811,136	1,574,270	15,236,190	1,711,530
14000	COMPUTER	5,126,512	16,593	3,434,913	2,503,607	931,306	343,075	3,777,988	1,348,524
16000	SYSTEMS INTEGRATION	201,022	7	201,022	179,370	21,652	---	201,022	---
17000	PROGRAM MANAGEMENT	1,905,296	9,392	1,803,577	1,676,390	127,187	975	1,804,552	100,744
18000	COMMON COST	1,723,100	35,974	1,299,885	1,235,347	64,538	12,462	1,312,347	410,753
19000	CONTINGENCY/RESERVE	504,004	---	---	---	---	---	---	504,004
	SUB TOTAL	73,549,189	834,928	57,839,693	31,446,273	26,393,420	8,167,941	66,007,634	7,541,555
30000	RETIREMENTS	(10,820)	---	(10,820)	(10,820)	---	---	(10,820)	---
	TOTAL PROGRAM	73,538,369	834,928	57,828,873	31,435,453	26,393,420	8,167,941	65,996,814	7,541,555

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. Of this amount, the NSF has made \$9,375,000 available.

NATIONAL RADIO ASTRONOMY OBSERVATORY
VLA PROGRAM

FINANCIAL STATUS REPORT
(in thousands)

As of: February 28, 1979

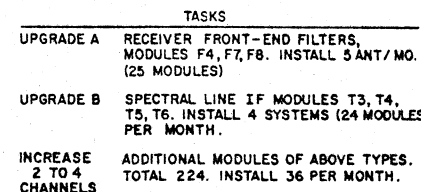
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Item	(A) Original Program Ceiling	Allocation to Date			Un- allocated Balance	(B) Outlook		(C)	Note
		Allocated	Expended and Committed	Allocated Balance		Estimate to Complete	Estimate Total	(Over) Under Ceiling	
Site and Wye	27,860	24,541	21,405	3,136	3,319	5,662	27,067	793	
Antennas	20,400	22,600	22,271	329	(2,200)	453	22,724	(2,324)	
Electronics	17,000	16,948	15,236	1,712	52	2,404	17,640	(640)	
Computer	4,850	5,127	3,778	1,349	(277)	2,404	6,182	(1,332)	
Systems Integration	400	201	201	-	199	-	201	199	
Program Management	2,650	1,905	1,805	100	745	297	2,102	548	
Common Cost	-	1,723	1,312	411	(1,723)	802	2,114	(2,114)	
Subtotal	73,160	73,045	66,008	7,037	115	12,022	78,030	(4,870)	
Contingency	2,840	504	-	504	2,336	1,000	1,000	1,840	
TOTAL	76,000	73,549	66,008	7,541	2,451	13,022	79,030	(3,030)	

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 November 1978 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) The antenna estimate includes \$800K for transporter No. 2.

UPDATE DATE: 3/1/79



ABBREVIATIONS

DSGN - DESIGN	TST - TEST
LAB - LABORATORY	PRELM - PRELIMINARY
INST - INSTALL	OPNS - OPERATIONS
ANT - ANTENNA(S)	

SYMBOLS

○ 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