NATIONAL RADIO ASTRONOMY OBSERVATORY
AUGUST PROGRESS REPORT
VLA PROGRAM
September 17, 1980

NATIONAL RADIO ASTRONOMY OBSERVATORY

MONTHLY PROGRESS REPORT

VLA PROGRAM

AUGUST 1980

SYSTEMS INTEGRATION DIVISION

The array was scheduled for 45 percent of the time; 30 percent went to astronomical programs and the remaining 15 percent went to tests. The average downtime for the month was approximately 9.8 percent.

During this month a milestone was reached when first fringes were obtained using antenna 28 (the last antenna to be outfitted with electronics) on August 8. The maximum number of antennas used for an astronomical observing program during the month of August was 25. Antenna 4 was removed from observation bringing the total number of antennas currently unavailable for observations to 4 (Antennas 1, 2, 4, and 6). Antenna 27 was declared operational on August 25, 1980. Antenna 28 is in the shakedown stage. The test array consists of antennas 11, 17 and 21.

The longest astronomically useable baseline is approximately 3.4 km.

ELECTRONICS DIVISION

In the Front End Area the last Front End was installed in Antenna 28 and first fringes were obtained. Front Ends 2, 3, 4 and 6 are still awaiting delivery of AIL paramps and upconverters to complete their retrofits. The Automatic Test Set Interfacing Hardware for the Front End subsystem is complete while the software is 70 percent complete. A prototype L Band RFI Filter is complete and will be tested with a Retrofitted Front End for Antenna 1 early next month.

In the Master Local Oscillator Area construction of M2 (the backup Master L.O.) is 80 percent complete while system integration is 95 percent. M2 was used as the Master L.O. during the last week of August. For a VLBI Observing Run the Rubidium Standard for the

Master L.O. subsystem was taken to White Sands to set its time to about 1 microsecond against their standard. After being returned to the laboratory comparisons were made between the Rubidium Standard, A Hydrogen Maser Oscillator (on loan from Smithsonian Astrophysical Observatory) and Loran C.

In the Monitor and Control Area, evaluation for a replacement A/D converter was completed. This A/D converter will be used to replace the present A/D converter as these units fail or become unstable. Fabrication of Monitor and Control modules for the master L.O. sub-system have been completed and these modules are ready for bench testing. Installation of an interface for the weather station, to be located with the last antenna at the end of the west arm, was completed. A dynamic analysis for the F/R drive system was completed and this analysis indicated that enviromental testing of this unit should be undertaken. These test are scheduled for December.

In the Delay/Multiplier Area, sub-system testing of the B and D channels is continuing. Self-Testing of the A and C channels or B and D channels is now possible in the spectral line Mode. The B and D channel sub-system will be ready for system testing early next month.

In the waveguide Area, Foundation waveguide was installed at stations AN7, AN8, BN9, AW9, and at the antenna assembly building also installation of coupler brackets and waveguide couplers was completed at stations BE7, BN9, AN6 and AN7. Waveguide loss measurements were made from AN8 to AN9 (Last Station on the North Arm) and these measurements showed a loss of 1.08 dB/km at 50 GH . Phase one of the Cathodic Protection survey of the waveguide was also completed.

COMPUTER DIVISION

The prototype controller from Information Product Systems has been successfully installed on the PDP 11/70 (SORTER). The delivery of the production models should be completed in the next week or two to allow us to operate with a high density tape drive on each of our PDP computers.

To improve compatibility between the PDP computers, we have purchased twin RK05 disc drives to reside on the PDP 11/70 (MAPPER). The operating systems may now be generated on one of the computers and transferred easily to any other. The Floating Point processor option has been purchased for the PDP 11/70 (SORTER) making the two 11/70 processors identical, so that program development for the MAPPER system may be done on SORTER.

After investigating a large number of computer CRT terminals, the ADDS Regent 40 was selected as the most suitable and cost effective. Nine of these units have been ordered, they will be used by programmers on the PDP 11 computers.

In the standard data reduction programs, there is now the capability to correct for the Faraday rotation due to the ionosphere. The ionospheric data is provided by the World Data Center in Colorado each month. Thus polarization measurements, especially at the lower (L band) frequencies may be corrected for ionospheric effects within a month of the observations being taken.

ANTENNA DIVISION

Antenna Moves

Two antennas were moved.

Major Overhaul

Antenna No. 6 overhaul is complete except for a few items. Antenna No. 4 was started.

Annual Preventive Maintenance

Completed on all antennas, except Antennas No. 11 and 16 on the east arm during normal non-operating periods.

Miscellaneous

All gas-discharge diodes on FFM motor leads were series doubled on antennas 21 thru 28. Higher voltage power transistors have been ordered for replacement as failures occur.

Transporter No. 2 has a failed wheel bearing, the same as in July. The transporter fabricator has been notified and corrective action will be initiated.

SITE AND WYE DIVISION

Waveguide Installation

Installed approvimately 5,640 feet of waveguide. 1,720 feet on East arm and 3,920 feet on West arm and trenched approximately 1,840 feet on East arm and 1,517 feet on West arm.

Phase IV

Overall completion 100%. With only administrative details remaining before closeout.

Phase V

Overall completion of the total contract is 99%. Track rough layed to AW9 and ballast is 100% complete. All ballast is in place on the North arm and antenna spur tracks. 100% of track materials have been layed out to A9 on the East arm and 99% of the ballast is in place. Maintenance vehicle spur track is in operation. Electrical work is 99% complete.

PROJECT MANAGEMENT

General

There has been no movement during the month on the Gross Receipts Tax case or the electric utility rate case.

The AIL Division of the Eaton Corporation is now delivering about one parametric amplifier per week. NRAO has cancelled the last twenty units for default as these units have been replaced by cold FET amplifiers in the second stage of the Front Ends. AIL has protested the cancellation.

Planning for the VLA Dedication, October 10th, is proceeding. Attendee list is now about 680. Governor King and Senators Domenici and Schmitt have formally accepted. Congressman Lujan has indicated he plans to attend.

The VAX addition to the Library-Office Building and the third Visiting Scientists quarters have been occupied.

The array was used as a portion of a VLBI network for the first time on August 28th.

Personnel

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

Division	Budgeted 12/31/80 Level	7/31/80 Level	Additions	Reductions	8/31/80 Level
Site & Wye	10	10	0	1	9
Antenna Division	17	16	1	0	17
Electronics	45	47	0	3	44*
Site Management	6	5	1	1	5
Computer Division	15	17	0	0	17
Operations Div.	12	13	0	0	13
Project Mgmt.	26	24	0	0	24*
TOTAL	131	132	2	5	129

*Does not include two part-time employees.

8/31/80

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 Contracting Co., Inc.	Phase V Construction	4/26/79	2,820,000	Sept. 1980	Work progressing satisfactorily.
P.O. S-09849	BWH/CVA Joint Ventures	A/E Service Phase V	5/16/79	39,000	Sept. 1980	
P.O. S-11638	DEC	Computer Maintenance	2/13/80	90,024	CY '80	Monthly expenditure rate estimated at $7,500.
VLA-354 P.O. S-11480	CASCO Fire Protection Systems	Fire Protection System for VLA Site Buildings	2/20/80	57,840	Complete	
P.O. S-11481	Century Data Systems	Disk Drives	2/15/80	64,078	9/20/80	
P.O. S-11478	Digital Equipment Corp.	Computer Systems	2/27/80	74,635	10/2/80	

8/31/80

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 Telecopes	10/18/73	$ 18,156,054	Complete	
VLA-256	New Mexico State University	Archaeological Excavation	9/20/77	$ 107,000	Complete	$91,245 invoice thru 2/29/80. Final reports expected in Sept. 1980.
P.O. S-07990	AIL Division Cutler-Hammer	Parametric Amplifiers	9/21/78	$ 212,800	Complete by 1/21/80	13 sets received. 15 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. 6 units are at AIL for repair. 3 will ship in Sept. 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-12394 VLA-355	Total Systems	Motel/Office	5/1/80	$ 123,500	Complete	Work complete. Final paper work pending.

NATIONAL RADIO ASTRONOMY OBSERVATORY

VERY LARGE ARRAY

STATUS AS OF AUGUST 31, 1980

TOTAL PROGRAM

PROGRAM 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	26,687,769	218,054	26,133,080	11,520,076	14,613,004	289,058	26,422,138	265,631
12000	ANTENNA	22,743,626	24,849	22,573,527	17,941,561	4,631,966	122,313	22,695,840	47,786
13000	ELECTRONICS	17,961,568	85,346	17,318,474	7,913,761	9,404,713	193,314	17,511,788	449,780
14000	COMPUTER	6,070,099	61,824	4,842,574	2,874,739	1,967,835	262,462	5,105,036	965,063
16000	SYSTEMS INTEGRATION	201,022	---	201,022	200,965	57	---	201,022	---
17000	PROGRAM MANAGEMENT	2,098,809	8,733	1,959,801	1,782,795	177,006	6,723	1,966,524	132,285
18000	COMMON COST	2,089,296	32,488	1,941,853	1,699,307	242,546	13,442	1,955,295	134,001
19000	CONTINGENCY/RESERVE	400,000	---	---	---	---	---	---	400,000
	SUB TOTAL	78,252,189	431,294	74,970,331	43,933,204	31,037,127	887,312	75,857,643	2,394,546
30000	RETIREMENTS	(67,979)	---	(67,979)	(67,979)	---	---	(67,979)	---
	TOTAL PROGRAM	78,184,210	431,294	74,902,352	43,865,225	31,037,127	887,312	75,789,664	2,394,546

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 AUGUST 31, 1980

CY - 80

PROGRAM NUMBER	DESCRIPTION	ALLOCATION	EXPENDED MONTHLY	TOTAL EXPENDED	TRANSFER TO FIXED ASSETS	BALANCE CONSTRUCT. IN PROGRESS	TOTAL COMMITTED	TOTAL EXPENDED & COMMITTED	NET BALANCE
11000	SITE/WYE	2,086,000	179,684	1,588,003	1,305	1,586,698	232,431	1,820,434	265,566
12000	ANTENNA	184,381	16,600	105,631	640	104,991	30,966	136,597	47,784
13000	ELECTRONICS	1,140,172	82,635	584,029	---	584,029	106,587	690,616	449,556
14000	COMPUTER	1,291,000	61,824	224,023	---	224,023	101,915	325,938	965,062
17000	PROGRAM MANAGEMENT	207,000	8,733	67,997	---	67,997	6,723	74,720	132,280
18000	COMMON COSTS	389,988	32,488	242,546	---	242,546	13,442	255,988	134,000
19000	CONTINGENCY	400,000	---	---	---	---	---	---	400,000
	TOTAL PROGRAM	5,698,541	381,964	2,812,229	1,945	2,810,284	492,064	3,304,293	2,394,248

Note: Project allocation for CY-80 consists of $4,500,000 in new funding plus $1,198,541 in prior year funds re-allocated in August 1980.

NATIONAL RADIO ASTRONOMY OBSERVATORY
VLA PROGRAM

FINANCIAL STATUS REPORT
(in thousands)

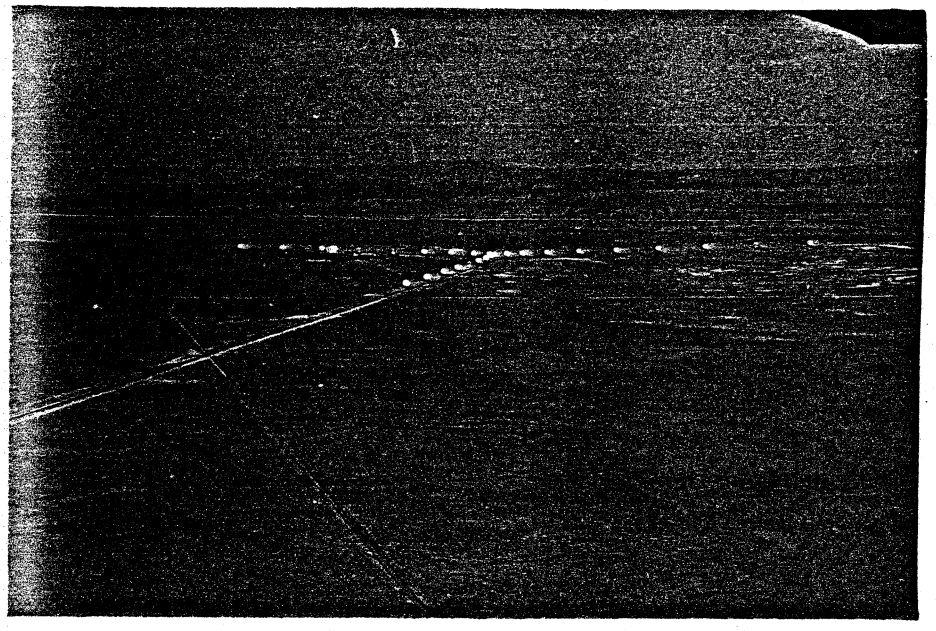
As of: August 31, 1980

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Item	Program Ceiling	(A) Allocation to Date (C)			Un-Allocated Balance	Outlook (B)			Notes
		Allocated	Expended and Committed	Allocated Balance		Estimate to Complete	Estimate Total	(Over) Under Ceiling	
Site and Wye	27,860	26,981	26,715	266	879	266	26,981	879	
Antennas	20,400	22,744	22,696	48	(2,344)	48	22,744	(2,344)	
Electronics	17,000	17,978	17,528	450	(978)	450	17,978	(978)	
Computer	4,850	6,070	5,105	965	(1,220)	965	6,070	(1,220)	
Systems Integration	400	201	201	-	199	-	201	199	
Program Management	2,650	2,116	1,984	132	534	132	2,116	534	
Common Cost	-	2,089	1,955	134	(2,089)	134	2,089	(2,089)	
Subtotal	73,160	78,179	76,184	1,995	(5,019)	1,995	78,179	(5,019)	
Contingency	2,840	400	-	400	2,440	400	400	2,440	
TOTAL	76,000	78,579	76,184	2,395	(2,579)	2,395	78,579	(2,579)	

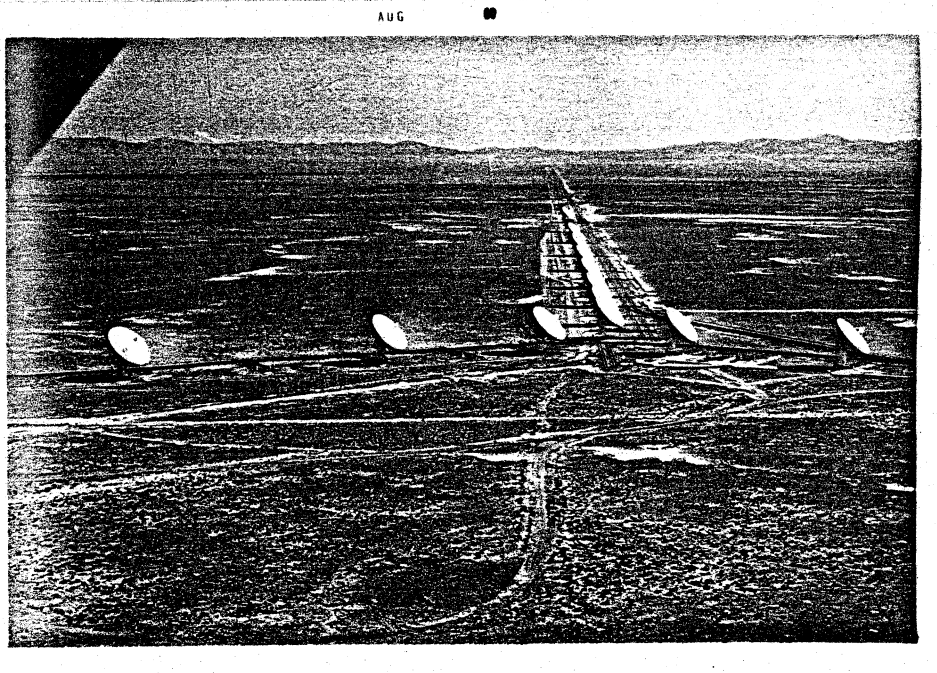
NOTES: (A) Includes $293K for site acquisition, $15.7K for ECAC Study, and $17.1K for NSF Ad Hoc Advisory Panel. Allocated and Expended includes $68K in assets which were retired in prior years.

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

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



Array in "C" configuration looking West.

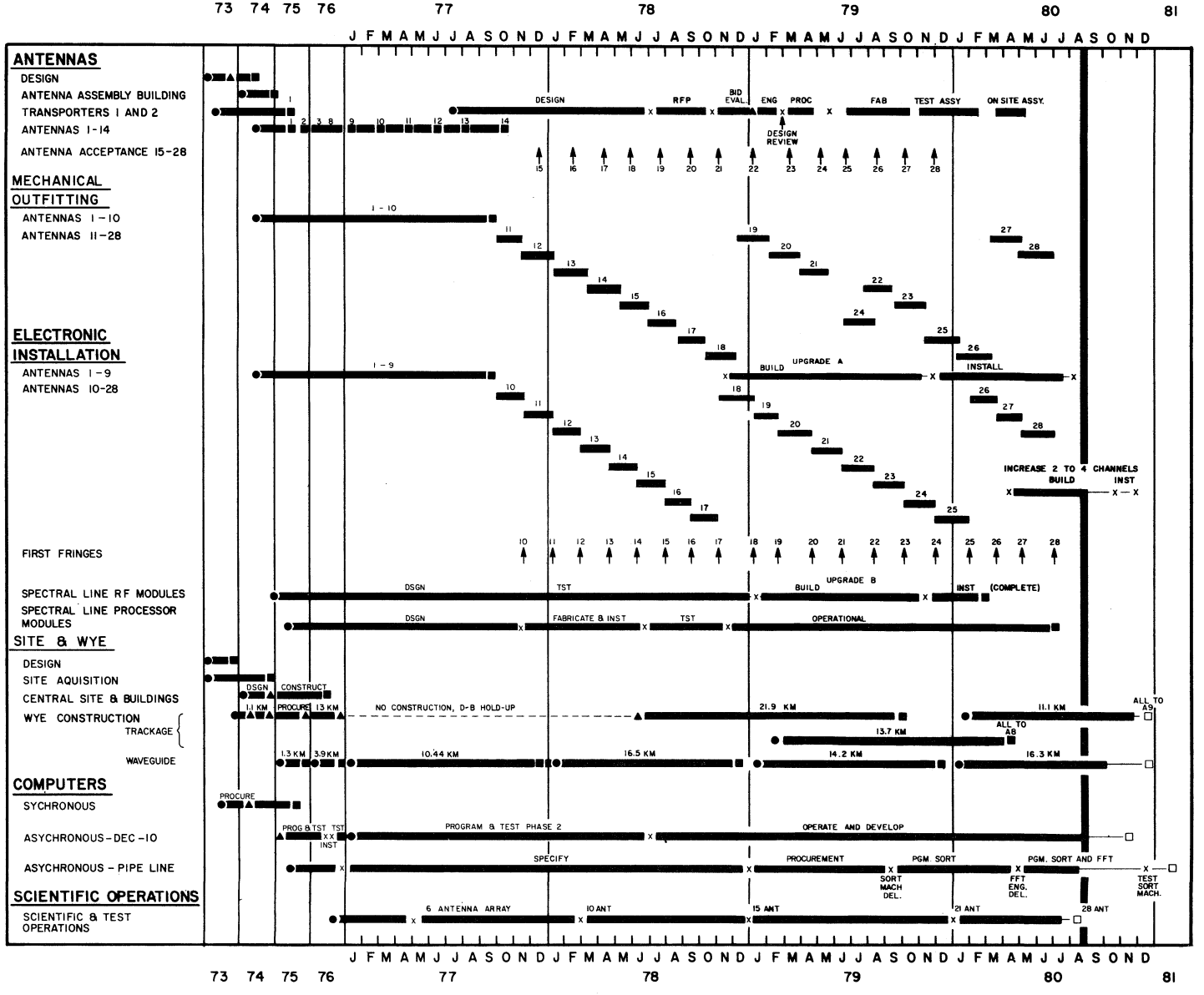


Array in "C" configuration looking North.

NATIONAL RADIO ASTRONOMY OBSERVATORY

VLA ACTIVITY SCHEDULE

UPDATE DATE: 09/01/80



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.
4	9/1/80	SHOW BUILD & INST, 2 TO 4 CHAN