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NASA TELECONFERENCE

PILOT PROJECT

EVALUATION FOR 1975

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INTRODUCTION

The Teleconferencing Pilot Project began in January of 1975. The teleconference network which had been originally established for the Apollo Program in 1969* was expanded to include all major NASA installations plus some contractor plants.

Teleconferencing proved to be successful on the Apollo Program. The per capita travel expenses of people assigned to this program seemed to decrease by 20% after widespread teleconferencing began. In addition, the coordination between the widespread organizations working on the Program appeared to improve. However, the coordination improvement is difficult to measure.

Spurred by the increased costs of energy and transportation, the Teleconferencing Pilot Project attempted to expand the Apollo network to encompass all major NASA installations.

The current voice teleconference network shown in Figure 1 connects 34 teleconference rooms interconnected through the MSFC switchboard at Huntsville, Alabama. The teleconference rooms on the 4-wire switch use voice-actuated "live" microphones. Some of these teleconference rooms use Bell-50A portable conference telephones on 2-wire dedicated circuits switched through the MSFC Centrex. All centers were provided with several of these portable conference telephone, which can use the FTS or DDD circuits as well as the dedicated circuits, provided a special jack has been installed.

All teleconference rooms can use projectors to display visual aids, e.g., graphs and figures. A typical teleconference room is shown in Figure 2. If the teleconference involves a display of figures or documents, these can be delivered prior to the teleconference and made into transparencies suitable for projection. For small audiences, the hard copy versions of these figures are adequate.

To enhance the delivery of these figures or graphical material, a facsimile network was provided to augment the teleconferencing voice network.

The facsimile network provided during the Apollo Program used LDX (Long Distance Xerography) terminals, which transmitted at a rate of 40 sec/page, but which required the lease of 50 KBS circuits (equivalent to 12 voice circuits). The cost of providing these voice circuits was too high, so the LDX terminals were replaced by Magnafax terminals which could use a single voice circuit. These terminals were too slow (requiring 4-6 minutes per page) and also required an attendant to feed in each page. Approximately 120 of these machines are still in use throughout NASA for administrative correspondence. After some experimentation, the Pilot Project selected Rapifax terminals, which can send at a rate exceeding 1 min/page on a single voice circuit. The pages can be placed

*Samuel W. Fordyce, "NASA Experience in Telecommunications as a Substitute for Transportation" NASA Headquarters, Washington, DC April 1974

in a stack and transmitted without requiring an attendant.

The current facsimile network with 47 terminals is shown in Figure 3. The use of these terminals varies with the location. In some cases they are quite busy, and in others they are under-utilized. The poor usage cases usually result because of poor location, restricted access, or lack of "marketing" efforts at the center.

These fax machines are often used to send administrative correspondence rather than material for teleconferences. Because this results in better utilization for NASA, this traffic is encouraged.

The project management responsible for the implementation, maintenance, and repair of the equipment is at MSFC. Headquarters has assumed responsibility for the evaluation and reporting on the network effectiveness. Assistance on this evaluation is being provided by ARC.

The telecommunications coordinator at each NASA center is the point of contact for the project at his center.

All teleconferences are asked to submit the teleconferencing evaluation form shown in Figure 4. Some centers are active in reporting teleconferences and some are not. Cross checks indicate that no more than 37% of the teleconferences have been reported. Teleconferences using the portable conference telephones not routed via MSFC are reported even less frequently.

The Rapifax machines have a counter which counts all transmitted pages. Throughout the year, these have been polled to determine their usage and the cost per page from each machine. Machines with excessive costs have been removed from the network.

The most successful users of the teleconferencing network has been the Shuttle Program. This large widespread program requires frequent and regularly scheduled meetings. The Shuttle Program personnel have developed expertise in teleconferencing techniques, are well acquainted with one another, and have the advantage of technicians assigned to the conference rooms who assist with the teleconferencing and graphics.

The occasional users of the teleconference network have experienced more difficulties. These have been primarily procedural, i.e., delivering the graphics in time and getting all participants to their assigned teleconference rooms at the correct time. However, there have been some equipment problems. The worst equipment performance has been in the overhead microphone system and associated electronics in the Administrator's Conference Room. Other problems have occurred in these 4-wire, "live" room systems as well as in the circuits. At present, we have no quantitative estimate of equipment problems. Some early difficulties with equipment are hoped to be resolved by the use of a standard Western Electric package throughout the Bell System.

EVALUATION

Teleconferences:

The number of teleconference evaluation forms received each month during 1975 are shown in Table 1. A total of 1,241 forms were received. The forms estimate the number of people participating in each teleconference, and the average attendance was between 27 and 28 people. The total attendance figure was 34,003, but many of these are the same people attending regularly scheduled teleconferences. The average teleconference involved 3.4 terminals and lasted 2.9 hours. The number of trips reported saved by the teleconferences was 4,663, or 3.76 per teleconference. A spot check during September of 1974 showed that the average NASA trip cost $309. Using this estimate, the travel money reported saved is $1,440,900.

A breakdown of the teleconference activity by organization is shown in Table 2. The first column represents the NASA, USAF, or contractor organization. The second column shows the number of evaluation forms submitted by each organization.

The third column labeled "Identified in All Reports" shows the number of teleconferences each organization participated in according to the evaluation forms. This is particularly true of those involving the portable conference telephones on FTS or DDD circuits. We have attempted to record all teleconferences using the MSFC switchboard or equipment supplied by the Teleconference Pilot Project. In December of 1975, automatic monitors were added to the MSFC 4-wire switchboard, and spot checks of the portable conference telephones are being made at some centers.

The fourth and fifth columns of Table 2 show the number of trips reported saved by teleconferences and the resulting estimated travel funds saved. The sixth column shows the cost of providing the teleconference network at each organization, and the final column shows the profit or (loss). Overall, the travel saved by teleconferences was reported to be $1,440,867. The cost of providing the teleconference service was $157,344, so the net saving was almost $1.3 million.

Some installations cost more for the teleconferencing than was saved by obviating travel costs. At the completion of the trial period at the end of FY 1976, these losers should be curtailed or eliminated from the network, unless their participation is essential for key programs.

Interviews with facility managers conducted under the direction of the ARC indicate that 51% of the teleconferences are being reported. Some teleconference terminals have no assigned managers, and these terminals undoubtedly have a lower reporting ratio. Consequently, the average reporting throughout NASA is probably considerably less. The interviews with teleconference participants show that about one respondent in three experienced some difficulty with the system, but only one in eight had a sufficient complaint to verbalize the nature of the difficulty.

Facsimile:

The fast facsimile network shown in Figure 3 was installed as an adjunct to the voice teleconferencing network. The fast "fax" used on the Apollo network used LDX machines, which required 12 voice circuits. The cost of leasing 50 kbps circuits (equivalent to 12 dedicated voice circuits was exorbitant ($600,000/year).

Following an evaluation of competitive machines, Rapifax was selected for the teleconferencing pilot project. The number of these machines grew from 35 to 47 terminals, all interconnected on dedicated lines through a 453 Centrex switch at MSFC. These machines can operate unattended, and transmit at a rate of approximately 1 min/page. This net was installed to enhance the voice teleconference network and permit the exchange of documents before or during teleconferences. In addition to this use, it has been used to transfer administrative correspondence. Such use is encouraged as long as the teleconference fax traffic is not impaired.

Each terminal has a counter which registers the pages transmitted from that terminal. These page counter tallies are shown in Table 3. The total page count for the first year of operation is 272,299. More pages are received because of the "broadcast" mode wherein one terminal can broadcast to a number of receiving terminals.

The monthly rate of pages transmitted is shown for each terminal in Table 3. The monthly cost includes the rental of the terminal, plus the lease cost of the dedicated circuit to the MSFC switch.

The final column in Table 3 shows the cost per page transmitted from each terminal. The average cost per page for the entire network is $1.08. This cost ranges from a low of 21¢ per page at Huntsville, Alabama, to a high of $10.90/page for the machine at Vandenberg Air Force Base. The most traffic (2472 pages/mo.) is handled by a machine at JSC.

The cost of sending a mailgram via Western Union is $2.50/page. Although mailgrams cannot send graphics, and require a day for delivery, this is a useful standard for comparison. Any teleconference fax terminal costing more than this is probably under-used. In the cases involving undue expense:

FRC	$8.58/page
KSC(O&C)	4.00
WFC	9.15
VAFB	10.90

One or more of the following explanations apply:

the machine is poorly located and undue restrictions are placed on its use; people are unaware of its capabilities and are not trained to use it; or the traffic does not warrant a fast fax. In these cases, it appears that the Rapifax and dedicated lines should be cancelled, and replaced by a slow fax (Magnafax) using FTS lines. Unfortunately, the fast fax terminals are not compatible with the slower machines without the addition of additional interface equipment.

In conclusion, the fast fax network has been useful in permitting the voice teleconference network to operate successfully. It has also been useful in handling priority document exhanges. The average costs of $1.08 per page can be lowered by eliminating the high cost under-used terminals in the network. Interviews with facility managers indicate that they are enthusiastic about the availability of this fast fax network, and the reliance upon this electronic means of transmitting administrative correspondence is growing.

CONCLUSIONS

The teleconferencing network has proved to be successful in conducting many management meetings and reviews within NASA and its contractors. In spite of difficulties caused by inexperience in teleconferencing and some equipment and circuit problems, the evaluation reports indicated the system was satisfactory in an overwhelming majority of cases.

The reporting procedures were inadequate, and less than 37% of the teleconferences were reported on evaluation forms.

Table 4 summaries the results for 1975. The 1,241 evaluation reports received indicate that almost 100,000 man-hours of teleconferences took place. The travel funds reported saved total about $1.44 million, which is about 10% of the NASA travel costs. Subtracting the cost of providing the teleconferencing networks, the net savings reported are $1.28 million (about 9% of the travel costs).

Our initial goal was to produce a net saving of 10-20% in the travel costs. The improved reporting procedures will probably enable us to know if this goal is reached during the second year of operation.

The future plans include the incorporation of 12 electronic blackboards, and the use of video via NASA experimental communications satellites. Initially, this use will probably concentrate on special event coverage of key events as depicted in Figure 5.

ARC - Ames Research Center
JSC - Johnson Space Center
MSFC - Marshall Space Flight Center

TABLE 1 TELECONFERENCE EVALUATION FOR CY 1975

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTALS
FORMS RECEIVED	52	124	142	159	136	97	76	50	56	85	123	131	1241
AVERAGE ATTENDANCE	20^{4}	17^{7}	21^{1}	62^{9}	25^{8}	27^{4}	22^{6}	16^{0}	20^{0}	33^{0}	21^{0}	20^{9}	27^{4}
AVERAGE NO. OF TERMINALS	3^{2}	2^{8}	4^{8}	2^{6}	3^{5}	4^{1}	3^{1}	4^{6}	3^{2}	3^{6}	2^{4}	2^{8}	3^{2}
AVERAGE DURATION(HRS)	2^{7}	2^{4}	2^{4}	3^{2}	3^{8}	3^{2}	2^{9}	2^{3}	3^{3}	3^{6}	2^{2}	2^{6}	2^{9}
NO. OF TRIPS REPORTED SAVED	97	94	317	848	627	278	115	745	152	477	364	549	4663
MONEY SAVED (THOUSANDS OF $)	30^{0}	29^{0}	98^{0}	262	194	85^{9}	35^{5}	230^{2}	47^{0}	147^{4}	112^{5}	169^{6}	1440^{9}

TABLE 2 NASA TELECONFERENCING PILOT PROJECT EVALUATION - CY 1975

ORGANIZATION	REPORTS	IDENTIFIED IN ALL REPORTS ($)	TRIPS REPORTED SAVED	TRAVEL COSTS REPORTED SAVED ($)	APPROX. CIRCUIT COSTS ($)	PROFIT OR (LOSS)
ARC	130	196	632	195,288	11,808	183,480
DRC	14	115	28	8,652	9,876	(1,224)
GSFC	39	181	128	39,552	4,596	34,956
JPL	174	257	134	41,406	10,848	30,558
JSC	52	368	691	213,519	17,952	195,567
KSC	88	326	165	50,985	13,356	37,629
LaRC	59	195	614	189,726	4,404	185,322
LeRC	52	158	133	41,097	4,068	37,029
MSFC	353	609	917	283,353	0	283,353
HQS	207	472	867	267,903	26,496	241,407
NSTL	11	91	143	44,187	1,248	42,939
RKTD*	0	18	0	0	10,848	(10,848)
RIDN*	4	120	2	618	10,848	(10,230)
THIO*	0	9	0	0	7,368	(7,368)
SAMSO**	0	14	0	0	9,876	(9,876)
WFC	53	130	177	54,693	4,680	50,013
WSTF	1	3	1	309	8,448	(8,139)
TOTAL	1,241	3,360	4,663	$1,440,867	$157,344	$1,283,523

*Contractor
**USAF

TABLE 3 NASA TELECONFERENCE FAX NET EVALUATION

INSTALLATION	BLDG	RM	FAX CALL NUMBER	PAGE COUNT ON 1/9/76	MONTHLY RATE	APPROX. MONTHLY COST ($)	COST/PAGE
ARC	200	5A	3-0631	5,166	430	$1,280	$.2.98
FRC	4800	1017	3-0331	1,571	130	1,119	8.58
GSFC	8	MCC	3-0332	2,581	215	679	3.16
JPL	202	212	3-0376	5,551	446	1,200	2.69
JSC	1	238	3-0443	29,672	2,472	670	0.27
"	1	671	3-4167	17,709	1,476	670	0.45
"	45	306	3-3584	5,023	417	670	1.60
"	1	669	3-5881	18,402	1,533	670	0.44
KSC	Hq	2157	3-4173	11,781	982	667	0.98
"	O&C	1054	3-2536	2,002	167	667	4.00
"	Hq	1161	3-5851	2,005	167	667	
LaRC	1219	301	3-0377	6,667	555	663	1.20
LeRC	3	3	3-0378	3,460	289	635	2.20
MSFC	4200	815	3-2297	16,723	1,394	296	0.21
	4201	6th Fl	3-2805	4,926	411	296	0.72
"	4201	437B	3-5939	6,418	534	296	0.54
"	4202	409	3-4511	11,336	945	296	0.30
"	4202	409	3-1297	16,518	1,372	296	0.22
"	4207	B4	3-2472	2,470	206	296	1.44
MAF	102	EJ25	3-4520	8,109	681	348	0.51
HQS	102	347A	3-2464	5,300	442	664	1.50
"	FOB6	7002	3-0233	2,428	203	664	3.27
"	10B	440	3-3898	3,404	284	664	2.34
"	10B	226	3-0289	5,571	465	664	1.43
"	10B	300	3-2518	3,106	259	664	2.56
"	10B	A25	3-4017	10,543	880	664	0.75
NSTL	4995	107	3-0536	9,135	760	348	0.46
"	100	B102	3-0444	1,773	148	348	2.35
NKTD	1	AA17	3-4345	12,353	1,030	1,200	1.17
"	1	210-40	3-2014	5,267	1,320	1,200	0.91
N.I. (Downey)	1	S4E2	3-4337	21,822	1,830	1,200	0.66
"	1	Telop	3-2371	1,384	346	1,200	3.46
Michoud	A2	TMX	3-0630	3,618	301	910	3.00
SAMSO	125	1512	3-4489	4,234	353	1,119	3.17
WTC	T6	123	3-0379	892	75	686	9.15
WAS. Res. Off	Riddeway Complex		3-5750	3,157	840	700	0.84
VAFB	8500	STS	3-5841	412	110	1,200	2.90
				212,209	24,458	28,476	Aver 1.69

TABLE 4 NASA TELECONFERENCING EVALUATION FOR 1975

EVALUATION REPORTS RECEIVED	1,241
AVERAGE ATTENDANCE PER TELECON	27.4
AVERAGE NUMBER OF TERMINALS PER TELECON	3.2
AVERAGE DURATION PER TELECON	2.9 HOURS
NUMBER OF TRIPS REPORTED SAVED	4,66
TRAVEL FUNDS REPORTED SAVED	$1,440,900
COSTS OF TELECONFERENCING	$ 157,300
NET FUNDS SAVED	$1,283,600
TOTAL TRAVEL COST	$14,890,000
NET REPORTED SAVINGS/TRAVEL COSTS	9%

FIG. 1

NASA VOICE TELECONFERENCING SYSTEM

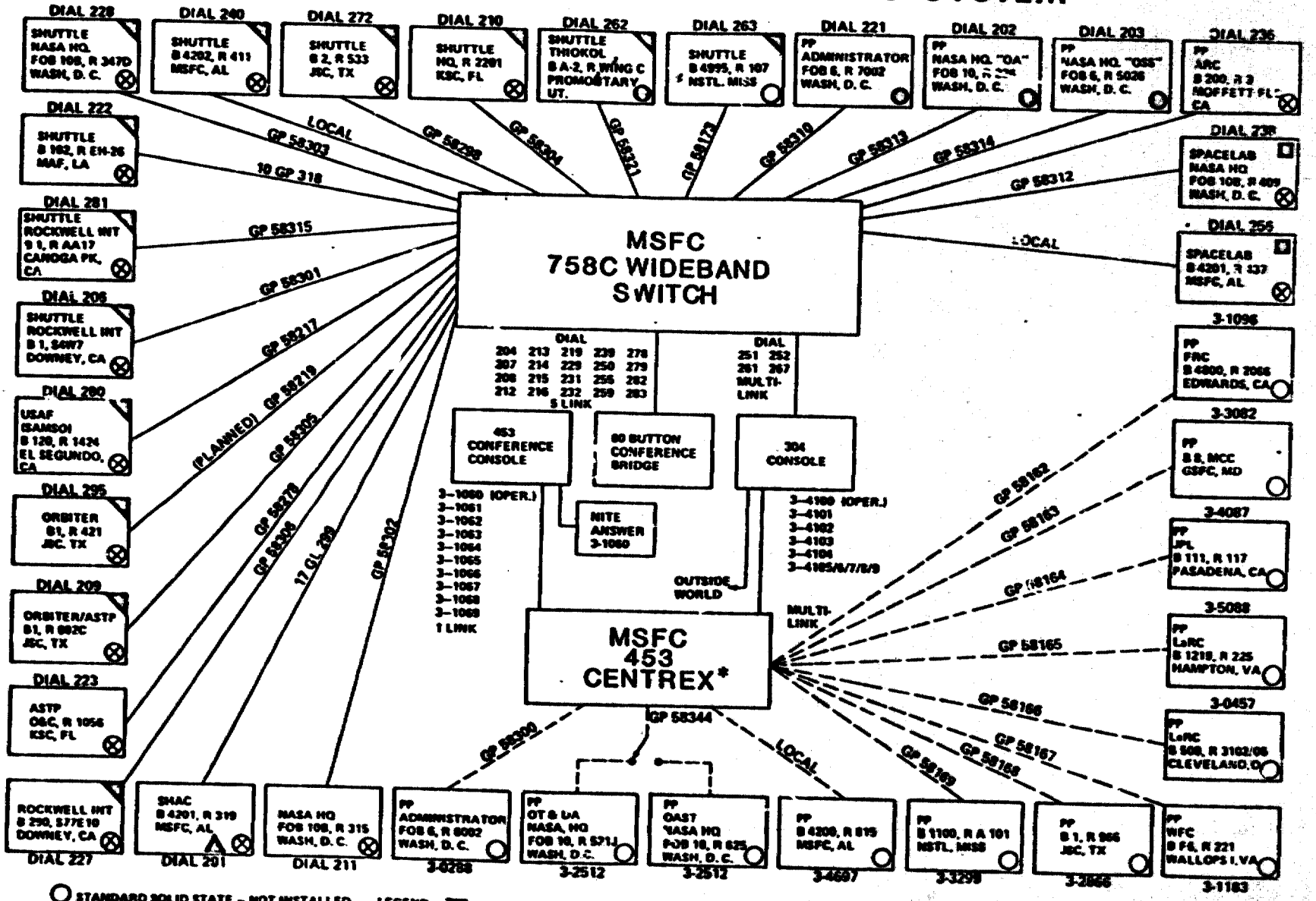


FIG. 5

NASA FACSIMILE SYSTEM

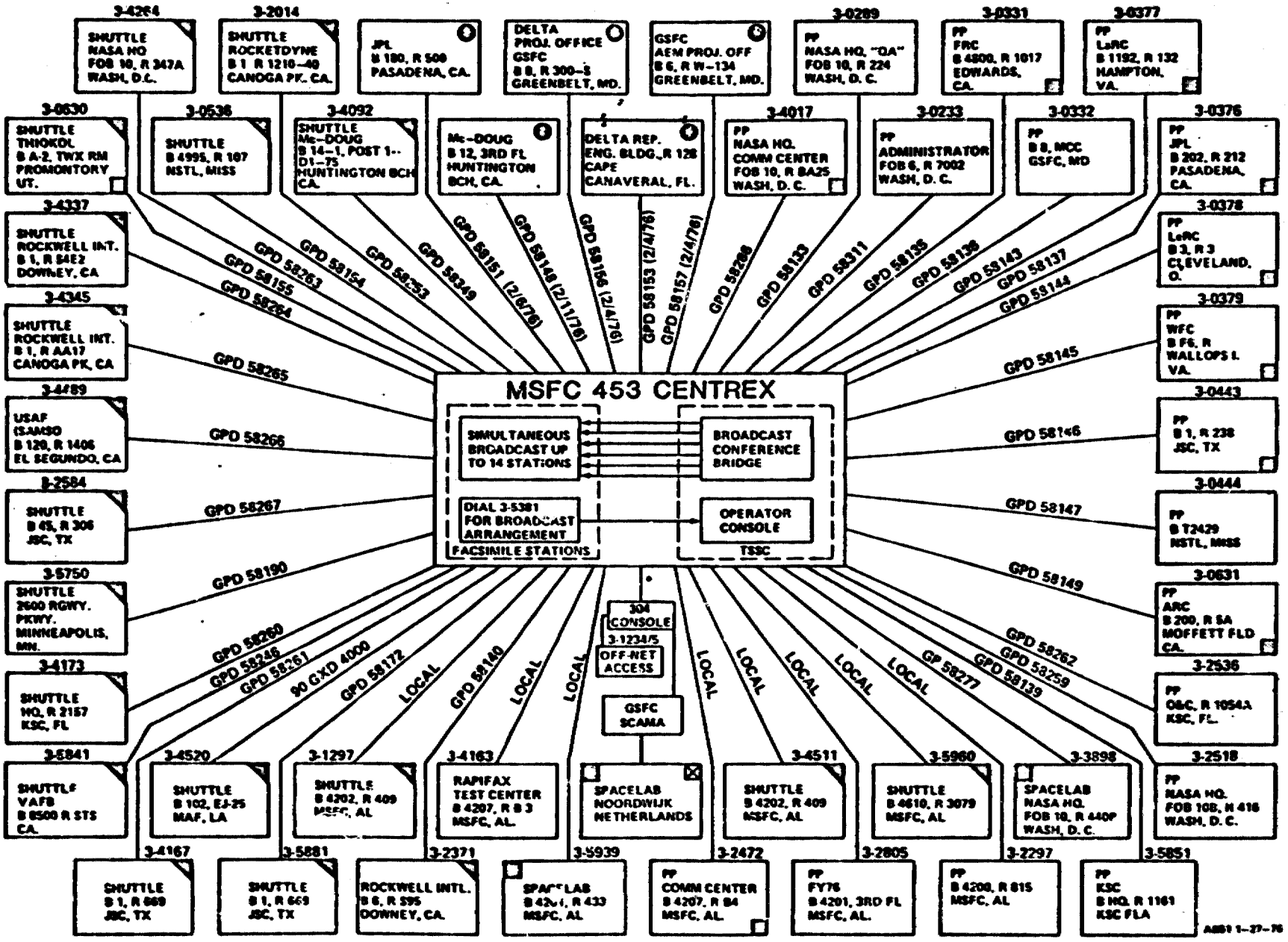
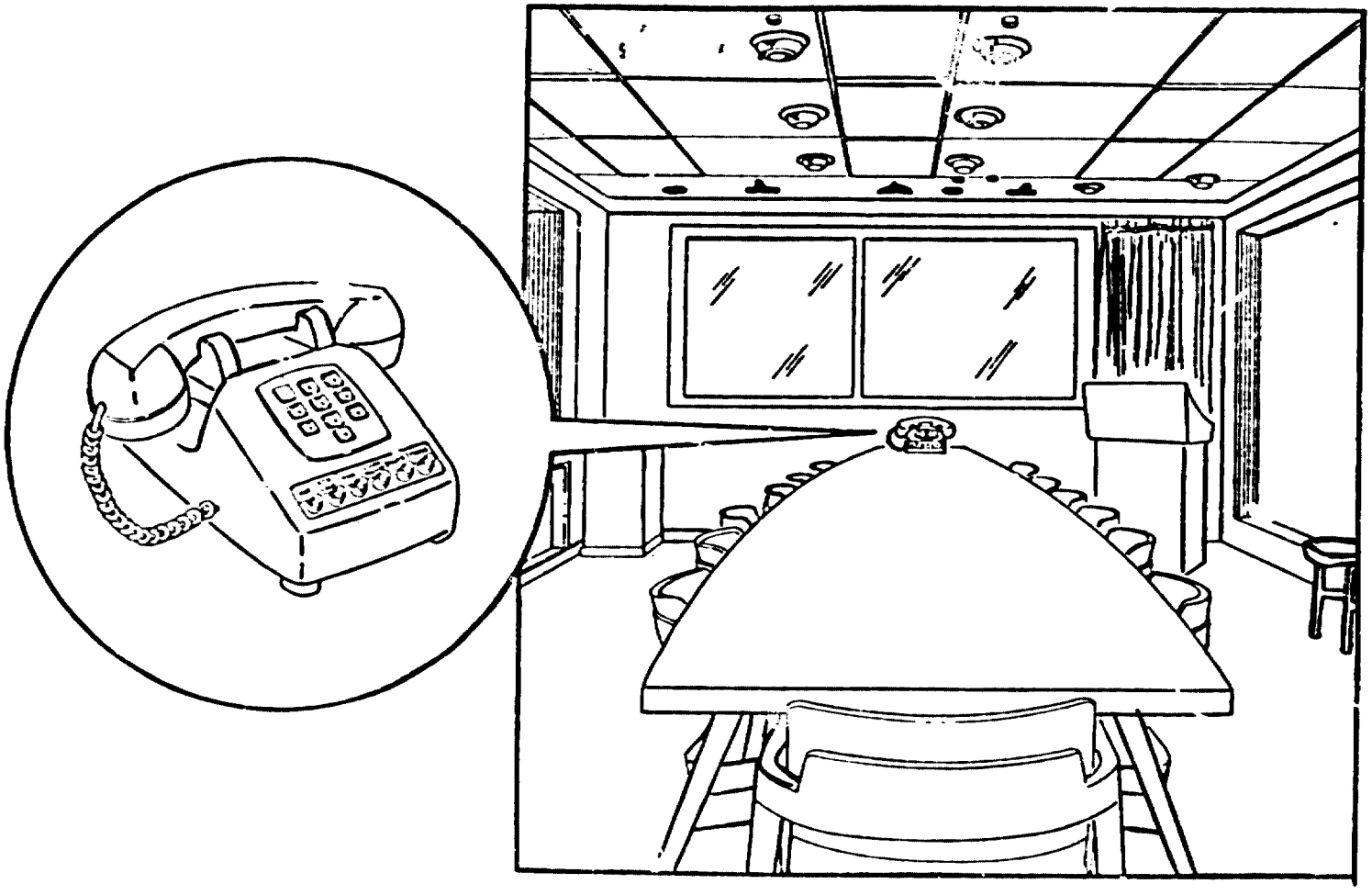


FIG. 2 TYPICAL ACTION CENTER



CAUTION: FOR A SUCCESSFUL CONFERENCE, ROOM NOISE LEVEL SHOULD BE KEPT TO A MINIMUM.
REMEMBER A DISCIPLINED TELECONFERENCE IS A SUCCESSFUL CONFERENCE.

NASA HQ EC74-15421 (1)
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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

TELECONFERENCING PILOT PROJECT USE RECORD

Would you please complete one page of this record every time the Teleconference room is used? This information is required for the evaluation of the Teleconference Service. *PLEASE LEAVE THIS RECORD IN THE BINDER.* Thank you for your cooperation.

YOUR ORGANIZATION	TIME OF MEETING (A.M. or P.M.)	
	START	COMPLETION

BRIEF PURPOSE OF MEETING

NUMBER OF PARTICIPANTS		FACSIMILE USED	NUMBER OF PAGES	
AT THIS LOCATION	AT ALL LOCATIONS	☐ YES ☐ NO	TRANSMITTED	RECEIVED

NAMES OF ATTENDEES AT THIS MEETING *(Use additional sheets if necessary)*

YOUR COMMENTS ON THE TELECONFERENCE FACILITIES

IMPORTANT: HOW MANY PARTICIPANTS IN THIS TELECONFERENCE FACILITY WOULD HAVE TRAVELED TO ANOTHER LOCATION FOR THIS MEETING?

LISTING OF LOCATIONS FROM WHICH TRAVELERS WOULD HAVE HAD TO DEPART IN ORDER TO PARTICIPATE IN THIS MEETING

PREPARED BY ▶	NAME *(Please print)*	SIGNATURE	DATE

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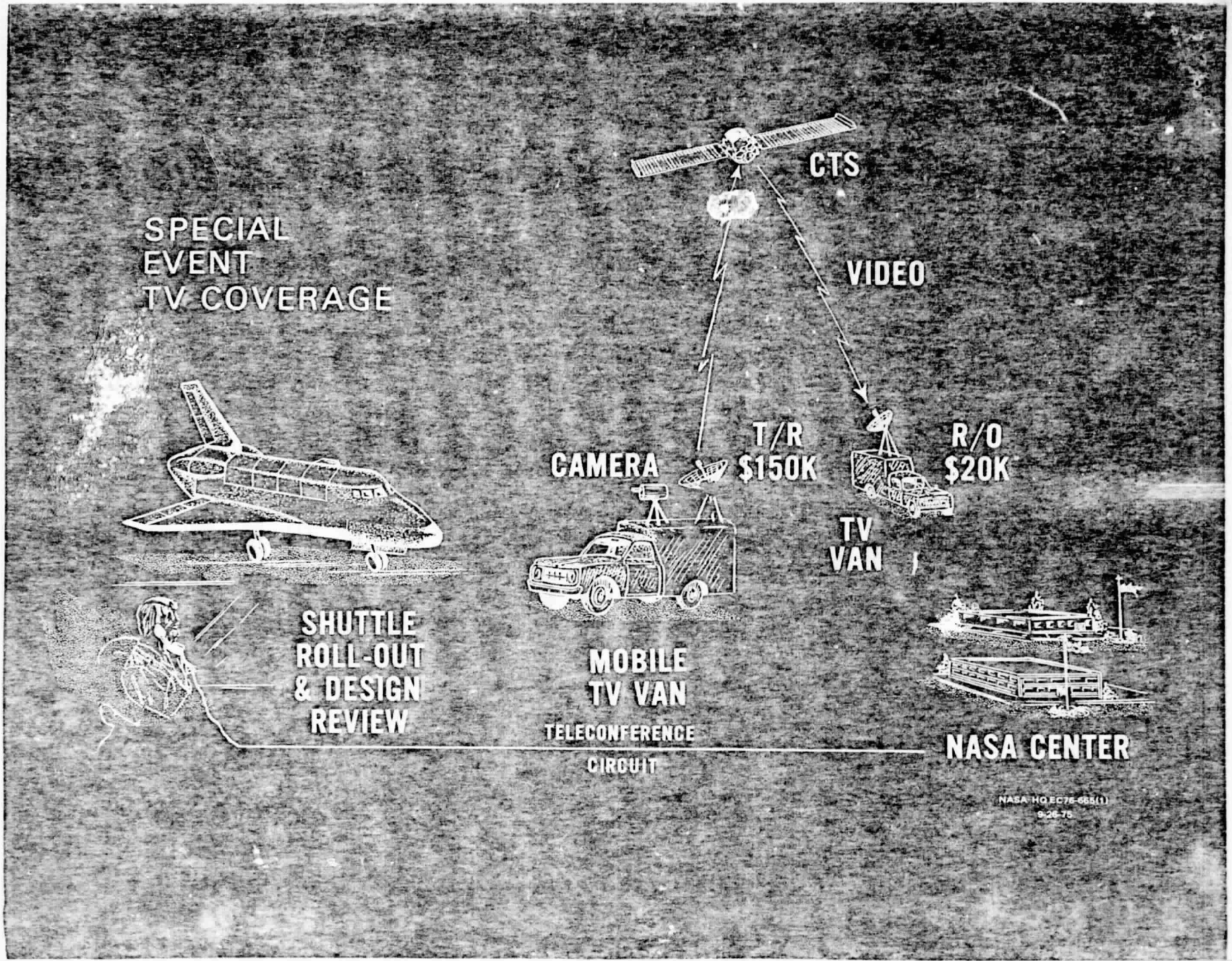
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EVENT
TV COVERAGE
CTS
VIDEO
T/R
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R/O
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TV
VAN
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