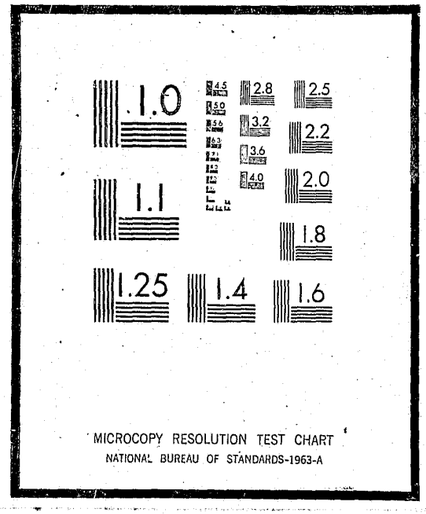

PROJECT SCAR

DENVER POLICE DEPARTMENT

Interim Report

October through December, 1973

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SPECIAL CRIME AERIAL RECONNISSANCE

INTERIM EVALUATION

PART I

SUMMARY AND CONCLUSIONS

This brief overview of the total report on Project SCAR activities during the third quarter of its operation (October - December, 1973) summarizes some of the central findings from each part

A. IMPLEMENTATION (PART II OF REPORT)

The acquisition of the helicopter for Project SCAR was delayed, postponing the implementation of the program for over four months. The Denver Police Department's traffic helicopter is being used as a "back-up" ship for the project helicopter, increasing the total air time coverage for the program. All aspects of the project have been implemented with the exception of the installation of the beacon alarm light system for the Lakewood, Aurora and Wheatridge communities. This light alarm system was appropriately contracted for, but the installers have not delivered according to the terms of the contract. It will be impossible to evaluate this aspect of Project SCAR, as intended.

B. COSTS, OPERATIONS, MAINTENANCE [OCTOBER-NOVEMBER] (PART III OF REPORT)

During these two months, the two aircraft have provided a total of 266 hours of air time availability for covering calls, patrol, response to calls for assistance, and so on. They have required a total of 214 hours of maintenance, or one hour of maintenance for each 1.3 hours in the air.

Total costs for fuel, oil, scheduled and unscheduled maintenance for the two months was in excess of $15,000 with slightly more than $11,000 of this amount being the cost for the scheduled 600 hour replacement and service for the new helicopter.

C. IMPACT ON CRIME RATES IN TARGET AREAS (PART IV OF REPORT)

The major objective of reducing the incidence of burglary in selected precincts (Denver Precincts 106, 109, and 110) by 25% when SCAR was teamed with the Special Crime Attack Team (SCAT), has been achieved, as burglaries decreased by over 26% in these precincts during this two month period of time. At this state of the research, it is difficult to ascertain the exact role played by the helicopter program in affecting this decrease.

D. ATTITUDE AND OPERATIONS SURVEY (PART V OF REPORT)

1. Almost half of the police officers (44%) and over half of those in the Denver Police Department (52%) have never had Project SCAR explained to them by a supervisor.

2. Officers report problems in the procedures for notification of the availability of the helicopter, and 57.5% report that they are never notified of the helicopter's status.

3. Use rates of the helicopter vary from a low of .57 calls for helicopter assistance by each officer in Aurora to the high of 1.3 calls per officer in Lakewood. For the total sample, the average is 1.2 calls for the helicopter for each officer.

4. The helicopter responded to these calls for help or cover in two minutes or less in 34.9% of the cases, from three to eight minutes in 51.6% of the cases, and in eight minutes or more in 13.5% of the cases.

5. The officers attitudes toward the helicopter program are generally very favorable, although the respondents from Denver are significantly less so than those from the suburban departments.

For example, 94.8% of the officers in Lakewood, Aurora and Wheatridge report that additional helicopters would be helpful to them in their work, compared to 65.7% of those from Denver.

6. Remarks, opinions and suggestions for improvement by the officers indicate that they feel the need (a) to be better informed of the objectives and operating procedures of the SCAR Program; and (B) a rather clear set of procedures and priorities made known regarding helicopter use. There is a rather strongly and frequently expressed feeling of a need for specific policies, procedures and guidelines to be developed regarding the helicopter program, and a consistent and appropriate effort made to completely inform the ground-based officers of just what these are.

7. Officers who are notified by radio that the helicopter is available report that they use it more frequently than do officers who report being informed by any other method (rollcall, etc.), and significantly more so than officers who are not notified regarding helicopter status.

8. The helicopter responded to the request for help 84.7% of the times requested. However, this rate increased to 96.3% for officers who had been notified by radio of the availability of the helicopter, compared to only 77.7% helicopter response to requests from officers who had not been notified of helicopter availability by any means.

CONCLUSIONS AND RECOMMENDATIONS

1. The primary concern of police officers centers around increased efficiency in helicopter operations, especially in regard to the coordination of the helicopter program with the other aspects of their work.

Some alternative method of supervision and/or organization is implied, which would place the helicopter operations more firmly within the structure of the normal departmental operations.

2. There is an obvious need for strengthening the position of the helicopter program in the Denver Police Department as compared to the suburban ones, for the Denver officers are significantly less likely to hold favorable attitudes toward the program. This seems directly related to the failure, as reported by over half of the Denver officers, to report that Project SCAR has never been explained to them by a supervisor.

3. There is serious and consistent confusion among the officers regarding procedures, policies, and operations of the helicopter both generally and in the specifics of: How do we know it is available?; When should we use it?; Should ground-based officers direct operations of the helicopter at the scene of a crime, or vice versa?; and so on. Firm guidelines, procedures, and perhaps an operations manual for ground-based officers for use of the helicopter, are clearly indicated.

4. The study indicates that officers should be notified by radio of helicopter status in a consistent, routine "matter of course" fashion. It is clearly indicated that the dispatcher should always be informed of the helicopter status, activity and condition, and should notify all patrolmen regarding these matters.

5. Further research must be conducted in order to more completely ascertain the helicopter program's impact on crime reduction, it's cost-effective results, and related issues. However, it is clear that the majority of officers in all departments are strongly inclined to believe in the potential benefits of the helicopter program to them in accomplishing their work.

It would seem that the prospects for the helicopter program are most favorable, and that the helicopter program to date has developed a strong basis of support among the majority of patrolmen. This support can and perhaps should be used in further strengthening, developing and refining the program, so that it is maximally beneficial to ground-based officers who can use it to accomplish more effective police work.

E. ITEMS FOR CONSIDERATION AND ACTION: REPORT FROM DISCUSSION AND PRESENTATION TO CHIEF ARTHUR G. DILL, JANUARY 24, 1974

1. Consideration should be given to using the downtown heliopad when the aircraft are in a standby mode. This pad is more centrally located and emergency response would be significantly reduced.

2. To increase administrative control and support for the helicopter unit, we recommend the development of Special Operations Division under the direction of a Captain of Police. This Division should merge the following special units:

a. SCAT
b. SSU
c. K-9 Corps
d. Helicopter

The formation of a Special Operations Division will resolve several basic issues:

a. The span of control for the Division Chief of Patrol will be reduced to a manageable level.

b. The grouping of like (Special Services) in one unit will reduce authority, control and communications problems.

3. The use of the light on the helicopter should be evaluated. Where practical, the light should be used only when the ground unit requests the light or the tactical situation dictates its use.

4. A video training program should be prepared to deal with the communications and operational problems identified in the survey. There is a significant lack of understanding of the program and the helicopter capabilities.

5. A formal policy statement regarding the use of radio communications should be prepared and issued to departmental personnel.

6. We strongly suggest that the helicopter be flown to district stations and that patrol officers be given briefings regarding the machine and its capabilities. There should also be some orientation program conducted in each Training Academy class.

PART II

NARRATIVE DESCRIPTION OF IMPLEMENTATION OF PROJECT SCAR

There are four major task areas outlined in the Project SCAR proposal (p. 41) as it was approved for funding:

1. Contract Development
2. Project Organization
3. Project Implementation
4. Project Execution

The degree of accomplishment of the first three of these tasks is discussed in this part of the report, while the fourth task is so general as to really be the definition of the entire scope and findings of this report.

TASK 1 - One and one-half months

Contract Development for:

1. One helicopter with full police equipment (Denver Police Department)
2. Interface communications systems and installation (Denver, Aurora, Lakewood and Wheatridge Police Departments)
3. Selection of vendor for beacon alarm systems (Aurora, Lakewood and Wheatridge)
4. Painting of identification symbols on squad and SCAT cars (Denver, Aurora, Lakewood and Wheatridge)
5. Installation of alarm systems

Project SCAR was originally scheduled to get underway January, 1973, but due to complications in purchasing procedures, the selected aircraft was not received until April 27, 1973. The helicopter was then flown to Denver from Ft. Worth, Texas, and installation of radio and support equipment was started immediately.

Because of the required down-time of the aircraft for routine maintenance, engine overhaul, etc., it became apparent that one helicopter could not provide satisfactory coverage. As a result, a second helicopter, which was previously used for traffic control, was put into service as a back-up ship. The two helicopters flew alternate schedules which allowed for adequate refueling and maintenance for each ship.

Due to manufacturer's requirements, one ship underwent a major engine overhaul at 600 hours of use on November 17, 1973. The overhaul was completed in three weeks and the ship resumed air patrol on December 7, 1973.

Due to the unavailability of any one single radio with 12 channel capability, that was compatible throughout the frequency necessary to provide maximum communications, portable units (three battery operated walkie-talkies) were installed. These units proved to be not only less expensive than the original equipment requested, but also were lighter in weight and portable in nature. The total unit is approximately nine pounds in weight and can be detached from the aircraft for ground patrol, should the pilot or observer need to leave the aircraft. The engineering for the portable units was accomplished in February of 1973, but the units were not available until late June, 1973.

Contracts for the acquisition and installation of the beacon alarm system and the painting of identification symbols on squad and SCAT cars were completed.

TASK 2 - Two and one-half months

Project Organization:

This task includes the following operations:

1. Selection of Tactical Committee
2. Selection of Policy Committee
3. Selection of Project Director

Policy Committee

Because of the complexity involved in a program of this nature, two committees were formed at the outset for the purpose of policy decisions and coordination. The first committee was the Policy Committee whose primary responsibilities were as follows:

1. Establish the qualifications for the Project Director of SCAR operations
2. Set qualifications and screening procedures for observance programs.
3. Identify criteria for installation of beacon alarms.
4. Establish secondary use services and the priority of same.
5. Insure proper fiscal control and accounting procedures.

The reasons for the establishment of this committee are as follows:

1. The number of cooperating jurisdictions requires a functional chain of command.

2. As a joint effort, it requires the representation of all cities to ensure that their investments and needs are met.
3. The complexity and design of the program are such that there must be some controls to ensure that all of the goals are dealt with in equal light.
4. Based on previous experience, law enforcement agencies not directly involved in the program will request helicopter services in certain situations. The Policy Committee will establish priority for handling those calls consistent with meeting the goals of the program.

The Policy Committee consists of the Chiefs of each participating department: Denver, Aurora, Lakewood and Wheatridge.

Tactical Committee

The second committee to be set up was the Tactical Committee, which was composed of the Project Director, the SCAT Commander, and one representative from each of the law enforcement agencies participating in the project. The primary function of the Tactical Committee was to act as an advisory body to the Policy Committee, to carry out its instructions, and to make recommendations regarding deployment (i.e., areas, day of week, time of day, techniques, priority) and other related matters.

Project Director

The selection of the Project Director was accomplished based on the following criteria:

1. Rank of Lieutenant
2. Experience with police aerial operations
3. A high degree of reasoning ability
4. A high degree of intelligence
5. Ability to understand and communicate with others
6. Ability to organize and coordinate activities
7. Ability to evaluate program progress and data

Members of the Tactical Committee were appointed by their respective Chiefs (other than SCAT Commander and Project Director). These members

have similar characteristics as the Project Director, but rank was not a consideration. The basic consideration was the ability to function positively in a committee atmosphere.

TASK 3

Project Implementation:

This task includes the implementation of the following:

1. Commence aircrew training
2. Baseline data collection
3. Develop operational policies and procedures
4. Commence training flights

During the month of May, while modifications and installations to the new helicopter were being completed, each of the five pilots were given ten hours of additional flight training because of the lapse of time since they had last flown. Two of the five pilots are back-up pilots in case of emergencies, sickness, or vacations of the regular three pilots. As such, they are not attached to the SCAR program on a full-time basis.

All pilots selected for the program were previously certified by the FAA for helicopter operations with the Chief Pilot having FAA helicopter instructor rating.

Aerial observers for this program were selected on a volunteer basis from district radio car officers in each cooperating city. Experience gained in project Sky Knight indicated that district radio car officers worked well as observers. District Commanders, under the Division Chief of Patrol, submitted names and qualifications of potential observers to the Tactical Committee for final selection. The Chief Pilot was responsible for the course instructions and aerial training of observers. In an attempt to select the best men available as observers, some deviation was allowed in maximum weight and height requirements.

Originally, the project called for the training of eight aerial observers, but due to scheduling problems with the respective agencies, it became necessary to train an additional eight observers in order to have availability at any given time (7 observers from Denver and 3 each from Aurora, Lakewood and Wheatridge). Observer training was implemented early in June and completed at the end of the month. All observers became familarized with the four cities participating in the project.

PART III

SUMMARY OF HELICOPTER OPERATIONS, SERVICE, COSTS, AND FLIGHT TIME, OCTOBER AND NOVEMBER, 1973

The information included in this section of the report is that compiled by the staff of the helicopter crew regarding the use, service, costs and operations of the aircraft. This information is gathered to assist in the evaluation of the four basic objectives of Project SCAR.

OBJECTIVE I: *REDUCE THE INCIDENCE OF BURGLARY BY 25% AND SUPPRESSIBLE (STREET OR OTHER) AND NON-SUPPRESSIBLE (FIXED LOCATION) ROBBERY BY 15% WHILE TEAMED WITH SCAT.*

OBJECTIVE II: *TO PROVIDE AERIAL OBSERVATION AND SUPPORT FOR A BEACON ALARM LIGHT SYSTEM IN THE CITIES OF AURORA, LAKEWOOD, AND WHEATRIDGE*

OBJECTIVE III: *DETERMINE WHICH METHODS OF DELIVERING HELICOPTER SERVICE PRODUCE THE BEST COST-EFFECTIVE RESULTS*

OBJECTIVE IV: *TO TRAIN EIGHT AERIAL OBSERVERS*

A. INFORMATION ON THE REDUCTION OF CRIME

The information presented here is that which is directly relevant to an assessment of the operation of the helicopter and its activities in arrests or assists during the months of October and November, 1973, as these are reported by the flight crew. The analysis of the reduction in crime rates for target and adjacent precincts, based on information gathered from official sources, and specifically generated to evaluate the impact of SCAT on crime rates, will be presented separately in Parv IV of this report.

Table I shows the summary, by month, of the number of apprehensions made with the assistance of the helicopter, or apprehensions by the helicopter, the number of hours the helicopter flew over the target area, and the number of hours of "downtime" for the helicopter for the months of October and November, 1973.

The Table shows that a total of 25 apprehensions or assists occurred during the month of October, and only 6 during the month of November. Part of the decrease in apprehensions from October to November might be explained by one helicopter being removed from service for maintenance from November 17 through the end of the month. However, even with only one helicopter available for half the month, there were still over 63 hours of flight time logged by the helicopter for that month, which is over half the hours logged in October, when both helicopters were more likely to be in service.

TABLE I

GENERAL OPERATIONAL INFORMATION FOR HELICOPTER IN RELATION TO CRIME SUPPRESSION AND APPREHENSION: OCTOBER AND NOVEMBER,1973

	OCTOBER			NOVEMBER			TOTAL		
	SHIP #1*	SHIP #2**	TOTAL	SHIP #1	SHIP #2	TOTAL	SHIP #1	SHIP #2	TOTAL
Number of apprehensions or assists with helicopter	5	20	25	1	5	6	6	25	31
Number of hours flown over target area	20.6	97.2	117.8	25.2	38.4	63.6	45.8	135.6	181.4
Number of hours downtime	0	16.0	16.0	21.0	112.0	133.0	21.0	128.0	149.0

* = 10DP
**= 20DP

TABLE II

REPORT OF INSTALLATION AND USE OF BEACON ALARM SYSTEM: OCTOBER-NOVEMBER, 1973

	DENVER			WHEATRIDGE			LAKEWOOD			AURORA			TOTAL		
	OCT.	NOV.	T	OCT.	NOV.	T	OCT.	NOV.	T	OCT.	NOV.	T	OCT.	NOV.	T
1. # Permanent lights installed	0	0	-	0	0	-	1	1	2	0	0	-	1	1	2
2. # Portable lights installed	0	2	2	0	0	-	0	0	-	0	0	-	0	2	2
3. # Robberies on premises w/lights	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-
4. # Burglaries on premises w/lights	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-
5. # Helicopter responses to lights	0	0	-	2	0	2	0	0	-	0	0	-	2	0	2
6. # Apprehensions from light alarm	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-
7. Light alarm/no helicopter response	0	0	-	0	0	-	0	0	-	0	0	-	0	0	-
8. Hours observer flew with helicopter	91.3	33.4	124.7	2.1	0	2.1	18.3	30.1	48.4	29	20	49	140.7	83.5	224.2
9. # Other calls covered by helicopter	214	78	292	1	0	1	12	3	15	8	1	9	235	82	317
10. # Requests for helicopter service	122	75	197	2	0	2	44	28	72	17	11	28	185	114	299
11. # False Alarms	24	18	42	0	0	-	7	5	12	1	1	2	32	24	56

Another way to state the above is that although 80.6% of the apprehensions and assists occurred during the month of October, the aircraft flew only 65% of its total hours for the two months during October. The decrease in helicopter apprehensions and assists during November would seem to be attributable to something more than merely the decreased hours flown during this month due to the maintenance of one of the helicopters.

B. INFORMATION ON THE INSTALLATION AND USE OF THE BEACON ALARM SYSTEM

It is apparent at the time of this writing that it will be impossible to evaluate this aspect of Project SCAR, as the contractors for the development and installation of the beacon light alarms have failed to install a significant number of them. At the end of the third quarter (the first nine months of the project) only two beacon alarms had been installed. However, some of the information obtained in order to evaluate the beacon alarm system is still of importance, and is presented in Table II.

This Table shows that through November, 1973, two permanent and two portable beacon lights had been installed. At least for the premises concerned, no robberies or burglaries had occurred during these two months.

The remainder of Table II information relates to the "non-beacon alarm related" activities of the helicopter, and are useful to the general purposes of this report. Row 8 indicates that of the total hours flown (see Table III), an observer was present in the helicopter for 224.2 hours. The helicopter covered 317 calls, of various kinds and from unspecified sources (Row 9, Table II), and received a total of 299 requests for assistance or cover from ground-based units (Row 10, Table II). Finally, in Row 11 of Table II, it is shown that the helicopter crew reports that of the total number of alarms, requests, or calls, 56 were "false alarms".

C. INFORMATION ON THE COST OF MAINTENANCE AND OPERATIONS OF THE HELICOPTERS

This information is supplied by the flight crew of the helicopter, and reports the hours of service, hours of "downtime" for maintenance, the hours of flight time, type of support being delivered during flight time, and the total costs for maintenance of both helicopters for the period of October and November, 1973.

Table III displays the information regarding the cost for maintenance, and the operational activities of both helicopters for October and November, 1973. In Row 1 of this table, it is shown that a total of 156 hours of maintenance work was accomplished on the two aircraft during this two

TABLE III

DATA RELATIVE TO MAINTENANCE AND OPERATIONAL COSTS OF HELICOPTER: OCTOBER-NOVEMBER, 1973

	OCTOBER			NOVEMBER			TOTAL	
	SHIP #1	SHIP #2	TOTAL	SHIP #1	SHIP #2	TOTAL	SHIP #1	SHIP #2	TOTAL
1. # Hours of scheduled maintenance	16	24	40	12	84	96	28	108	136
2. # Hours for Unscheduled maintenance	1	27	28	20	4	24	31	21	52
3. # Hours aircraft in service			216			200			416
4. # Hours flown	59.5	112.8	172.3	39.0	55.1	94.1	98.5	167.9	266.4
5. Maintenance Costs:									
Fuel:	$ 239.95	$ 672.00	$ 911.95	$217.36	$ 371.00	$ 588.36	$457.31	$ 1,043.00	$1,500.31
Oil:			151.90			152.15			304.05
Scheduled repairs	102.77	147.28	250.05	67.44	11,267.97	11,335.41	170.21	11,415.25	11,585.46
Unscheduled repairs	94.68	1,643.74	1,738.42	112.40	-0-	112.40	207.08	1,643.74	1,850.82
Total Maintenance:	$ 437.40	2,463.02	3,052.32	397.20	11,638.97	12,188.32	834.60	14,101.99	15,240.64
6. # Equipment deficiencies	0	0	-	-	-	3	-	-	3
7. % Time flown in support of SCAT			56.0%			62.4%			- x=59.2%
8. % Time flown in support of co-operating departments			29.0%			20.1%			- x=29.6%
9. % Time other assignments or calls			15.0%			7.5%			- x=11.3%

month period, 139 of these hours are attributable to Ship #2 (new one purchased by the grant), with 27 hours of unscheduled maintenance in October (replace mast bearing and seal, ground valve on #5 cylinder), and 108 hours of scheduled maintenance (600 hour major engine change).

Comparing Row 1 to Row 2 in Table III, we see that for every 3 hours of scheduled maintenance for the two aircraft, an additional hour of unscheduled maintenance occurred.

In Row 3 of Table III, it is important to note that there was an aircraft in service for 200 hours during November (compared to 216 hours in October), even though one of the aircraft was out of service for over half the month of November.

Row 5, Table III, is a straight forward presentation of the costs resulting from fuel, oil and scheduled and unscheduled maintenance of the two helicopters. The total cost, as found here, is taken from this Table and displaed with data from the foregoing tables in Figure 1 in order to give a preliminary cost-effectiveness analysis of the helicopter program. It is noted that the routine scheduled and anticipated maintenance of the new helicopter (600 hour engine change) accounts for $11,267.97 of the total maintenance costs of $15,240.64 for the two helicopters for two months.

FIGURE 1

SELECTED INFORMATION FROM TABLES I, II AND III RELATED TO COST-EFFECTIVE ANALYSIS OF HELICOPTER PROGRAM: OCTOBER AND NOVEMBER, 1973

Total Hours Flown	266
Total Maintenance Costs	$15,240.64
Total Apprehensions/Assists	31
Total Ca-ls for Assistance	297
Other Calls Covered	317
Total Hours in Maintenance	208

Calculations of the Data in Figure 1 reveal the following:

1. For the months of October and November, 1973, the total cost of maintenance for both helicopters was $57.26 per hours of flight time.

2. At the rate determined above, it cost $491.29 for each apprehension made or assist in apprehension rendered by the helicopter.

3. The helicopter averaged one (1) apprehension/assist for each 8.6 hours of actual flight time.

4. On the average, the helicopter received 1.1 calls for assistance or cover for each hour of flight time.

5. On the average, the helicopter covered 1.2 other calls for each hour of flight time.

6. Between the two helicopters, one(1) hour of maintenance is required for every 1.3 hours in the air.

D. INFORMATION RELEVANT TO TRAINING OF AERIAL OBSERVERS

According to the information submitted by the helicopter flight crew, a total of 17 men have each (1) been qualified as meeting standards for flight observers; (2) received 8 hours of ground training; (3) received 8 hours of flight training during the day; and (4) received 8 hours of flight training during the night.

For the total of 266 hours flown during this two month period, a trained aerial observer was on-board the helicopter for 224 of these hours, or 84.2% of the time.

No information was submitted regarding the scores which the aerial observer trainees made on their final examination.

PART IV

ASSESSMENT OF REDUCTION IN CRIME RATES FOR TARGET AND ADJACENT PRECINCTS: OCTOBER AND NOVEMBER, 1973

The objective for the reduction of rates of crimes for Project SCAR is stated in terms of its being teamed with SCAT (Special Crime Attack Team). During the months of October and November, 1973, SCAR was working intensively in the suppression/apprehension of burglary in Denver Police Precincts 106, 109 and 110. The impact of the combined activities of SCAR and SCAT in these precincts is shown in Table I, in which the number of burglaries in 1973 (with SCAT and SCAR active in the area) is compared to the number of burglaries for 1972 (without SCAT or SCAR), both for the target precincts and for the adjacent precincts - Denver Precincts 104, 105, 107, 108, 111, 112, 113, 208, and 213.

At first glance, the data in Table I seem to indicate that Project SCAR, when teamed with SCAT, is exceeding the objective of reducing the amount of burglary in the target precincts by 25%, for the total decrease in burglaries for October and November, 1973, compared to burglaries in these same precincts in 1972, is 26.3%. However, the significance of this decrease as occurring principally due to SCAT and SCAR is open to question, for the burglaries in the adjacent precincts (in which, technically, SCAT activities are not located during this period) is 17.6%. Speaking now of the adjacent precincts as a "control" group, in an experimental design, one would suggest that the impact of SCAR teamed with SCAT is a reduction of the number of burglaries by 8.7%, for this crime also decreased by a substantial margin in those precincts that did not serve as the locus for activities of these two special projects.

Still directing attention to the combined decrease in burglary for October and November in Table I, it could be suggested that the helicopter is playing a very significant role in this decrease in burglary, for it provides intensive patrol to the target area, and its visibility and related activities acts to suppress the dispersion of burglaries from the SCAT effort in the target area to the immediately adjacent areas. One factor bearing analysis in SCAT is whether intensive patrol actually suppresses crime, or merely directs potential criminals to operate in less intensively patrolled areas of the city. The data reviewed so far indicate that when the helicopter is teamed with intensive ground patrol, the crime rates decrease significantly not only in the target area, but in a large area adjacent to it.

These data for both October and November also indicate that the combined efforts of SCAT and SCAR are most effective in suppressing residential burglaries in the target area, and commercial burglaries in the adjacent precincts. Commercial burglaries in the adjacent precincts decreased to a greater extent than did either type of burgalry in either of the two groups of precincts - a total decrease of 30.9%. It should finally

TABLE I

NUMBER OF BURGLARIES FOR TARGET AND ADJACENT PRECINCTS AND PERCENTAGE CHANGE FROM 1972 TO 1973: DENVER OCTOBER AND NOVEMBER

	RESIDENTIAL			COMMERCIAL			TOTAL		
	1973	1972	+ % -	1973	1972	+ % -	1973	1972	+ % -
TARGET PRECINCTS	94	131	- 28.2	49	63	- 22.2	143	194	- 26.3
ADJACENT PRECINCTS	152	162	- 6.2	96	139	- 30.9	248	301	- 17.6
OCTOBER ONLY									
TARGET PRECINCTS	42	71	- 40.9	30	32	- 6.6	72	103	- 30.1
ADJACENT PRECINCTS	74	83	- 10.8	57	58	- 1.7	131	141	- 7.1
NOVEMBER ONLY									
TARGET PRECINCTS	52	60	- 13.3	19	31	- 38.7	71	91	- 22.0
ADJACENT PRECINCTS	78	79	- 1.3	39	81	- 51.9	117	160	- 26.9

be noted that residential burglaries in the precincts adjacent to the target areas decreased by only 6.2% from the 1972 rates.

The exact relationship that the helicopter program has in bringing about the significant reduction in burglaries for both the target and adjacent precincts is difficult to calculate. For research purposes, it is fortuitous that the helicopter flew significantly less hours in November than in October, for this provides an opportunity to assess the impact of SCAT with intensive helicopter coverage, as compared to its impact with the more limited coverage afforded during the month of November. (From data in Part III, Table III, it is calculated that the helicopter flew 96 hours in support of SCAT during October, and that this was reduced to 59 hours in November, a reduction of 37 hours or a 38.6% decrease in helicopter support for SCAT).

The research assumptions are made that (1) the rate of decrease in burglaries in the target area will be greater in October (with full helicopter support) than in November (with limited helicopter support); (2) the decrease in burglaries in the adjacent areas will be greater in October (with full helicopter support to suppress dispersion) than in November; and (3) the difference in the rate of decrease between target and adjacent precincts will be greater in November.

Checking out these research assumptions against the data in Table I under "November only" and "October only", it is found that assumption #1 is supported. However, precisely the opposite situation occurs for assumptions #2 and #3. In the case of #2, one finds that burglary in the adjacent precincts decreases by only 7.1% during October, and by 26.9% in November. The finding that burglaries in adjacent precincts decrease at a greater rate with decreased helicopter support for SCAT is certainly a negative one, and one that needs much exploration in later research. On a more positive note, it is also seen in the Table that burglaries in the target precincts decreased more in October (30.1% decrease from 1972) than they did in November (22%).

Regarding assumption #3, it was based on the idea that reduced helicopter coverage would lead to an increase in dispersion of crime from the target or precincts to the adjacent ones. However, in October, with full helicopter support, the target precincts decreased in burglary rates by 30.1% and the adjacent precincts by 7.1%, a difference of 23% greater decrease favoring the target areas.

In November, the decreases in burglary for the adjacent precincts exceeded those in the target precincts (26.9% and 22% respectively) by 4.9%. In summary, with decreased helicopter support in November, the adjacent precincts showed a 27.9% greater decrease in burglary for October, than did the target precincts.

One final situation in Table I which merits discussion is the noticeably different impacts on rates of residential and commercial burglaries

during the months of October and November. These data reveal that during October, the rate of decrease in residential burglary was greater, in both the target and adjacent precincts, than was the decrease in commercial burglaries. For the target precincts, residential burglary decreased by 40.9% in October, while commerical burglary decreased by only 6.6% (averaging out, as shown in the table to a total decrease in the target precincts of 30.1%). The same pattern holds for the adjacent precincts, only at a very reduced level, with residential burglary decreasing by 10.8% and commercial burglary by 1.7%.

However, for the month of November, the pattern is exactly reversed. During November, the rate of commercial burglary decreases significantly more than does that for residential burglary, and the more striking comparison is found in the adjacent districts, in which commercial burglary decreased by 51.9% compared to a 1.3% decrease in residential burglary during the same month. The differences in the rate of reduction of the two kinds of burglaries is also found at a lower level for the target precincts, in which commercial burglaries are decreased by 38.7% compared to a 13.3% reduction in the rate of residential burglaries.

The data reported in Table I seem to indicate that the combined efforts of SCAR and SCAT are reducing the number of burglaries in both the target and adjacent precincts. However, these same data do more to obscure than to clarify the manner in which this is being accomplished.

PART V

POLICE ATTITUDE SURVEY

Project SCAR, providing helicopter assistance to police officers in the apprehension of suspects and the suppression of criminal behavior, must be understood, accepted, and used by the ground-based police officers if it is to be effective. The police attitude survey was principally designed to gather information from these ground-based officers regarding their understanding, use, and attitudes toward the helicopter unit.

The evaluation team designed a questionnaire and it was distributed to all police officers reporting for a shift during the days of December 10 and 11, 1973, in Denver, Wheatridge, Lakewood and Aurora. This questionnaire (Appendix C) asked for a number of different kinds of information deemed important in analyzing the ground-based police officers general relationship to Project SCAR. It asked for general background information about the officer who responded to the questionnaire (age, sex, years of experience); the extent to which the officer had used SCAR during the past nine months; operational problems using officers had experienced with SCAR (response times, communications problems, knowledge of procedures for contacting and using helicopter); and some questions regarding the officers' attitudes toward the program and its operation. The results of this questionnaire are presented and interpreted in this part of the report.

SAMPLE

The questionnaire was distributed to all patrol officers reporting for a shift on December 10th or 11th for the Aurora, Denver, Lakewood, and Wheatridge Police Departments. Of the total of approximately 1544 officers assigned to these departments it was estimated that slightly under half of them would be contacted in this manner, without any noticeable bias introduced. Those not working during these two days due to sickness, vacation, days off, and so on, are not known to differ from those who were working.

The questionnaires were distributed in a manner designed to obtain a random selection of officers, representing a varied percentage of officers in each department, depending on department size. As illustrated in Table I, not all of the officers selected in the sample actually obtained the questionnaires in time to return them for analysis, resulting in a slightly smaller percentage of officers being included in the sample than had been anticipated.

As in much survey research, the sample is often compromised a bit from being selected in a perfectly random manner, for limited opportunity and constraints of time sometimes preclude conducting the survey as it appears "on the drawing boards"; so it is here. However, follow-up inquiries and communications indicate that the loss of questionnaires resulted from problems in distribution, communications, and related "logistical" problems,

TABLE I

ACTUAL NUMBER OF OFFICERS IN SAMPLE COMPARED TO ANTICIPATED NUMBER, BY PERCENT AND DEPARTMENT

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
ANTICIPATED RESPONDENTS	50	43	375	30	60	50	15	43	500	32
ACTUAL RESPONDENTS	37	32	318	25	47	39	12	34	414	27

and not from the refusal to cooperate, or rejection of the questionnaire, by officers in any manner which would indicate bias in those returned. Given the purposes of this inquiry, the nature of the data collected and the modest statistical analysis to which they are subjected, the sample of 414 appears valid. (See Appendix D for a precise "breakdown" of the percentage of officers surveyed, by District, Detail, and Special Units of Assignment in Denver).

As indicated in Table I, the final sample consisted of 414 respondents representing 27% of the total police forces of the four cities involved in Project SCAR. Figure I, below, shows the relative contribution to the total number of returned questionnaires by department.

FIGURE I

NUMBER OF QUESTIONNAIRES RETURNED, BY PERCENT AND POLICE DEPARTMENT

	NUMBER	PERCENTAGE
AURORA	37	8.9%
DENVER	318	76.8%
LAKEWOOD	47	11.4%
WHEATRIDGE	12	2.9%

NATURE OF PRESENT WORK AND CHARACTERISTICS OF RESPONDENTS

Each respondent was asked, in the questionnaire, to answer seven questions regarding his police work and personal characteristics, present assignment, rank, district to which assigned, watch assignment, years of experience in police work, age, and sex. The first seven questions "describe" the sample - that is, they provide information about the respondents' type of police work, and personal characteristics. The answers to these questions are presented below, both for the total sample, and individually for each police department in the survey.

PRESENT ASSIGNMENT:

394 of the 414 respondents (94.9%) are presently assigned to patrol. As shown in Table II, this ranges from a low of 66.7% in the Wheatridge sample to a high of 100% in the Lakewood sample, with Denver having 96.5% of its respondents working patrol.

TABLE II

PRESENT ASSIGNMENTS OF RESPONDENTS AND CITY DEPARTMENT
FREQUENCY AND PERCENT N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
PATROL	31	83.8	307	96.5	47	100	8	66.7	393	94.9
INVESTIGATION	2	5.4	5	1.6	0	0	1	8.3	8	1.9
TRAFFIC	0	0	0	0	0	0	0	0	0	0
ADMINISTRATION	1	2.7	0	0	0	0	0	0	1	2.2
YOUTH	0	0	0	0	0	0	0	0	0	0
OTHER	3	8.1	6	1.9	0	0	3	25.0	12	2.9

TABLE III

PRESENT RANK OF RESPONDENTS AND CITY BY FREQUENCY AND PERCENT

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
CAPTAIN	1	2.7	2	.6	0	0	0	0	3	.7
LIEUTENANT	2	5.4	1	.3	0	0	0	0	3	.7
SERGEANT	4	10.8	16	5.0	3	6.4	1	8.3	24	5.8
PATROLMAN	27	73.0	254	79.9	38	80.9	9	75.0	328	79.2
DETECTIVE	1	2.7	6	1.9	0	0	1	8.3	8	1.9
TECHNICIAN	2	5.4	37	11.6	0	0	0	0	39	9.4
OTHER	0	0	2	.6	6	12.8	1	8.3	9	2.2

PRESENT RANK OF RESPONDENT:

Of the 414 respondents, 328 (79.2%) are presently in the rank of patrolman. The next two most frequent ranks are technician - 39 - (9.4%), and sergeant - 24 - (5.8%). The remaining 5.6% of the respondents are distributed among captains, lieutenants, detectives and "other". Once again, the sampling procedure is demonstrated successful in obtaining the vast majority of responses from officers of the patrolman rank, who are assigned to active patrol.

It is precisely these officers who have the most to gain from the helicopter unit, and the most to lose if it does not function properly, or is not continued. It is also this group of officers who stand the greatest possibility of direct contact with the helicopter "in the field" and therefore are able to comment on, and evaluate its operation on the basis of experience.

DISTRICT ASSIGNED (DENVER ONLY):

The distribution of the respondents in terms of the district to which they are assigned in Denver is presented in Table IV. The frequencies show a rather even proportional representation of officers from each of the four active patrol districts, since more men are actually assigned to District I than to District II, more to District II than to District III, and more to District III than to District IV. The Table shows that District II is proportionately under-represented in this sample. This reflects the fact that the questionnaires for an entire detail in District II were not delivered until too late to be included in this study.

However, it is again clear, by the small numbers of respondents assigned to Central Headquarters, that the sample is predominatly composed of patrolmen actively engaged in street patrol functions.

PRESENT WATCH ASSIGNMENT:

Because the helicopter flies more often at some times of the day than others, the time of day during which a respondent is working might have a significant impact on knowledge of, exposure to, use of, and perhaps, attitude toward the helicopter program. There are also certain operational elements of the helicopter procedures which might well effect its usefulness to ground patrol units which are related to hours of the day, i.e., its light can illuminate the scene of a crime for an officer at night, who might otherwise have no way to search out a suspect. Such daytime use is not feasible. It is also true that during the past three months, the helicopter has been more likely to be airborn during the early or late evenings and at night, than during the morning and daylight hours. Table V indicates that of the respondents from Denver, almost half are working evenings, and therefore, will have had the most opportunity for exposure to the helicopter over the past three months. However, the Wheatridge sample has no respondents who work evening watch and over two-thirds (66.7%) working the morning watch. By contrast, only one (2.7%) of the Aurora respondents is working morning watch, about one-third evenings, and over two-fifths of the Aurora respondents

TABLE IV

NUMBER AND PERCENT OF RESPONDENTS FROM EACH PATROL DISTRICT IN DENVER, HEADQUARTERS ASSIGNMENTS AND SUBURBAN DEPARTMENTS N=414

	NUMBER	PERCENT
SUBURBAN DEPARTMENTS	95	22.9
DENVER DISTRICT I	98	23.7
DENVER DISTRICT II	67	16.2
DENVER DISTRICT III	73	17.6
DENVER DISTRICT IV	55	13.3
DENVER CENTRAL H.Q.	25	6.3
TOTAL	413	100.0

TABLE V

PRESENT WATCH ASSIGNMENT AND CITY DEPARTMENT BY FREQUENCY AND PERCENT N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
MORNINGS	1	2.7	72	22.6	15	31.9	8	66.7	96	23.2
AFTERNOONS	4	10.8	41	12.6	6	12.8	2	16.7	53	12.8
EVENINGS	12	32.4	149	46.9	17	36.2	0	0	179	43.0
STRAIGHT DAYS	16	43.2	50	15.7	4	8.5	2	16.7	72	17.4
OTHER	4	10.8	6	1.9	5	10.6	0	0	15	3.6

are from the "straight day" watch. This was a problem in the sample structure, and its impact on the results of other data obtained in this questionnaire will be analyzed at a later point in this report.

YEARS OF EXPERIENCE (IN POLICE WORK):

The years of experience in police work is, of course, highly related to the age of the respondents since younger officers cannot have obtained many years of experience on the force, etc. Generally, the respondents to this questionnaire have 5 years or less of police work (264 or 63.8%), and another 88 (21.3%) have 6 to 11 years of experience. Two departments - Lakewood and Wheatridge - have no respondents with more than 11 years of experience, while Aurora has 5 (13.5%) and Denver has 55 (17.3%). The sample of respondents from the Denver Police Department contains a disproportionate number of officers with more experience, compared to the departments of the other cities. It should be noted that the suburban cities in this sample have been expanding and as the size of the city increased new patrolmen have been added. This factor would explain the age and experience differences. Furthermore, new officers (younger men) are generally assigned to patrol duties before any other assignment.

AGE OF RESPONDENTS:

The age of the respondents in this sample is distributed much in the same manner as the "years of experience" presented above. As shown in Table VII, the vast majority of the respondents in this sample are thirty years of age or less - 67.9%. (27.1% are from 21-25 years of age, and 40.8% are from 26-30 years of age).

The sample from Denver, in Table VII, has proportionately fewer respondents in the younger age groups than the other departments. Correspondingly, Denver has proportionately more respondents in the older age categories than do the other departments. Aurora follows the same pattern as Denver, although not to such a great extent, while Lakewood and Wheatridge show generally younger respondents, with none in either of these two departments over the age of 40. In Figure I, below, the number and percent of men from each department who are over 35 years of age are presented.

FIGURE I

FREQUENCY AND PERCENT FOR SAMPLE RESPONDENTS OVER THIRTY FIVE YEARS OF AGE N = 70

AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
N	%	N	%	N	%	N	%	N	%
5	13.5	64	20.2	1	2.1	0	0	70	16.8

TABLE VI

YEARS OF EXPERIENCE IN POLICE WORK AND CITY POLICE DEPARTMENT BY FREQUENCY AND PERCENT N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
1 - 5	26	70.3	194	61.0	33	70.2	11	91.7	264	63.8
6 - 11	6	16.2	67	21.1	14	29.8	1	8.3	88	21.3
12 - 17	2	5.4	23	7.2	0	0	0	0	25	6.0
18 - 22	3	8.1	18	5.7	0	0	0	0	21	5.1
22 - over	0	0	14	4.4	0	0	0	0	14	3.4
Unknown	0	0	2	.6	0	0	0	0	2	.5

TABLE VII

AGE OF RESPONDENTS BY DEPARTMENT - FREQUENCY AND PERCENT N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
21-25	8	21.6	85	26.7	15	31.9	4	33.3	112	27.1
26-30	17	45.9	122	38.4	22	46.8	8	66.7	169	40.8
31-35	7	18.9	45	14.2	9	19.1	0	0	61	14.7
36-40	3	8.1	26	8.2	1	2.1	0	0	30	7.2
41-45	1	2.7	19	6.0	0	0	0	0	20	4.8
46-50	1	2.7	11	3.5	0	0	0	0	12	2.9
51-55	0	0	5	1.6	0	0	0	0	5	1.2
55-over	0	0	3	.9	0	0	0	0	3	.7
Unknown	0	0	2	.6	0	0	0	0	2	.5

This figure demonstrates that the Denver sample contains more older respondents than the sample from any other city police department. Indeed, in the total sample of 414 respondents, only 70 are over 35 years of age, and 64 of these are from the Denver Department (91.4% of those over 35).

SEX OF RESPONDENTS:

As demonstrated in Table VIII, the over-whelming majority of respondents are male. This is not assumed to be a reflection of a bias in sampling, for in each of the four departments covered in this survey, the over-whelming majority of patrol officers are male. For example, the 1972 Annual Report of the Denver Police Department lists 20 policewomen of a total force of 1235, or 1.6% female officers. The Denver sample in Table VIII shows 1.3% female respondents.

SUMMARY OF SAMPLE:

The sample size is smaller than anticipated, but no evidence of bias is apparent. The vast majority of respondents are younger patrolmen, actively involved in patrol assignments, and appear to be proportionately representative in regard to watch assignments, districts assigned (Denver only), age, years of experience, and sex for each of the city police departments represented in the SCAR Program. The Denver Police Department shows proportionately more respondents who are over 35 years of age than the respondents from the other three departments, and also more who are older with longer years of service. Finally, Denver has proportionately more men from the night watch assignment than do the other departments.

TABLE VIII

SEX OF RESPONDENTS BY CITY DEPARTMENT - FREQUENCY AND PERCENT
N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
MALE	37	100	311	97.8	45	95.7	12	100	405	97.8
FEMALE	0	0	4	1.3	2	4.3	0	0	6	1.4
UNKNOWN	0	0	3	.9	0	0	0	0	3	.7

INFORMATION REGARDING OPERATION, USE AND ATTITUDES OF RESPONDENTS IN REGARD TO SCAR

In this section of the analysis of the data obtained from the questionnaire, attention is given to those responses to questions concerned with the actual operations of Project SCAR and officers' attitudes and opinions of it. This second set of questiors appear in the copy of the questionnaire (Apprndix C) and are:(A) How was the SCAR Program explained to you by your supervisor?; (B) How did you learn about the program, if not explained by supervisor?;(C) Do you feel the helicopter program is beneficial in crime suppression and/or apprehension?; (D) How are you notified that helicopter is available?; (E) Have you ever requested relicopter cover or assistance while on duty?; (F) If helicopter was requested did it respond?; (G) If helicopter responded, how long did it take to arrive?; (H) Were you ever requested to assist or cover a call that was initiated by aerial unit?; (I) If yes, were there communications problems with helicopter unit?; (J) If yes, what were communications problems?; (K) Do you think additional helicopter support would assist you in your work?; (L) Do you feel safer if a helicopter is available to cover you during felony calls, etc.?; (M) Do you feel the program should be continued, decreased, increased or abandoned?

The last question (N) on the questionnaire asks respondents to make whatever suggestions they care to regarding the improvement of the helicopter program, and add additional opinions to those presented in the questionnaire. Of the total 414 respondents, 243 (58.5%) made additional remarks.

Following the display of data describing the different responses to and descriptions of the helicopter by each city police department, the "remarks and opinions" coded by content analysis are presented and briefly discussed.

A. How was the SCAR program explained to you by your supervisor?

The responses to this question are presented in Table IX. The Table clearly shows, on inspection, that the methods used (or lack of methods used) vary sharply among the different departments. For example, no officer in the Wheatridge department heard about the SCAR Program through normal channels of communication from supervisory personnel, while 70.2% of the Lakewood sample report their supervisor explained the program during rollcall.

Perhaps the most important single piece of information in Table IX is that over one-half of the Denver sample indicate that the SCAR Program has never been explained to them by a supervisor (51.9%). Adding the 9.5% of the Denver respondents who only heard of SCAR through informal communications with supervisory personnel, it is apparent that supervisory personnel of the Denver department have not used "formal" communication to inform their patrol officers what SCAR is about, how it might be used, and related information to the program.

TABLE IX

MANNER IN WHICH OFFICERS RECEIVED EXPLANATION OF SCAR BY DEPARTMENT
N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
ROLLCALL	11	29.7	84	26.4	33	70.2	0	0	128	30.9
T.V. TRAINING	0	0	22	6.9	0	0	0	0	22	5.3
TRNG. BULLETIN	2	5.4	9	2.8	3	6.4	0	0	14	3.4
DEPT. ORDER/DIR.	8	21.6	5	1.6	3	6.4	0	0	16	3.9
INFORMAL COMM.	5	13.5	31	9.7	5	10.6	10	83.3	51	12.3
NEVER EXPLAINED	11	29.7	165	51.9	3	6.4	2	16.7	181	43.7
UNKNOWN	0	0	2	.6	0	0	0	0	2	.5

By contrast, over two-thirds of the Lakewood respondents had the helicopter program explained to them by supervisory staff at a rollcall, and an additional 12.8% through other formal channels of departmental communication. Generally speaking, each of the suburban departments have made significantly greater use of formal channels of communication in explaining SCAR than has the Denver department.

B. If you know about the program, but did not get the information through formal departmental sources, how did you find out?

Table X shows how those officers who did not hear of the SCAR Program from their supervisors did learn about the program, if in fact they did. Although some, especially in Denver, did learn of SCAR through the mass media, the most frequent method for all officers was through "word of mouth" or informal discussion with friends and fellow officers (22%).

C. Do you feel that the helicopter program is beneficial in crime suppression and/or apprehension?

The responses to this question are displayed in Table XI. This is an attitudinal question, and is aimed at gaining an indication of patrol officers' ideas about what the Helicopter can and cannot provide in the way of crime suppression and apprehension.

In Table XI, the data in #5 represent, at an attitudinal level, rather strong endorsement of the potential helpfulness of the helicopter to the patrol officer in carrying out his duties.

It is therefore of interest to note that the respondents from the Denver department have the lowest percentage of any of the departments feeling that the helicopter is beneficial in both suppression and apprehension. It is also noted that Denver has the highest percentage of respondents who have "no opinion" (12.3%), and the highest percentage who feel the helicopter is not useful for either suppression or apprehension. In total, it seems indicated on the basis of the data in Table XI, that the Denver respondents are much less positive in assessing the potential benefits of the helicopter than any of the three suburban departments' personnel. The reader is also reminded of prior ways in which the Denver department differed significantly from the suburban ones - less likely to be notified of the helicopter at rollcall or through formal channels of communication, older, and more years experience in police work.

D. When on shift, how are you notified that the helicopter is available?

In view of the obvious need for coordination of helicopter operations with ground-based units, and the general overall need for efficient communications in this area, the findings presented in Table XII in answer to this question are rather surprising. None of the police departments of any city shows a majority of its officers receiving notification of the helicopter's availability in the same way. Indeed, the respondents from both Denver and Wheatridge indicate that the majority of these officers are not notified, by any means, when the helicopter is available. In

TABLE X

NON-SUPERVISORY MODES OF LEARNING ABOUT SCAR BY CITY DEPARTMENT - FREQUENCY AND PERCENT - N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
ANSWERED ABOVE	23	62.2	171	53.8	38	80.9	6	50.0	238	57.5
NEWSPAPER	1	2.7	38	11.9	0	0	0	0	39	9.4
PUBLIC RADIO	0	0	1	.3	0	0	0	0	1	.2
TELEVISION	0	0	8	2.5	0	0	0	0	8	1.9
WORD OF MOUTH	13	35.1	69	21.7	6	12.8	3	25.0	91	22.0
OTHER	0	0	26	8.2	2	4.3	3	25.0	31	7.5
UNKNOWN	0	0	5	1.6	1	2.1	0	0	6	1.4

TABLE XI

BENEFIT OF HELICOPTER IN CRIME SUPPRESSION AND/OR APPREHENSION FREQUENCY AND PERCENT N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
APPREHENSION ONLY	2	5.4	35	11.0	5	10.6	0	0	42	10.1
SUPPRESSION/BURG.	4	10.8	16	5.0	0	0	1	8.3	21	5.1
SUPPRESSION/ROBB.	0	0	1	.3	0	0	0	0	1	.2
SUPPRESSION/ST. CRIME	2	5.4	40	12.6	6	12.8	4	33.3	52	12.6
SUPPRESSION/ APPREHENSION	25	67.6	149	46.9	35	74.5	6	50.0	215	51.9
NEITHER	1	2.7	35	11.0	0	0	0	0	36	8.7
NO OPINION	3	8.1	39	12.3	1	2.1	1	8.3	44	10.6
UNKNOWN	0	0	3	.9	0	0	0	0	3	.7

TABLE XII

METHOD OF NOTIFICATION RE: AVAILABILITY OF HELICOPTER BY DEPARTMENT
FREQUENCY AND PERCENT N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
ROLLCALL	1	2.7	6	1.9	4	8.5	0	0	11	2.7
RADIO	18	48.6	96	30.2	21	44.7	2	16.7	137	33.1
DAILY BULLETIN	1	2.7	0	0	0	0	0	0	1	.2
NOT NOTIFIED	15	40.5	196	61.6	18	38.3	9	75.0	238	57.5
OTHER	2	5.4	18	5.7	4	8.5	1	8.3	25	6.0
UNKNOWN	0	0	2	.6	0	0	0	0	2	.5

addition to the inconsistent and unpredictable modes of communication within each department, the differences among the departments are also rather marked, i.e., almost one-half (48.6%) of the respondents of the Aurora department indicate they are notified by radio when the helicopter is available, while less than one-fifth (16.7%) of those from the Wheatridge department are notified in this manner. In summary, well over half of all officers responding indicate that they are never, or most typically not, notified when the helicopter is available (57.5%).

E. Have you ever requested helicopter cover or assistance while engaged in your police activities?

This question seeks to find the extent to which patrolmen have actually requested cover or assistance from the helicopter, or have felt the need to. As such, it is an important measure of the "acceptance" of the helicopter program by the patrolmen, for if they have used it, they must have at least some minimum idea that it is useful. These data are presented in Table XIII.

Because of the wide range of the data in Table XIII, these are recast below (for purposes of discussion) in Figure 2, on the basis of a simple split between officers who have never used the helicopter, for whatever reason, and those who have. The reader may wish to refer to Table XIII to fill in the details of the extent of helicopter use by each department.

Figure 2

USE AND NON-USE OF HELICOPTER BY DEPARTMENT:
FREQUENCY AND PERCENT N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO	%
NO USE	20	54.1	146	46.2	21	44.7	6	50.0	193	46.8
ONE OR MORE TIMES	17	45.9	170	53.8	26	53.3	6	50.0	219	53.2

From Figure 2, it can be seen that over half of all the respondents to this questionnaire have requested the helicopter on at least one occasion. The extent of the use does not vary greatly among the departments of the various cities, although Aurora respondents show less use than the other three, and Denver shows the most frequent use by a very slight margin over Lakewood (.3%).

TABLE XIII

REQUESTS FOR HELICOPTER ASSISTANCE BY DEPARTMENT - FREQUENCY AND PERCENT
N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
NEVER	11	29.7	121	38.1	18	38.3	6	50.0	256	37.7
NO NEED TO REQUEST NEEDED BUT DID NOW KNOW HOW	8	21.6	22	6.9	3	6.4	0	0	33	8.0
ONE TIME	1	2.7	3	.9	0	0	0	0	4	1.0
TWO TIMES	14	37.8	57	17.9	7	14.9	5	41.7	83	20.0
THREE TIMES	2	5.4	51	16.0	8	17.0	1	8.3	62	15.0
FOUR TIMES	1	2.7	18	5.7	4	8.5	0	0	23	5.6
UNKNOWN	0	0	44	13.8	7	14.9	0	0	51	12.3
	0	0	2	.6	0	0	0	0	2	.5

It is also apparent in Table XIII that use of the helicopter more than one time occurs most frequently in Denver. In order to assess the total number of times the helicopter has been actually called to cover a call or assist ground-based patrol officers in this sample, the data in Table XIII are re-grouped once again, in Figure 3, on the basis of the frequency with which each department has called for assistance from the helicopter unit. Figure III shows that the respondents from the Lakewood department have shown the greatest frequency of calls to the helicopter for assistance, (1.3 calls per respondent) followed closely by those from Denver (1.2 calls per respondent). Whether or not this indicates greater acceptability of the helicopter to Denver and Lakewood officers, or greater accessibility, or is a reflection of respondents from these two cities being proportionately more involved in night watch, or whatever, is open to question at this point.

FIGURE 3

FREQUENCY OF USE OF HELICOPTER PER RESPONDENT
BY CITY DEPARTMENT N=414

	AURORA	DENVER	LAKEWOOD	WHEATRIDGE	TOTAL
# RESPONDENTS IN SAMPLE	37	318	47	12	414
TOTAL # TIMES REQUESTED	21	389	63	7	480
TIMES REQUESTED PER OFFICER	.57	1.2	1.3	.58	1.2

F. If helicopter was requested, did it respond?

On the average for all departments, the helicopter responded 84.7% of the times it was called. As demonstrated in Table XIV, the respondents from Lakewood show the highest percentage of helicopter response to calls for assistance and Denver and Wheatridge the lowest.

It is also noted that these two departments had the highest percentage of their officers responding that they were not notified when the helicopter was available (Table XII). Aurora respondents, who have the highest percentage of reponse from the helicopter to their calls for assistance, also have the highest percentage of officers who are notified if the helicopter is available either at rollcall or by radio.

TABLE XIV

HELICOPTER RESPONSE UPON REQUEST - FREQUENCY AND PERCENT
N = 222

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
YES HELICOPTER RESPONDED	17	89.4	142	83.0	24	92.3	5	83.3	188	84.7
NO HELICOPTER DID NOT RESPOND	2	10.6	29	17.0	2	7.7	1	16.7	34	15.3
TOTAL	19		171		26		6		222	

G. If helicopter responded, how long did it take to arrive?

Table XV displays the various amounts of time it took the helicopter to arrive in response to a request for assistance from a ground-based patrol unit. The modal and median response times for all city departments are from three to eight minutes. Overall, Lakewood seems to enjoy, on the average, the shortest helicopter resonse times, with 91.5% of these falling in the range of eight minutes or less. However, 86.5% of all the respondents indicate that the helicopter arrived within this period of time.

In order to simplify interpretation; the data in Table XV are re-grouped below in Figure 4 into only three categories of response time: "fast" is 2 minutes or less; "average" is 3 - 8 minutes; and "slow" is 8 minutes and over.

FIGURE 4

FAST, AVERAGE AND SLOW HELICOPTER RESPONSE TIMES
BY CITY DEPARTMENT: FREQUENCY AND PERCENT N = 192

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
FAST	5	36.3	53	36.3	8	33.3	1	20.0	67	34.9
AVERAGE	8	47.1	73	50.0	14	58.3	4	80.0	99	51.6
SLOW	4	23.5	20	13.8	8	8.5	0	0.0	26	13.5
TOTAL	17		146		24		5		192	

Figure 4 reveals very little difference among the various city police departments in the percentage of times the helicopter response is classified as "fast", (less than 3 minutes). This category covers at least one-third of all responses except for the city of Wheatridge, and the number of helicopter responses indicated by Wheatridge is so small (5) that it does not afford a basis for comparison. However, Wheatrige also had the lowest percentage response of the helicopter to calls for assistance (83.3%), see Table XIV.

Also in Figure 4, we see that Aurora has the highest percentage of responses in the "slow" category (23.5%) followed by Denver. Overall, it appears that Lakewood and Wheatridge have generally more responses to this question falling in the average and fast categories than do Denver and Aurora.

H. Were you ever requested to assist or cover a call that was initiated by the aerial unit?

TABLE XV

LENGTH OF TIME FOR HELICOPTER TO ARRIVE-BY DEPARTMENT - FREQUENCY AND PERCENT

	AURORA		LAKEWOOD		WHEATRIDGE		DENVER		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
- 1 MINUTE	2	11.8	4	16.6	1	20.8	15	10.3	22	11.3
1-2 MINUTES	3	17.6	4	16.6	0	0	38	26.0	45	23.4
3-8 MINUTES	8	47.1	14	58.3	4	80.0	73	50.0	99	51.6
8-12 MINUTES	4	23.5	0	0	0	0	9	6.2	13	6.8
+ 12 MINUTES	0	0	2	8.5	0	0	11	7.6	13	6.8
TOTAL	17		24		5		146		192	

As demonstrated in Table XVI, patrolmen from each city department have been contacted by the helicopter to cover or assist in a call, ranging from a low of 25% of the respondents in Wheatridge, to a high of 42.6% in Lakewood.

Once again, Lakewood shows the highest percentage of respondents involved in helicopter activity, with 42.6% reporting a call from the helicopter, followed closely by Denver with 39.9%.

I/J. If called by the helicopter, were there communication problems. If so, what were they?

As can be seen in Table XVII, the large majority of officers who were called from the helicopter to cover or assist in a call, did not experience a communication problem (76.5%). However, this does not vary among the departments, with all departments except Denver indicating no communication problems in over 87.5% of the contacts with the helicopter.

Respondents from the Denver Police Department proportionately report far more problems with communications from the helicopter than do those of the other departments, especially in the problem category of "unable to copy helicopter transmission". Indeed, with the exception of this particular category from the Denver department, there are very few reported communication problems. Leaving out the Denver respondents who marked this category, there are only 15 other reported problems in communications from the 184 remaining responses, or 8.1%.

K. Do you think additional helicopter support would assist you in your work?

This is a key attitude question, for we have seen above that almost half of the respondents to this questionnaire have actually requested the use of the helicopter, and another (or perhaps some of the same respondents) 38.6% of the respondents have worked with the helicopter at its request. Therefore, asking whether more helicopters would be useful to the ground-based patrolmen who responded to this questionnaire does afford a rather direct expression of the officers' evaluation of the helicopter program to date, as well as an indication that perhaps the helicopter program would be more useful if additional aircraft were provided.

In Table XVIII, it can be seen that the majority of officers in each of the city departments feel that additional helicopters would assist them in their work. However, it is to be noted that the Denver respondents are much more likely to disagree with this statement than are those from any of the suburban departments. Because the Denver department has so many more respondents than do the suburban departments, this significantly influences the total outcomes in Table XVIII. For example, omitting the Denver sample from the computations, and grouping the suburban departments together, we find that 94.8% of the respondents feel additional helicopters would be an asset, 1.0% do not, and 4.2% register no opinion.

TABLE XVI

REQUESTS FROM HELICOPTER FOR ASSISTANCE: FREQUENCY AND PERCENT
N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
YES	10	27.0	127	39.9	20	42.6	3	25.0	160	38.6
NO	27	73.0	189	59.4	27	57.4	9	75.0	252	60.9
UNKNOWN	0	0	2	.6	0	0	0	0	2	.5

TABLE XVII

PROBLEMS WITH COMMUNICATIONS FROM HELICOPTER BY CITY DEPARTMENT
FREQUENCY AND PERCENT N = 188

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
NO PROBLEMS	15	88.2	113	71.9	20	86.9	21	87.5	169	76.5
UNABLE TO COPY TRANSMISSION	1	5.9	37	23.6	0	0	0	0	38	17.2
DIRECTIONS FROM HELICOPTER UNCLEAR	0	0	3	1.9	0	0	0	0	3	1.4
HELICOPTER UNABLE TO GIVE LOCATION	0	0	2	1.3	1	4.3	1	4.2	4	1.8
UNABLE TO TALK DIRECTLY TO HELICOPTER	1	5.9	1	.6	2	8.7	2	8.3	6	2.7
OTHER	0	0	1	.6	0	0	0	0	1	.4
TOTAL W/PROBLEMS	3	11.8	44	28.1	3	13.1	2	12.5	52	23.5
TOTAL ALL RESPONSES	17		157		23		24		221	

TABLE XVIII

RESPONDENT'S OPINION TOWARD USEFULNESS OF ADDITIONAL HELICOPTERS - FREQUENCY AND PERCENT, N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
YES	36	97.3	209	65.7	43	91.5	12	100	300	72.5
NO	0	0	62	19.5	1	2.1	0	0	63	15.2
NO OPINION	1	2.7	44	13.8	3	6.4	0	0	48	11.6
UNKNOWN	0	0	3	.9	0	0	0	0	3	.7

This is a significantly greater positive endorsement of the need for more helicopters than is indicated in the "total" column of Table XVIII.

L. Do you feel safer if a helicopter is available to cover you during felony calls, suspicious car stops, or other potentially dangerous calls?

The data in Table XIX, indicate that the majority of the officers responding to this question feel "safer" when a helicopter is available to cover dangerous calls. Once again, the respondents from Denver are less likely to give a positive response than those from the suburban departments, although the difference is not so great in this area as in some others, i.e., Table XVIII.

M. Do you feel that the program should be continued at its present level, continued at an increased level, continued at a lower level, or discontinued?

This is a rather crucial question in this survey, for it seeks to learn if the ground-based patrol officers would like to see the program continued or increased, or if such officers feel it should be discontinued or decreased. Table XX shows that a very large majority of the respondents to this question favor the continuation of the program - 16.5% at its present level and 73.7% at an increased level. Only 5.6% of the total respondents wish to see this program discontinued, and only 2.4% would like to see it continued, but at a lower level of operation.

Once again, the respondents from the Denver department are noticeably different than those from all of the suburban departments in being less positive or enthusiastic about the helicopter program. This is the only department for which any respondents indicated that the program should be discontinued, or continued at a reduced level - 7.2% and 3.1% respectively. Nonetheless, a strong majority of the respondents from the Denver department (68.6%) do favor the continuation of the program at an increased level of operation, although this amount of support is much lower than that given by any of the other departments: Aurora - 86.5%; Lakewood - 91.5%; and Wheatridge - 100%.

N. How can the program be improved? Remarks and Opinions.

This question is asked in an "open-ended" fashion, and it is not possible to "pre-code" the responses which might be made to it. Well over one-half of the respondents did offer suggestions, remarks or opinions (a total of 243 of the 414, or 58.8%), which are summarized by the method of "content analysis" and presented and discussed below. It is possible to classify the varied responses of the officers to this question into seven general categories, as presented in Table XXI. The number and percent of officers in each department who made a suggestion, remark or offered an opinion falling into one of these categories are presented. The categories are also presented in "rank order", with the first category appearing in Table XXI being the most frequently cited by the respondents, the second one the second most frequently cited, and so on.

TABLE XIX

RESPONDENT'S FEELING OF INCREASED SAFETY WHEN HELICOPTER IS AVAILABLE - BY CITY DEPARTMENT - FREQUENCY AND PERCENT - N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
YES	28	75.7	196	61.6	36	76.6	10	83.3	270	65.2
NO	7	18.9	88	27.7	9	19.1	0	0	104	25.1
NO OPINION	2	5.4	31	9.7	2	4.3	2	16.7	37	8.9
UNKNOWN	0	0	3	.9	0	0	0	0	3	.7

TABLE XX

RESPONDENT'S ATTITUDE TOWARD FUTURE OF HELICOPTER PROGRAM - BY CITY DEPARTMENT - FREQUENCY AND PERCENT - N = 414

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
CONTINUED PRESENT LEVEL	5	13.5	58	18.2	4	8.5	0	0	67	16.5
CONTINUED INCREASED LEVEL	32	86.5	218	68.6	43	91.5	12	100	305	73.7
DISCONTINUED	0	0	23	7.2	0	0	0	0	23	5.6
CONTINUED LOWER LEVEL	0	0	10	3.1	0	0	0	0	10	2.4
UNKNOWN	0	0	9	2.8	0	0	0	0	9	2.2

TABLE XXI

CONTENT ANALYSIS OF SUGGESTIONS, REMARKS, AND OPINIONS OFFERED BY OFFICERS
BY CITY GOVERNMENT - FREQUENCY AND PERCENT - N = 243

	AURORA		DENVER		LAKEWOOD		WHEATRIDGE		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
INCREASED AIRCRAFT AVAILABILITY	13	34.2	86	35.1	21	41.1	2	25.0	122	35.3
BETTER INFORMATION/ COMMUNICATION	12	31.5	53	21.6	5	9.8	2	25.0	72	20.8
IMPROVEMENT IN OPERATIONS	8	21.0	40	16.3	9	17.5	4	50.0	61	17.6
NEED PRIORITIES FOR AIRCRAFT UTILIZA.	0	0	33	13.4	8	15.6	0	0	41	11.8
LIMITING USE OF AIRCRAFT TO SPECIFIC FUNCTIONS	1	2.6	26	10.6	8	0	0	0	27	7.6
CONFLICT IN ALLOCATION OF AIRCRAFT BETWEEN DENVER AND SUBURBS	3	7.8	3	1.2	5	9.8	0	0	11	3.1
GENERAL POSITIVE OR NEGATIVE STMTS.	1 0	2.6 0	4 3	1.6 1.2	3 0	5.8 0	0 0	0 0	8 3	2.3 .8

A good number of officers, in responding to this question, listed more than one remark or opinion, so that the 243 officers who answered this question created a total of 345 separate statements, or an "average" of 1.4 "answers" from each officer who did respond. Because of the diverse nature of the responses contained in Table XXI, each category will be presented and briefly discussed separately.

1. Increased aircraft availability: (N = 122/35.3% of responses)

There are three major kinds of comments captured by this category. The first are expressions by officers that the helicopter should spend more time in the air and/or should be available more readily and quickly. Some indicated a need for a regularization of flight schedules, duties or activities of the helicopter, so that ground-based units would know when the helicopter was airborne and when it was available for use. Seventy of the 122 responses in this category are of this type, or 57.4%.

The second most frequent kind of comment coded in this category is a statement that a helicopter should always be available: "at all times", "on a 24 hour basis", "around the clock", etc. 44 of the 122 responses or 36.1% were of this type. The final kind of comment included in this category is one that the helicopter should increase its "patrol" activity. This comment was given by only 8 (6.6%) of the respondents.

2. Better Information/Communication: (N = 72/20.8% of responses)

Remarks included in this category are those which state the need for a stronger, better informed, and consistent manner of linkage between the helicopter program and the ground-based patrol units. There are 6 specific kinds of comments or suggestions included in this category, which are as follows:

Twenty-two of the comments here (30.6%) indicate that patrol units should be notified when the helicopter is available, when it is not, when it is out of service, etc. This is felt by these officers to be necessary on a day-by-day, shift-by-shift, or even hour-by-hour basis.

An additional 11 officers (15.3% of the remarks in this category) cite a related need in mentioning the desirability of more and better communications between the helicopter and the patrol units, so that each may be better informed and aware of the others' activities, problems, needs, and duties.

At a more general level, but directed to the same issue, 35 respondents (48.4%of those in this category) remark that patrol officers need better instructions on how to use the helicopter, when to use it, what it is supposed to be used for, and the general goals and objectives of the helicopter program. Some include specific suggestions for training of the patrol officers, i.e., T.V. training series, members of the helicopter staff presenting briefings. Some suggest that members of the patrol units be given time to ride in the helicopter as observers to become familiar with helicopter procedures, while other suggest that the same activity

would help familiarize helicopter personnel with particular problems in their respective patrol districts.

The remaining suggestions in this category (4 or 5.6% of all remarks in this category) indicate the need for better radio and communications equipment, and the need for more mutual planning and cooperation between patrol units and the helicopter.

3. Improvements in operations: (N = 61/17.6% of responses)

This category includes all those remarks made by the officers which are directed toward specific details of the helicopter program which might be improved. The most frequent remark in this category is that the helicopter does not seem to be deployed in a manner which provides effective assistance to the ground unit. 19 officers (31.1%) make such a statement. It is a statement similar to those in #2 above, except it implies that the present number of helicopters is sufficient to provide adequate support for ground units, if used effectively. Many of the remarks are critical and/or cynical, i.e., "in nine year of police experience, I have never known a helicopter to be available when it is really needed" or "mostly the helicopter is for P.R., just flies around politicians and bigwigs".

Some of the statements are contradictory, and a bit puzzling. For example, one officer states that the "helicopter seems to be in District #1 all the time" while another states that "it (helicopter) is never in District #1". It is this writer's impression that the remarks indicating that the helicopter is improperly deployed and not available to patrolmen are a reflection of some uncertainty which must presently exist regarding the procedures for using the helicopter, and a lack of clarity regarding its intended use and its operating procedures to date. However, these officers expressed this idea "negatively", in being critical of the present helicopter program. If this impression is correct, the meaning of these statements is identical to all of those which have been discussed so far from Table XXI. In short, the patrolmen want to have a helicopter available to support them, when they need it. They also want, apparently very much, to have a better understanding of what the objectives and goals of the helicopter program are, what the aircraft is currently being used for, what it's intended use is, and a rather clear set of procedures and priorities made known regarding its use. In short, there is an apparent need for specific policies, procedures, and guidelines to be developed regarding the helicopter program, and a consistent and appropriate effort made to completely inform the ground-based patrol officers of just what these might be.

The remainder of the responses in this category are scattered and relate to the need for coordination between air and ground operations. For example, 9 (14.8%) of the remarks in this category indicate that the helicopter should respond more quickly to calls, while 2 (3.2%) indicate that the helicopter should not arrive at a call too far in advance of a patrol unit, for it can scare the suspects away. 7 officers (11.5%) clearly state that the helicopter should be "controlled" by ground-based

units at the scene. 6 suggest that the helicopter is too noisy, and might scare suspects away, and 9 indicate that the use of the "light" on the helicopter needs some modification, since in their experience the light has "scared off suspects", "blinded and illuminated the officers", etc. 7 respondents indicate that the helicopter program could be improved by hiring pilots and observers with experience in aerial reconnaissance, some specifying Viet Nam veterans.

It is the impression of this writer that the remarks calling for more coordination between the helicopter crew and the ground-based patrol units again reflect the lack of clear procedures governing the use of the helicopter in this instance while actively engaged in rendering support or cover to ground patrol units. There is an often strongly expressed wish by some officers to allow for close contact with the helicopter crew when they are mutually engaged in covering a call.

4. Need priorities for aircraft utilization: (N = 41/11.8% of responses)

This category of responses to the question asking for suggestions for improvement of the helicopter program, do exactly that. Officers made a number of specific suggestions regarding the deployment of the aircraft which the feel would make the program more effective in crime suppression/apprehension. Almost half (43.9%) of the remarks in this category suggest that the use of the aircraft be concentrated from about 6 p.m. to about 3 a.m., indicating that it is most useful at these times. The remaining respondents whose remarks fall into this category make the following suggestions: concentrate helicopter use in high crime areas (N = 5); use during shift changes (N = 2); use during peak day/times of crime (N = 5); use for daylight burglaries (N = 3); use for silent burglar alarms (N = 4); use for morning traffic (N = 1); and use at needed times (N = 3).

Since many of these suggestions have appeared earlier, in the Project SCAR program description for example, one cannot help but speculate again that the objectives of SCAR and the intended uses and deployment practices of the aircraft have not been explained to the officers. However, the reader is referred to Table XXI, and reminded that these particular kinds of responses were made only by officers from the Denver and Lakewood departments, and not by those from Wheatridge and Aurora, where perhaps the program has been more fully explained.

5. Limiting use of aircraft to specific functions: (N = 27/7.8% of responses)

This category of response is generally the most negative and critical regarding the use of the helicopter. Of the 27 responses coded in this category, 12 (44.4%) state that they do not believe the helicopter is, or can be, useful in the prevention or suppression of crime nor in the apprehension of suspects. This type of statement often includes the notion that the money spent in the helicopter program could be much better and more effectively expended in normal police functions, i.e., squad cars.

The majority of responses in this category (15 or 55.6%) also include the notion that the helicopter is not useful in suppression/apprehension, but do indicate that it might be very useful in other police functions, such as police chase, rush hour traffic, emergency transportation, etc.

The reader is again referred to Table XXI, and reminded that of the 27 critical statements coded in this category, 26 are made by officers from the Denver Police Department, 1 from Aurora, and none from either Wheatridge or Lakewood.

6. Conflict in allocation of aircraft between Denver and suburbs: (N = 11/3.1% of responses)

There are very few respondents who indicated specifically that there was/is a problem in the allocation of the aircraft among the four cities involved in Project SCAR. Three of these responses are from Denver officers, who indicate that the coverage being offered to the suburban areas stretches the aircraft resources too greatly, and limits its effectiveness in Denver. Two officers from Lakewood and 2 from Aurora stress the need for more cooperation and joint planning for the use of the helicopter among the four departments involved. Additionally, 3 officers from Wheatridge indicate a need for more community or public relations so that citizens may be informed of the potential benefit of the helicopter. Finally, one Aurora officer notes that all requests from officers in his city for use of the helicopter must go through, or be approved by the watch commander, which increases response time and perhaps reduces the effectiveness of the service of the helicopter to this city.

7. General positive or negative comments: (N = 11/3.1% of responses)

Comments coded into this category are those unspecific endorsements or criticisms of the helicopter, without reference to any particular aspect of the program or reason for the expressed sentiment. Eight of the 11 comments are positive, such as "it's a good program". One respondent indicated he felt certain that the helicopter had saved the life of at least one officer, which is strongly positive, to say the least.

The negative comments, only three in number, amounted to statements such as, "it won't work".

SUMMARY OF QUESTIONS RELATING TO USE AND OPINIONS OF HELICOPTER PROGRAM

This summary will be divided into two parts, the first dealing with the four questions attempting to measure the respondents' attitudes and opinions about the helicopter, and the second part summarizing the use and operations of the helicopter program itself.

OPINIONS AND ATTITUDES:

On each of the four questions requesting respondents' attitudes toward the

helicopter program, a very strong majority of respondents gave positive answers. Well over half of the respondents felt the helicopter was beneficial in both suppression and apprehension, about 60% felt an increased degree of safety from potential helicopter presence, over 80% felt that an increased number of helicopters would be useful to them in doing their work, and 90.2% wish to see the program continued at present level or increased. In each of these four questions, the respondents from the Denver Police Department are noticeably less positive than are their counterparts from the suburban departments.

OPERATIONS AND USE:

The use of the helicopter by respondents to this survey is fairly extensive, with an average of 1.4 requests for helicopter assistance or cover for each officer. Additionally, more than 3 out of 10 respondents had been called by the helicopter to assist in, or cover a call. For officers who had requested helicopter assistance or cover, the helicopter responded in almost 90% of the cases, with a median response time of 3 to 8 minutes.

This use of the helicopter is surprising, in light of the findings in two related questions. First, over half of the Denver department respondents have never had the helicopter program explained to them, and over half of the total sample reported that they are not notified in a regular manner when the helicopter is in service, when it is "down", where it is, where it is supposed to be, etc.

Approximately 10% of those officers who were called by the helicopter to cover or assist in a call experienced communication problems with the helicopter crew, with a disproportionate amount of this communication problem being recorded by Denver respondents.

Finally, the remarks and opinions of the officers in the final question again indicate strong support for the program, and significant interest in its expansion and development. However, and perhaps more importantly, they also reveal a considerable degree of confusion about the helicopter program's goals, objectives and possibilities, a definite lack of clarity regarding how they are involved with the helicopter program, and how they might make more certain, effective and frequent use of it. The answers to this question clearly imply a need for the officers, especially those in Denver, to be better informed, perhaps trained, regarding the policies and procedures relative to their most effective and efficient use of the helicopter program. They seem most anxious to "get with the program", but not certain just how that is to be done.

SIGNIFICANT INFLUENCES IN THE OPERATIONS, USE AND OPINIONS OF THE HELICOPTER:

In the first section of the analysis of the data from the questionnaire, the nature of the "sample" was described and disucssed. Variations and similarities in terms of police duties and rank of the respondents, age, and related characteristics were presented for each department. In the second section of the analysis of the data, the use, attitudes, and

operations of the helicopter program were presented and discussed. In the present section of data analysis, attention is given to determinning the relationship between these two separate sets of data. This analysis seeks to determine, for example, if one's watch assignment significantly influences his use of the helicopter, his opinion of the helicopter, and so on. Similarly, the extent to which age, rank, years of experience, district, and present duty assignment might influence one's perception of the operations of the helicopter, attitudes toward the program and actual use of the aircraft are examined.

This examination is conducted by applying the Chi-Square test of significance to the cross-tabulations for each set of questions. [1]. This test allows one to estimate the probability that any relationship which occurs between two sets of data, for example "watch" and "use of helicopter", or "age" and "attitude toward the future of the program", occur by chance, or that there is indeed a significant relationship between them.

As an example, let us assume that 50% of the sample is on night watch, and that 80% of these officers favor an increase in the number of helicopters available to patrol units, while the remaining 50% is on straight days, and 40% of these officers favor such an increase. The Chi-Square test is designed to tell us the extent to which the higher percentage of those favoring an increase from the night watch would occur by "chance", as compared to its occurring because of characteristics and features of the night watch itself.

The statistical analysis is divided into three sections, each with a table summarizing the statistical tests of significance among the data to be discussed in that section. The first section analyzes the relationships between selected characteristics of the sample (watch, assignment, district, age, and method used by supervisor to explain SCAR), and the operations and use of the helicopter. The second section analyzes the relationship between the characteristics of the sample and the attitudes and opinions which the respondents have of the helicopter program. The third and final section reports the relationship between the uses and operations of the helicopter as reported by these respondents, and their attitudes and opinions of it.

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1. The sampling percentages from the four different police departments are not equal. Because Denver is much larger than all of the other three departments combined, it was decided to sacrifice the proportional distribution in order to obtain larger numbers from the suburban departments.

TABLE XXII

SUMMARY OF CHI-SQUARE PROBABILITIES FOR RELATIONSHIPS BETWEEN VARIABLES DESCRIBING SAMPLE AND THOSE FOR USE AND OPERATIONS OF HELICOPTER - N = 414

	ASSIGNMENT, i.e. PATROL, TRAFFIC ETC.	DISTRICT	WATCH	AGE	SUPERVISOR'S EXPLANATION OF SCAR
NOW NOTIFIED WHEN AIRCRAFT IS AVAILABLE	N.S.	N.S.	N.S.	N.S.	.01
NO. TIMES HELICOPTER REQUESTED	N.S.	N.S.	.001	N.S.	N.S.
HELICOPTER RESPONDED?	N.S.	N.S.	N.S.	N.S.	N.S.
NO. TIMES HELICOPTER REQUESTED PATROLMEN COVER/ ASSIST	N.S.	.10	.02	N.S.	N.S.

NOTE: Two variables which describe the sample are omitted from Table XXII. Sex is omitted because of the very small number of female officers in the sample, while years of experience is omitted because it so closely paralled age that it would be redundant to include both.

SECTION I: RELATIONSHIP BETWEEN SELECTED CHARACTERISTICS OF THE SAMPLE AND THE USE AND OPERATIONS OF THE HELICOPTER

The probabilities that the relationship between a characteristic of the sample and a respondents's use of the helicopter are presented in Table XXII. What the figures in the Table represent are the calculation of the probability that the relationship between a characteristic of the sample (listed down the left side of the Table) and helicopter use are related or occur by chance. An "N. S." indicates that the relationship is not significant, in this case meaning that the relationship could have occurred two or more times out of ten merely by chance. A .01 indicates that a relationship as large as the one between any two variables could occur only one time in a 100 by chance; .001, one time in 1,000, and so on.

A. PRESENT DUTY ASSIGNMENT AND HELICOPTER USE

In reading Table XXII, one begins by noticing the first column of the Table, "Assignment", and then reads down that column to find the statistical probability that the assignment of an officer is significantly related to, or determinative of, each of the variables describing helicopter use and operations. The N.S. that appears in each row of this column indicates that there is no sifnificant relationship between the assignment of a respondent and any of the operations data reported by him in this questionnaire. We can, therefore, say with certainty that the manner in which one is notified that the helicopter is available is not determined by his present assignment and so on down the column. This is undoubtedly true because the vast majority of respondents are from the same duty assignment - patrol - and there are not enough cases available from the other assignments to effect the outcome. (Table II demonstrates that 94.9% of the respondents are assigned to patrol).

B. DISTRICT ASSIGNED AND HELICOPTER USE

In order to interpret Table XXII for the impact or influence of the district in which one is working on his use of the helicopter, one moves to the second column, "District", and again reads down the column. There is no significant difference among the six districts (numbers 1-4 in Denver, the suburban departments, and central headquarters) in (a) manner in which officers are notified the aircraft is available, (b) number of times (on a proportional basis) that the helicopter has been requested to cover a call, or (c) percentage of times that the helicopter has responded when called.

However, one can be confident (with one chance in ten of being wrong) [2] that the helicopter is more likely to call officers in some districts than

2. This probability is based on the Chi-Square. These data were processed at the University of Colorado Computing Center using the statistical package for the social sciences.

in others to cover a call for assistance. Rather than present the tables displaying the data on which the cross-tabulation program of the SPSS was run and the Chi-Square statistic computed, only the findings from the table will be presented here, and throughout this report. These tables are included as Appendix E of this report.

The data from which the statistics were computed suggest that the personnel at central headquarters "district" are more likely to have received a call from the helicopter crew than those in the other districts. Officers in District #1 (Denver) show the second highest percentage receiving a call, followed by officers in Denver Districts #2 and #4, and then by officers from the suburban departments. Finally, officers from Denver District #3 are least likely to report that they have been called by the helicopter for assistance or to cover a call.

In order for the reader to get a clear picture of this interpretation of the relationship, and just what is being referred to above as the "data from which the statistics are computed", the raw data from this particular table are presented in Figure 5.

FIGURE 5

CROSS-TABULATIONS FOR HELICOPTER'S REQUEST FOR PATROL UNIT ASSISTANCE AND DISTRICT ASSIGNED

		SUBURBAN DEPT.	DENVER DISTRICT # 1	DENVER DISTRICT # 2	DENVER DISTRICT # 3	DENVER DISTRICT # 4	H.Q.
		N %	N %	N %	N %	N %	N %
HELICOPTER REQUESTED OFFICER TO ASSIST OR COVER CALL	YES	33 34.7	45 45.9	26 38.8	20 27.4	21 38.2	15 57.5
	NO	62 65.3	52 53.1	41 61.2	52 71.2	34 61.8	11 42.3

The reader can see from inspection that when in the above discussion, it is indicated that an officer in H.Q. is most likely to be called by the helicopter for assistance, this does not mean that the helicopter called H.Q. more times than any other district. What it means is that the likelihood that a particular officer in this sample will, or will not have, received a call from the helicopter is significantly influenced by the district to which he is assigned. Figure 5 then demonstrates perhaps more clearly the meaning of the relationship established by the Chi-Square analysis - a significantly higher percentage of officers assigned to H.Q. and District #1 in Denver have been called by the helicopter than for the remaining Denver Districts or for the suburban departments.

C. WATCH ASSIGNMENT AND HELICOPTER USE

Following down the column headed "watch" in Table XXII, it is seen that the watch assignment of the officers responding to this questionnaire significantly influences three of the four aspects of the operation of the helicopter program under consideration. This influence is specified, for each of the operations, below.

1. "Watch Assignment and How Respondents Are Notified When The Helicopter Is Available"

Respondents who work the evening watch are significantly less likely to respond that they are not notified when the helicopter is available than those working any other watch. Those working the morning watch are most likely to indicate that they are not notified when the helicopter is available, with the respondents from the other two shifts - days and afternoons - ranging between. However, for all shifts, if one is notified that the helicopter is available, the predominate mode is by radio.

2. "Watch Assignment and Number of Times Helicopter Has Been Requested"

Respondents working the evening watch report a significantly higher rate of request for helicopter assistance than do those for any other watch assignment. 65% of the officers on the evening watch have called for helicopter assistance one or more times, compared to 34.5% of the officers on the morning watch - with the lowest rate of request for helicopter assistance. Straight day watch respondents and those from the afternoon watch report rates of use falling between these extremes (57% and 45.3% respectively). The 115 respondents from the night watch report a total of 273 calls for helicopter assistance, a use rate of 2.4 times per officer, almost double the use rate for the sample as a whole.

3. "Watch Assignment and Helicopter's Requests To Patrol Units for Assistance or to Cover a Call"

The officers from the evening watch are the most likely to have been contacted by the helicopter for assistance, followed closely by those working afternoons, and then by those working straight days. 46% of the officers of evening watch assignments have been contacted by the helicopter to cover a call or provide ground assistance, compared to only 24% of those officers working the morning watch.

4. "Age of Respondents and Use of Helicopter"

Inspection of the "age" column in Table XXII confirms that the use of the helicopter, how one is informed of its availability, its reponse, and its requests to ground units are not influenced by the age of the respondent. This provides a sound reliability check on the manner in which these questionnaires were completed by the respondents, for indeed, one can think of no important reason why age would be related to these aspects

of the helicopter program. The non-significance of age as a predictor in this case encourages the acceptance of the responses made by the respondents as reliable.

E. SUPERVISOR'S METHOD OF EXPLAINING THE HELICOPTER PROGRAM (SCAR) AND HELICOPTER

Inspection of the last column in Table XXII indicates that the manner in which the supervisor explains the SCAR Program does not significantly effect the on-going operation of the program except for its high relationship to the manner in which one is notified that the helicopter is available. Although this might appear to be surprising at first glance, it is in the long run consistent with related studies regarding the adoption and use of new programs, products and ideas. These studies indicate that the manner of presentation of a product - for instance a TV commercial - does not sell it, but rather exposes the product to potential consumers, who then seek to validate or reject the product by "checking it out" with persons whose opinions they respect (Lazensfeld, Personal Influence). This finding in the present study suggests that informal patterns of interaction and influence among police personnel are at work in determining the use of the helicopter, and further suggests that clear directives and procedures governing the use of the helicopter would be available in keeping within limits, officers informal and often inadvertant dissemination of incorrect information among themselves.

However, the relationship found between the absence of explanation of the helicopter program and a report that one is not notified when the helicopter is available is great. For 68.2% of the respondents who have not had the program explained also report they are not notified when the aircraft is available.

SECTION II: CHARACTERISTICS OF THE SAMPLE AND ATTITUDES TOWARD THE HELICOPTER PROGRAM

Table XXIII summarizes the statistical tests of the significance of the impact or influences of the variables which are characteristic of the sample, on attitudes which respondents express toward the helicopter program and its future.

A. DISTRICT AND ATTITUDES TOWARD HELICOPTER PROGRAM

As can be seen in Table XXIII the district to which an officer is assigned does not significantly effect the extent to which he feels safer from the potential presence of the helicopter. However, one can be confident (with one chance in 1,000 of error) that the attitudes of officers from different districts, toward the desirability of more helicopters and the continuation of the program, are in fact different. Contrary to what one might expect, this analysis reveals that officers from Denver District #1 are the least likely of those from all the districts to feel the program should be continued at an increased level (66.6%) and the most likely to indicate that the program should be discontinued (13%). By contrast, 91.6% of the

officers from the three suburban departments favor the continuation of the project at an increased level, 11.9% at its present level, and no respondent from any of the three suburban departments indicates that the program should be discontinued or decreased in its level of operation.

The pattern of responses from the remaining districts are worth noting. 76% of the respondents from Denver District #1 and 75% of those from District #3 wish to see the program continue at an increased level, 65.5% of those at Central Headquarters, and 66% of those in Denver District #4 indicate that the program should be increased. Although the majority of respondents (over 60%) in each district do indicate a desire to see the program continue at an increased level, the striking differences between the suburban departments and the Denver personnel are cause for concern. Denver Districts #1 and #4 are, in total, the least positive toward the continuation of the program at any level, followed very closely by personnel at Central Headquarters. Denver Districts #2 and #3 are significantly more positive about the continuation of the program, but significantly less so than those from the three suburban police departments.

This same pattern is reflected in the relationship between a respondent's district and his attitude toward the usefulness of additional helicopters, except the differences are more extreme among the different districts. For example, 94% of the respondents from the suburban departments favor additional helicopters, while only 59.4% of the officers from Denver District #1 feel that additional helicopters would be helpful to them in their work. Respondents from Denver District #4 and Central Headquarters are very similar in attitudes toward increased helicopters as those in District #1, while those in District #2 and #3 are significantly more positive than those, but significantly less positive than those from the suburban departments.

B. WATCH ASSIGNMENT AND ATTITUDES TOWARD HELICOPTER PROGRAM

Inspection of Table XXIII indicates that attitudes toward the helicopter program do vary significantly with the watch assignment of the respondents. For economy in presentation, the three attitude measures will be discussed concurrently here, for the relationships between watch assignments and each of the three attitudinal measures - desirability of increase in helicopters, feelings of increased safety, and increasing the level of operation of the program in the future - follow the same pattern. The reader is referred to the Appendix C for the Tables describing this relationship, and from which the statistics were computed.

Respondents working the evening and day watches are more likely to report positive attitudes regarding increased helicopters, increase in program operations, and increased feelings of safety from helicopter availability than those from the morning and afternoon watches. In rank order, the evening watch is most positive toward the helicopter program, the straight day watch next, followed by morning and afternoon watches. The one exception, which is difficult to explain, is that the respondents working the straight day watch are slightly more inclined to indicate an increased feeling of safety from potential availability of the helicopter (75%) than are those

from the evening watch (71.9%) - contrasted to 65.7% of the total sample.

C. AGE OF RESPONDENTS AND ATTITUDES TOWARD THE HELICOPTER PROGRAM

Again, inspection of Table XXIII indicates that the "age" of the respondent is significantly related to each of the measures of attitude toward the helicopter program. And, again, this is a consistent relationship among the three attitudinal measures, and assumes the following pattern. The youngest officers are the most favorable toward the helicopter program, strongly favoring an increase in operations, increased helicopters, and feeling safer when the helicopter is available. This positive attitude decreases with increasing age, rather gradually, until the age categories of 36-45 are reached, at which time the attitudes become most negative, with, for example, less than half the officers in this age group indicating that more helicopters would be helpful to them in their work, compared to 81.3% of those in the 21-25 year group. However, after the age group of 36-45, respondents become increasingly favorable towards each of the three uses and possibilities of the helicopter. The following presentation of the data for the various age groups in regard to the usefulness of more helicopters is illustrative of the relationship between age and the two remaining measures as well.

AGE	PERCENT AGREE MORE HELICOPTERS HELPFUL
21-25	81.3%
26-30	76.3%
31-35	72.1%
36-40	46.7%
41-45	40.0%
46-50	66.7%
51-55	60.0%
56-over	66.7%

SECTION III: THE ANALYSIS OF THE RELATIONSHIP AMONG SELECTED MEASURES OF OPERATIONS, USE AND ATTITUDES

There is one significant relationship in this analysis which merits discussion, for it indicates some important aspects of program operation. This is the very significant relationship discovered between the manner in which the respondents are notified that the helicopter is available, and the frequency with which officers call on it for assistance, and the likelihood that the helicopter will respond if called. The key values from this table are presented in Figure 6.

Figure 6 confirms that for those officers who request the helicopter but are not routinely notified of its availability the helicopter fails to respond to a significantly greater extent than for those officers who are notified of its availability. Indeed, officers not informed whether it is available report that the the helicopter failed to respond 22.3% of the times it was requested, compared to 16.7% for those officers notified at

TABLE XXIII

SUMMARY OF CHI-SQUARE PROBABILITIES FOR RELATIONSHIPS BETWEEN VARIABLES DESCRIBING THE SAMPLE AND THOSE FOR RESPONDENT'S ATTITUDES TOWARD PROJECT SCAR - N = 414

	DISTRICT	WATCH	AGE
MORE HELICOPTERS HELPFUL IN DOING WORK	.001	.20	.01
		.01	.10
		.10	.001
FEEL SAFER WITH HELICOPTER AVAILABLE?	.20		
SHOULD PROGRAM BE CONTINUED?	.001		

NOTE: The reader is reminded that in this table, as in Table XXII, N.S. means no significant relationship; .01 means that one can be confident that the relationship could occur only one time in 100 by chance; .001 means one time in 1,000.

rollcall of the helicopter's availability. These rates of failure are significantly greater than for those officers in the sample who are notified by radio when the helicopter is or is not available, in which case the helicopter failed to respond only 3.8% of the times it was requested. One can confidently interpret these differences as strongly suggesting that the use of the helicopter would be both greater and more efficient if officers are notified when the helicopter is available, perhaps by the dispatcher.

FIGURE 6.

FREQUENCY OF HELICOPTER RESPONSE BY METHOD OF NOTIFICATION OF HELICOPTER AVAILABILITY - FREQUENCY AND PERCENT - N = 222

METHOD OF NOTIFICATION	IF CALLED, HELICOPTER RESPONDED		HELICOPTER DID NOT RESPOND	
	NO.	%	NO.	%
ROLLCALL	5	83.3	1	16.7
RADIO	77	96.3	3	3.8
NOT NOTIFIED	94	77.7	27	22.3
OTHER	12	80.0	3	20.0

APPENDIX A

RAW DATA SUBMITTED BY HELICOPTER CREW FOR COSTS, MAINTENANCE AND SERVICE

Section II / Operational Data	10 DP	20 DP	TOTAL
NUMBER OF APPREHENSIONS OR ASSISTS WITH HELICOPTER	1	5	6
NUMBER OF HOURS FLOWN OVER TARGET AREA	25.2	38.4	63.6
NUMBER OF HOURS DOWN TIME PER ~~WEEK~~	21.0	112.0	133.0

(NOTE: ATTACH FLIGHT SCHEDULE, I.E. HOURS FLOWN BY TIME OF DAY, DAY OF WEEK.) MON THRU SAT 6PM - 2AM

OBJECTIVE II - *TO PROVIDE AERIAL OBSERVATION AND SUPPORT FOR A BEACON ALARM LIGHT SYSTEM IN THE CITIES OF AURORA, LAKEWOOD, AND WHEATRIDGE.*

DENVER

1. NUMBER OF PERMANENT LIGHTS INSTALLED	0		
2. NUMBER OF PORTABLE LIGHTS INSTALLED	2		
3. NUMBER OF ROBBERIES ON PREMISES w/ LIGHTS	0		
4. NUMBER OF BURGLARIES ON PREMISES w/ LIGHTS	0		
5. NUMBER OF HELICOPTER RESPONSES *to Light ALARM*	0		
6. NUMBER OF APPREHENSIONS BY HELICOPTER IN RESPONSE TO LIGHT ALARMS	0		
7. LIGHT ALARM/NO HELICOPTER RESPONSE	0		
8. NO. OF HOURS OBSERVER Flew WITH HELICOPTER	7.5	25.9	33.4
9. NO. OF OTHER CALLS COVERED BY HELICOPTER	20	58	78
10. NO. OF REQUESTS FOR HELICOPTER SERVICE	17	58	75
11. NUMBER OF FALSE ALARMS	6	12	18

ADEPTRIDGE

1. NUMBER OF PERMANENT LIGHTS INSTALLED 0
2. NUMBER OF PORTABLE LIGHTS INSTALLED 0
3. NUMBER OF ROBBERIES ON PREMISES W/LIGHTS 0
4. NUMBER OF BURGLARIES ON PREMISES W/LIGHTS 0
5. NUMBER OF HELICOPTER RESPONSES 0
6. NUMBER OF APPREHENSIONS BY HELICOPTER IN RESPONSE TO LIGHT ALARMS 0
7. LIGHT ALARM/NO HELICOPTER RESPONSE 0
8. NUMBER OF HOURS OBSERVER FLEW WITH HELICOPTER 0
9. NUMBER OF OTHER CALLS COVERED BY HELICOPTER 0
10. NUMBER OF REQUESTS FOR HELICOPTER SERVICE 0
11. NUMBER OF FALSE ALARMS 0

AURORA

1. NUMBER OF PERMANENT LIGHTS INSTALLED 0
2. NUMBER OF PORTABLE LIGHTS INSTALLED 0
3. NUMBER OF ROBBERIES ON PREMISES W/LIGHTS 0
4. NUMBER OF BURGLARIES ON PREMISES W/LIGHTS 0
5. NUMBER OF HELICOPTER RESPONSES 0
6. NUMBER OF APPREHENSIONS BY HELICOPTER IN RESPONSE TO LIGHT ALARMS 0
7. LIGHT ALARM/NO HELICOPTER RESPONSE 0
8. NUMBER OF HOURS OBSERVER FLEW WITH HELICOPTER 22.2
9. NUMBER OF OTHER CALLS COVERED BY HELICOPTER 25
10. NUMBER OF REQUESTS FOR HELICOPTER SERVICE 12
11. NUMBER OF FALSE ALARMS 1

LAKEWOOD

1. NUMBER OF PERMANENT LIGHTS INSTALLED 1
2. NUMBER OF PORTABLE LIGHTS INSTALLED 0
3. NUMBER OF ROBBERIES ON PREMISES W/LIGHTS 0
4. NUMBER OF BURGLARIES ON PREMISES W/LIGHTS 0
5. NUMBER OF HELICOPTER RESPONSES 0
6. NUMBER OF APPREHENSIONS BY HELICOPTER IN RESPONSE TO LIGHT ALARMS 0
7. LIGHT ALARM/NO HELICOPTER RESPONSE 0
8. NUMBER OF HR. OBSERVER FLEW WITH HELICOPTER 30.1
9. NUMBER OF OTHER CALLS COVERED BY HELICOPTER 31
10. NUMBER OF REQUESTS FOR HELICOPTER SERVICE 28
11. NUMBER OF FALSE ALARMS 5

OBJECTIVE III - *DETERMINE WHICH METHODS OF DELIVERING HELICOPTER SERVICE PRODUCE THE BEST COST-EFFECTIVE RESULTS*
monthly

1. NUMBER OF HOURS REQUIRED FOR MAINTENANCE

	10DP	20DP	TOTAL
a. scheduled	12.	84	96
b. unscheduled	20	4	24

2. NUMBER OF HOURS MACHINE IN SERVICE PER MO. 200
3. NUMBER OF HOURS FLOWN PER MONTH

10DP	20DP	TOTAL
39.6	55.1	94.1

4. MAJOR REPAIRS AND OVERHALLS. ITEMIZE:
   20DP - 600 hr MAJOR ENGINE change

5. MAINTENANCE COSTS:

	10DP	20DP	TOTAL
a. fuel	217.36	371.00	588.36
b. oil			152.15
c. repairs:	10DP	20DP	TOTAL
1. scheduled	67.41	11,267.97	11325.41
2. unscheduled	112.40	0	112.40

6. NUMBER OF EQUIPMENT DEFICIENCIES REPORTED BY FLIGHT CREW (include all equipment, radios, etc.) 3

7. a. PERCENT OF TIME FLOWN IN SUPPORT OF SCAT 62%. 58.7 hr
   b. PERCENT OF TIME FLOWN IN SUPPORT OF SUBURBAN COMMUNITY 30%. 28.3 hr.
   c. PERCENT OF TIME OTHER ASSIGNMENT OR CALLS 1% 7.1 hr.

TOTAL FLIGHT HRS 94.1

OBJECTIVE IV - *TO TRAIN FLIGHT AERIAL OBSERVERS*

NUMBER OF OFFICERS WHO MET FLIGHT OBSERVER STANDARDS:

a. weight
b. experience

NUMBER OF OFFICERS TRAINED 17

a. 8 hr. ground 17
b. 8 hr. flight training days 17
c. 8 hr. flight training nights 17

AVERAGE SCORE ON FINAL TEST

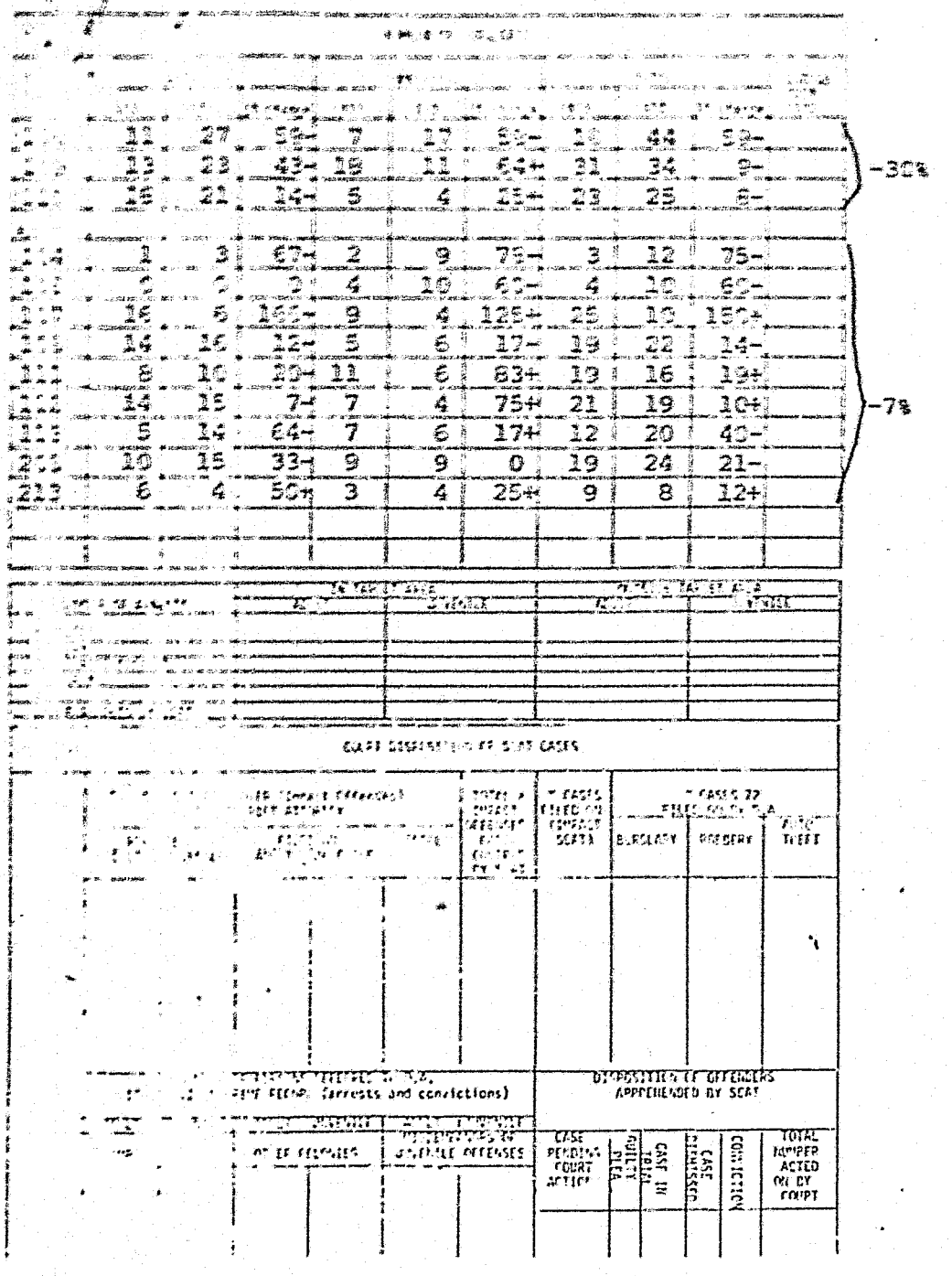
ATTACH FITNESS NARRATIVE FOR EACH OBSERVER IN PROGRAM

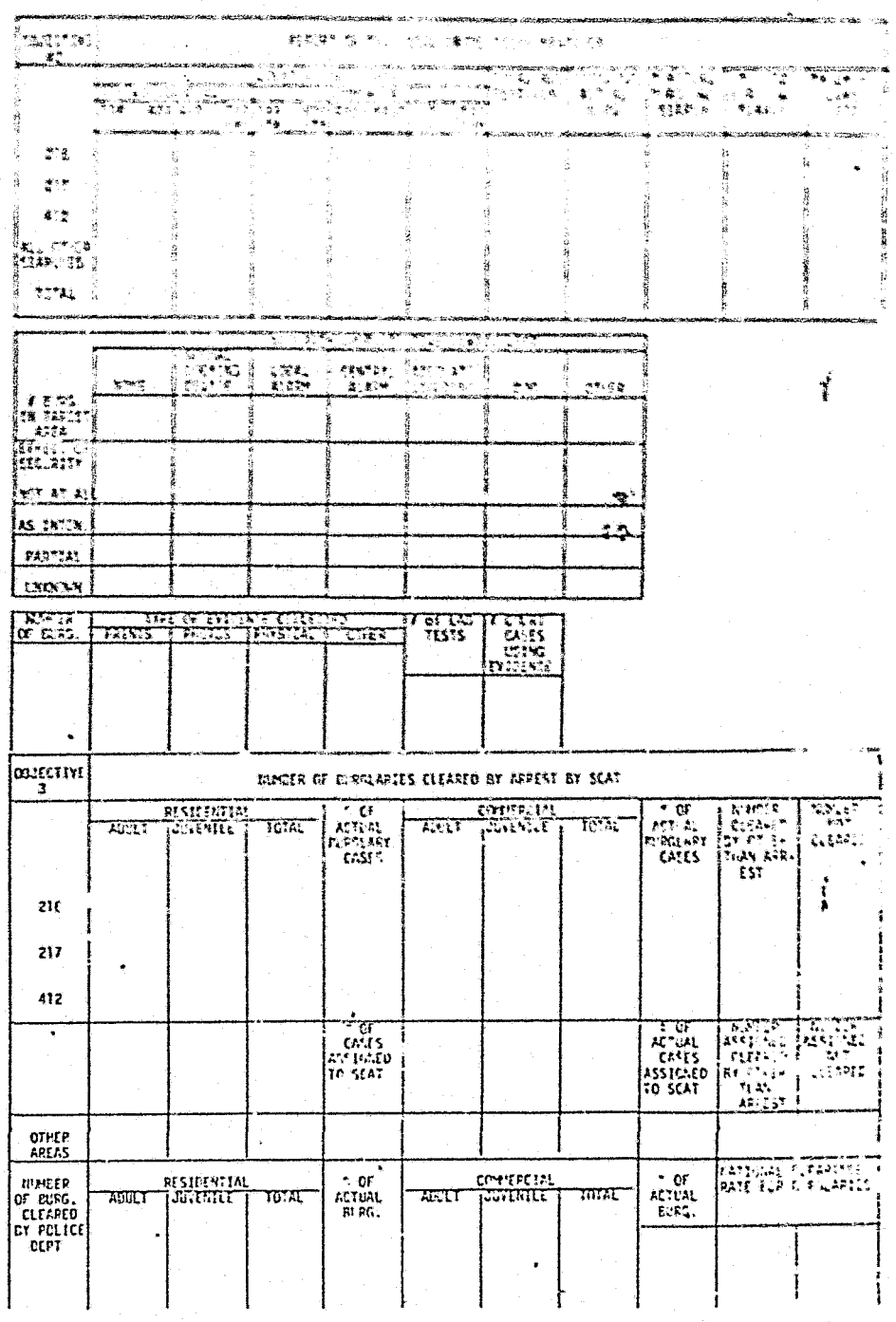
TOTAL OBSERVER HOURS FLOWN

	10DP	20DP	TOTAL
WHEATRIDGE	0		
LAKEWOOD	15.9	14.2	30.1
AURORA	8.8	11.4 (20DP)	20.2
DENVER	7.5 (10DP)	25.9 (20DP)	33.4 (TOTAL)

DENVER ANTI-CRIME COUNCIL - MONTHLY EVALUATION REPORT - FORM E

PROJECT #_____ TITLE_____ NO. OF RPT'T_____ DATE SUBMITTED_____





WHEATRIDGE

1. NUMBER OF PERMANENT LIGHTS INSTALLED 0
2. NUMBER OF PORTABLE LIGHTS INSTALLED 0
3. NUMBER OF ROBBERIES ON PREMISES W/LIGHTS 0
4. NUMBER OF BURGLARIES ON PREMISES W/LIGHTS 0
5. NUMBER OF HELICOPTER RESPONSES 10DP 0 20DP 2 TOTAL 2
6. NUMBER OF APPREHENSIONS BY HELICOPTER IN RESPONSE TO LIGHT ALARMS 0
7. LIGHT ALARM/NO HELICOPTER RESPONSE 0
8. NUMBER OF HOURS OBSERVER FLEW WITH HELICOPTER 10DP 0 20DP 2.1 TOTAL 2.1
9. NUMBER OF OTHER CALLS COVERED BY HELICOPTER 1
10. NUMBER OF REQUESTS FOR HELICOPTER SERVICE 2
11. NUMBER OF FALSE ALARMS 0

AURORA

1. NUMBER OF PERMANENT LIGHTS INSTALLED 0
2. NUMBER OF PORTABLE LIGHTS INSTALLED 0
3. NUMBER OF ROBBERIES ON PREMISES W/LIGHTS 0
4. NUMBER OF BURGLARIES ON PREMISES W/LIGHTS 0
5. NUMBER OF HELICOPTER RESPONSES 10DP 5 20DP 20 TOTAL 25
6. NUMBER OF APPREHENSIONS BY HELICOPTER IN RESPONSE TO LIGHT ALARMS 0
7. LIGHT ALARM/NO HELICOPTER RESPONSE 0
8. NUMBER OF HR. OBSERVER FLEW WITH HELICOPTER 18.3
9. NUMBER OF OTHER CALLS COVERED BY HELICOPTER 12
10. NUMBER OF REQUESTS FOR HELICOPTER SERVICE 44
11. NUMBER OF FALSE ALARMS 7

LAKEWOOD

1. NUMBER OF PERMANENT LIGHTS INSTALLED 1
2. NUMBER OF PORTABLE LIGHTS INSTALLED 0
3. NUMBER OF ROBBERIES ON PREMISES W/LIGHTS 0
4. NUMBER OF BURGLARIES ON PREMISES W/LIGHTS 0
5. NUMBER OF HELICOPTER RESPONSES 10DP 15 20DP 41 56
6. NUMBER OF APPREHENSIONS BY HELICOPTER IN RESPONSE TO LIGHT ALARMS 0
7. LIGHT ALARM/NO HELICOPTER RESPONSE 0
8. NUMBER OF HOURS OBSERVER FLEW WITH HELICOPTER 29.0
9. NUMBER OF OTHER CALLS COVERED BY HELICOPTER 8
10. NUMBER OF REQUESTS FOR HELICOPTER SERVICE 17
11. NUMBER OF FALSE ALARMS 1

OBJECTIVE III - DETERMINE WHICH METHODS OF DELIVERING HELICOPTER SERVICE PROVIDE THE BEST COST-EFFECTIVE RESULTS

1. NUMBER OF HOURS REQUIRED FOR MAINTENANCE:

	100 HR	200 HR
a. scheduled	16	24
b. unscheduled	1	27

2. NUMBER OF HOURS MACHINE IN SERVICE PER MO. 240

3. NUMBER OF HOURS FLOWN PER MONTH

100 HR	200 HR	TOTAL
59.5	112.8	172.3

4. MAJOR REPAIRS AND OVERHAULS. ITEMIZE:

200 HR Engine part failure & cyl blow head on #5 cyl

5. MAINTENANCE COSTS:

	100 HR	200 HR	TOTAL
a. fuel	$239.95	$672.00	$911.95
b. oil			151.90
c. repairs:			
1. scheduled	102.77	147.28	250.05
2. unscheduled	94.68	1643.74	1738.42

6. NUMBER OF EQUIPMENT DEFICIENCIES REPORTED BY FLIGHT CREW (include all equipment, radios, etc.)

7. a. PERCENT OF TIME FLOWN IN SUPPORT OF SCAT 52%

b. PERCENT OF TIME FLOWN IN SUPPORT OF SUBURBAN COMMUNITY 29%

c. PERCENT OF TIME OTHER ASSIGNMENT OR CALLS 15%

OBJECTIVE IV - TO TRAIN FLIGHT AERIAL OBSERVERS

NUMBER OF OFFICERS WHO MET FLIGHT OBSERVER STANDARDS:

a. weight _____

b. experience _____

NUMBER OF OFFICERS TRAINED 17

a. 8 hr. ground 17

b. 8 hr. flight training days 17

c. 8 hr. flight training nights 17

AVERAGE SCORE ON FINAL TEST _____

ATTACH FITNESS NARRATIVE FOR EACH OBSERVER IN PROGRAM

TOTAL OBSERVER HOURS FLOWN

WHEATRIDGE	2.1
LAKEWOOD	15.3
AURORA	29.0
DENVER	91.3

SELECTED INFORMATION RELATED TO COST-EFFECTIVE ACTIVITIES OF HELICOPTER
OCTOBER - NOVEMBER, 1973

TOTAL HOURS FLOWN	266
TOTAL MAINTENANCE COSTS	$15,230
TOTAL ARRESTS/ASSISTS	31
TOTAL CALLS FOR ASSISTANCE	297
TOTAL NUMBER OF CALLS COVERED	317
TOTAL HOURS MAINTENANCE	208

1. Costs $57.26 in maintenance costs for each hour of flight time
2. Costs $491.29 in maintenance costs for each arrest or assist
3. Helicopter averages 1 arrest or assist for every 8.6 hours of flight time
4. On the average, the helicopter receives 1.1 calls for assistance or cover for each hour of flight time
5. On the average, the helicopter covers 1.2 calls for each hour of flight time
6. Between the two helicopters, one hour of maintenance is required for every 1.3 hours in the air
7. The helicopter averages one false alarm for each 4.75 hours of flight time

INFORMATION ON TRAINING OF AERIAL OBSERVERS
OCTOBER AND NOVEMBER, 1973

	OCTOBER	NOVEMBER	TOTAL
# OFFICERS WHO MET FLIGHT OBSERVER STANDARDS	17	17	34
# OFFICERS RECEIVING:			
8 HRS. GROUND TRAINING	17	17	34
8 HRS. DAY FLIGHT TRNG.	17	17	34
8 HRS. NIGHT TRAINING	17	17	34
AVERAGE SCORE ON FINAL TEST	INFORMATION NOT AVAILABLE		
OBSERVER HOURS FLOWN:			
WHEATRIDGE	2.1	-0-	2.1
LAKEWOOD	18.3	30.1	48.4
AURORA	29.0	20.2	49.2
DENVER	91.3	33.4	124.7
TOTAL:	140.7 hrs.	83.7 hrs.	224.4 hrs.

APPENDIX B

CRIME DATA

OCTOBER - NOVEMBER

TARGET AND ADJACENT PRECINCTS

CRIME DATA - OCTOBER AND NOVEMBER
TARGET AND ADJACENT PRECINCTS
1973 vs 1972
BURGLARIES ONLY

	RESIDENTIAL 1973	RESIDENTIAL 1972	%CHANGE	COMMERCIAL 1973	COMMERCIAL 1972	%CHANGE	TOTAL 1973	TOTAL 1972	%CHANGE
* TARGET PRECINCTS	94	131	- 28.2	49	63	- 22.2	143	194	- 26.3
**ADJACENT PRECINCTS	152	162	- 6.2	96	139	- 30.9	248	301	- 17.6
TOTAL	246	293	- 16.0	145	202	- 28.2	391	495	- 21.0
OCTOBER ONLY									
TARGET PRECINCTS	42	71	- 40.9	30	32	- 6.6	72	103	- 30.1
ADJACENT PRECINCTS	74	83	- 10.8	57	58	- 1.7	131	141	- 7.1
NOVEMBER ONLY									
TARGET PRECINCTS	52	60	- 13.3	19	31	- 38.7	71	91	- 22.0
ADJACENT PRECINCTS	78	79	- 1.3	39	81	- 51.9	117	160	- 26.9

* Precincts 106, 109, 110
** Precincts 104, 105, 107, 108, 111, 112, 113, 208, 213

OCTOBER = Decrease Residential
NOVEMBER= Decrease Commercial

DENVER ANTI-CRIME COUNCIL - IMPACT EVALUATION REPORT - FORM 3 — NOVEMBER MONTHLY 1973

PROJECT #__________ TITLE______________ MO. OF REP'T________ DATE SUBMITTED________

OBJECTIVE #1 — NUMBER OF BURGLARIES

TARGET PRECINCT	RESIDENCE 1973	RESIDENCE 1972	% change	COMMERCIAL 1973	COMMERCIAL 1972	% change	TOTAL 1973	TOTAL 1972	% change	CHANGE OVER 1972
106	19	31	39-	7	11	36-	26	42	38-	22%-
109	17	14	21+	8	15	47-	25	29	14-	
110	16	15	7+	4	5	20-	20	20	0	
ADJACENT										
104	0	3	100-	4	10	60-	4	13	69-	27%-
105	0	0	0	5	6	17-	5	6	17-	
107	14	13	8+	4	6	33-	18	19	5-	
108	9	18	50-	2	10	80	11	28	61-	
111	13	8	62+	3	10	70-	16	18	11-	
112	10	6	67+	4	7	43-	14	13	8+	
113	14	15	7-	9	13	31-	23	28	18-	
208	11	10	10+	4	11	64-	15	21	29-	
213	7	6	17+	4	8	50-	11	14	21-	

NUMBER OF ARRESTS	IN TARGET AREA ADULT	IN TARGET AREA JUVENILE	OUTSIDE TARGET AREA ADULT	OUTSIDE TARGET AREA JUVENILE
HOMICIDE				
[illegible]				
[illegible]				
[illegible]				
[illegible]				
[illegible]				

OBJECTIVE #2 — REPORT OF TECHNICAL CRIME SCENE SEARCHES

	LOCATION OF SEARCH – RESIDENTIAL: hse	apt	oth	tot res	COMMERCIAL: gas sta	gro str	bar	rest	oth	tot com	TOTAL ALL SEARCHES	TOTAL NO. ACTUAL BURG.	% ACTUAL BURG. W/ SEARCH	% 1972 BURG. W/ SEARCH	% + or - over 1972
216															
217															
412															
ALL OTHER SEARCHES															
TOTAL															

SECURITY OR PROTECTIVE DEVICE USED

	NONE	NORMAL LOCKING DEVICE	LOCAL ALARM	CENTRAL ALARM	ADEQUATE LIGHTING	DOG	OTHER
# BURG. IN TARGET AREA							
EFFEC. OF SECURITY NOT AT ALL							
AS INTEN.							
PARTIAL							
UNKNOWN							

NUMBER OF BURG.	TYPE OF EVIDENCE COLLECTED: PRINTS	PHOTOS	PHYSICAL	OTHER	# OF LAB TESTS	# COURT CASES USING EVIDENCE

OBJECTIVE #3 — COURT DISPOSITION OF SCAT CASES

	CASES TURNED OVER (Impact Offenses) TO DISTRICT ATTORNEY: REFUSED ADULT	REFUSED JUVENILE	FILED ON ADULT	FILED ON JUVENILE	TOTAL	TOTAL # IMPACT OFFENSES CASE CLEARED BY SCAT	# CASES FILED ON (IMPACT SCAT)	# CASES 72 FILED ON BY D.A.: BURGLARY	ROBBERY	AUTO THEFT

NUMBER OF PERSONS REFERRED TO D.A. WITH PRIOR CRIME RECORD (arrests and convictions): IMPACT	OTHER FELONIES	% OF OFFENSES	DISPOSITION OF OFFENDERS APPREHENDED BY SCAT: CASE PENDING COURT ACTION	GUILTY	CASE IN TRIAL	CASE DISMISSED	CONVICTION	TOTAL NUMBER ACTED ON BY COURT

OBJECTIVE 3 — NUMBER OF BURGLARIES CLEARED BY ARREST BY SCAT

	RESIDENTIAL ADULT	RESIDENTIAL JUVENILE	RESIDENTIAL TOTAL	% OF ACTUAL BURGLARY CASES	COMMERCIAL ADULT	COMMERCIAL JUVENILE	COMMERCIAL TOTAL	% OF ACTUAL BURGLARY CASES	NUMBER CLEARED BY OTHER THAN ARREST	NUMBER NOT CLEARED
216										
217										
412										
				% OF CASES ASSIGNED TO SCAT				% OF ACTUAL CASES ASSIGNED TO SCAT	NUMBER ASSIGNED CLEARED BY OTHER THAN ARREST	NUMBER ASSIGNED NOT CLEARED
OTHER AREAS										

NUMBER OF BURGS. CLEARED BY POLICE DEPT	RESIDENTIAL ADULT	RESIDENTIAL JUVENILE	RESIDENTIAL TOTAL	% OF ACTUAL BURG.	COMMERCIAL ADULT	COMMERCIAL JUVENILE	COMMERCIAL TOTAL	% OF ACTUAL BURG.	NATIONAL CLEARANCE RATE FOR BURGLARIES

DENVER POLICE DEPARTMENT MONTHLY EVALUATION REPORT
PROJECT SCAR

MONTH NOVEMBER

DATE _____

OBJECTIVE I - *REDUCE THE INCIDENCE OF BURGLARY BY 25% and SUPPRESSIBLE ROBBERY (FIXED LOCATION) BY 15% IN PRECINCTS 216 and 412 WHILE TEAMED WITH S.C.A.T.*

Section I/Crime Data

BURGLARY

TARGET PRECINCT	RESIDENTIAL 1973	RESIDENTIAL 1972	RESIDENTIAL % change	COMMERCIAL 1973	COMMERCIAL 1972	COMMERCIAL % change	TOTAL 1973	TOTAL 1972	TOTAL % change
ADJ. PRECINCTS									

ROBBERY

TARGET PRECINCT	AGGRAVATED 1973	AGGRAVATED 1972	AGGRAVATED % change	SIMPLE 1973	SIMPLE 1972	SIMPLE % change	TOTAL 1973	TOTAL 1972	TOTAL % change
ADJ. PRECINCTS									

DENVER POLICE DEPARTMENT MONTHLY EVALUATION REPORT
PROJECT SCAR

MONTH OCTOBER

DATE _____

OBJECTIVE I - *REDUCE THE INCIDENCE OF BURGLARY BY 25% and SUPPRESSIBLE ROBBERY (FIXED LOCATION) BY 15% IN PRECINCTS 216 and 412 WHILE TEAMED WITH S.C.A.T.*

Section I/Crime Data

BURGLARY

TARGET PRECINCT	RESIDENTIAL 1973	RESIDENTIAL 1972	RESIDENTIAL % change	COMMERCIAL 1973	COMMERCIAL 1972	COMMERCIAL % change	TOTAL 1973	TOTAL 1972	TOTAL % change
ADJ. PRECINCTS									

ROBBERY

TARGET PRECINCT	AGGRAVATED 1973	AGGRAVATED 1972	AGGRAVATED % change	SIMPLE 1973	SIMPLE 1972	SIMPLE % change	TOTAL 1973	TOTAL 1972	TOTAL % change
ADJ. PRECINCTS									

Section II / Operational Data	10 DP	20 DP	TOTAL
NUMBER OF APPREHENSIONS OR ASSISTS WITH HELICOPTER	5	20	25
NUMBER OF HOURS FLOWN OVER TARGET AREA	46	97.2	143.8
NUMBER OF HOURS DOWN TIME PER WEEK	No	16.0	16.0

(NOTE: ATTACH FLIGHT SCHEDULE, I.E. HOURS FLOWN BY TIME OF DAY, DAY OF WEEK.)

OBJECTIVE II - *TO PROVIDE AERIAL OBSERVATION AND SUPPORT FOR A BEACON ALARM LIGHT SYSTEM IN THE CITIES OF AURORA, LAKEWOOD, AND WHEATRIDGE.*

DENVER

1. NUMBER OF PERMANENT LIGHTS INSTALLED	0		
2. NUMBER OF PORTABLE LIGHTS INSTALLED	0		
3. NUMBER OF ROBBERIES ON PREMISES w/ LIGHTS	0		
4. NUMBER OF BURGLARIES ON PREMISES w/ LIGHTS	0		
5. NUMBER OF HELICOPTER RESPONSES	0	0	0
6. NUMBER OF APPREHENSIONS BY HELICOPTER IN RESPONSE TO LIGHT ALARMS	0	0	0
7. LIGHT ALARM/NO HELICOPTER RESPONSE	0		
8. NO. OF HOURS OBSERVER FLEW WITH HELICOPTER	19.6	71.7	91.3
9. NO. OF OTHER CALLS COVERED BY HELICOPTER	68	146	214
10. NO. OF REQUESTS FOR HELICOPTER SERVICE	4	118	122
11. NUMBER OF FALSE ALARMS	10	14	24

APPENDIX C

ATTITUDE SURVEY

POLICE HELICOPTER SURVEY

INSTRUCTIONS FOR ADMINISTRATION OF SURVEY

1. Explain that no names are to be put on any papers. They are not necessary or are they wanted for the purpose of this survey.

2. It takes from 5 to 10 minutes to complete the survey.

3. Insure that only one mark is made for each question.

4. In question II (Program Data), G. If the person answered II, E, 5, 6 or 7, an average time should be selected for G.

5. Encourage remarks for Question II, N.

6. Attempt to restrict group responses to the questionnaire. Individual work is necessary to obtain valid results.

7. Attempt to administer the survey to men on all three details. A random selection is desired.

8. When finished call Detective Thomas Coogan, Research and Development Section, 297-2045.

9. Attempt to complete task no later than 12 noon, December 7, 1973.

Thank you for your cooperation.

SPECIAL CRIME AERIAL RECONNAISSANCE

-PROJECT SCAR-

POLICE ATTITUDE SURVEY

This questionnaire is designed to survey the attitudes of a number of area police officers toward the use and employment of the Police Helicopter Program (SCAR). It is the intent of this questionnaire to obtain your opinions in regard to the practical benefits, tactical employment, and value of the program.

YOUR TIME AND COOPERATION ARE GREATLY APPRECIATED.

INSTRUCTIONS: ANSWER ALL QUESTIONS. ONLY MARK ONE ANSWER FOR EACH QUESTION.

I. ASSIGNMENT DATA

A. Police Department
- ☐ 1. Aurora
- ☐ 2. Denver
- ☐ 3. Lakewood
- ☐ 4. Wheatridge

B. Present Assignment
- ☐ 1. Patrol
- ☐ 2. Investigation
- ☐ 3. Traffic
- ☐ 4. Administration
- ☐ 5. Youth Division
- ☐ 6. Other (specify)_____

C. Present Rank
- ☐ 1. Captain
- ☐ 2. Lieutenant
- ☐ 3. Sergeant
- ☐ 4. Patrolman
- ☐ 5. Detective
- ☐ 6. Technician
- ☐ 7. Other (specify) _____

D. District (Denver Police Personnel Only)
- ☐ 1. District 1
- ☐ 2. District 2
- ☐ 3. District 3
- ☐ 4. District 4
- ☐ 5. Central Headquarters

E. Present Watch Assignment
- ☐ 1. Mornings
- ☐ 2. Afternoons
- ☐ 3. Evening
- ☐ 4. Straight Day Watch
- ☐ 5. Other (specify)_____

F. Years of Experience
- ☐ 1. 1-5
- ☐ 2. 6-11
- ☐ 3. 12-17
- ☐ 4. 17-22
- ☐ 5. over 22

G. Age
- ☐ 1. 21-25
- ☐ 2. 26-30
- ☐ 3. 31-35
- ☐ 4. 36-40
- ☐ 5. 41-45
- ☐ 6. 46-50
- ☐ 7. 51-55
- ☐ 8. over 55

H. Sex
- ☐ 1. Male
- ☐ 2. Female

II. PROGRAM DATA

A. How was the SCAR Program explained to you by your supervisor?

- ☐ 1. Roll Call
- ☐ 2. Television training
- ☐ 3. Training bulletin
- ☐ 4. Departmental directive or order
- ☐ 5. Informal communications
- ☐ 6. Never explained

B. If you know about the program, but didn't get the information through formal departmental sources, how did you find out?

- ☐ 1. Answered above
- ☐ 2. Newspapers
- ☐ 3. Public radio
- ☐ 4. Television
- ☐ 5. Word of mouth
- ☐ 6. Other (specify) _____

C. Do you feel that the helicopter program is beneficial in crime supression and/or apprehension?

- ☐ 1. Apprehension only
- ☐ 2. Suppression of burglary
- ☐ 3. Suppression of robbery
- ☐ 4. Suppression of all street crime
- ☐ 5. Suppression and apprehension
- ☐ 6. Neither
- ☐ 7. No opinion

D. When on shift how are you notified that the helicopter is available?

- ☐ 1. At roll call
- ☐ 2. By radio
- ☐ 3. Daily bulletin
- ☐ 4. Not notified
- ☐ 5. Other (specify) _____

E. Have you ever requested helicopter cover or assistance while engaged in your police activities?

- ☐ 1. Never requested
- ☐ 2. Never had need to request
- ☐ 3. Needed service but did not know how to obtain it
- ☐ 4. Requested helicopter one time
- ☐ 5. Requested helicopter two times
- ☐ 6. Requested helicopter three times
- ☐ 7. Requested helicopter four or more times

F. If helicopter was requested did it respond?

- ☐ 1. Not applicable (answered above)
- ☐ 2. Yes
- ☐ 3. No

G. If helicopter responded, how long did it take to arrive?

- ☐ 1. Question not applicable (answered in question E)
- ☐ 2. Under 1 minute
- ☐ 3. 1-2 minutes
- ☐ 4. 3-8 minutes
- ☐ 5. 8-12 minutes
- ☐ 6. over 12 minutes

H. Were you ever requested to assist or cover a call that was initiated by aerial unit?

- ☐ 1. Yes
- ☐ 2. No

I. If yes, did you experience communications problems when working with the helicopter unit?

- ☐ 1. Question not applicable
- ☐ 2. Yes
- ☐ 3. No

J. If yes, what were the communications problems?

- ☐ 1. Question not applicable
- ☐ 2. Unable to copy helicopter transmission
- ☐ 3. Directions from helicopter were unclear
- ☐ 4. Helicopter was unable to give street locations
- ☐ 5. Had to use dispatcher/could not talk direct to helicopter
- ☐ 6. Other (specify)_____

K. Do you think additional helicopter support would assist you in your work?

- ☐ 1. Yes
- ☐ 2. No
- ☐ 3. No opinion

L. Do you feel safer if a helicopter is available to cover you during felony calls, suspicious car stops, or other potentially dangerous calls?

- ☐ 1. Yes
- ☐ 2. No
- ☐ 3. No opinion

M. Do you feel that the program should:

- ☐ 1. Continue at present level of operation?
- ☐ 2. Continue at an increase level of operation?
- ☐ 3. be discontinued?
- ☐ 4. Continue a lower level of operation?

N. How can the program be Improved? Remarks and opinions.

_____

_____

_____

_____

_____

_____

APPENDIX D

DISTRIBUTION OF ATTITUDE SURVEYS

HELICOPTER SURVEY DISTRIBUTION

DENVER POLICE DEPARTMENT

	OFFICERS ASSIGNED	SAMPLE	%
DISTRICT 1			
Detail 1	47	26	55%
Detail 2	57	32	44%
Detail 3	80	43	46%
Totals	184	101	45%
DISTRICT 2			
Detail 1	37	20	46%
Detail 2	53	31	42%
Detail 3	77	42	45%
Totals	167	93	44%
DISTRICT 3			
Detail 1	37	20	46%
Detail 2	38	21	45%
Detail 3	61	34	44%
Totals	136	75	45%
DISTRICT 4			
Detail 1	31	17	45%
Detail 2	33	18	45%
Detail 3	53	29	45%
Totals	117	64	45%

APPENDIX E

TABLES USED IN STATISTICAL ANALYSIS

CROSS-TAB - POLICE DISTRICT BY CALL FROM HELICOPTER

RESPONDENT ASKED TO ASSIST HELI.	SUBURBAN NO.	%	DENVER DIST. #1 NO.	%	DENVER DIST. #2 NO.	%	DENVER DIST. #3 NO.	%	DENVER DIST. #3 NO.	%	HEAD-QUARTERS NO.	%	TOTAL NO.	%
YES	33	34.7	45	46.4	26	38.8	20	27.8	21	38.2	15	57.7	160	38.8
NO	62	65.3	52	53.6	41	61.2	52	72.2	34	61.8	11	42.3	252	61.2

$X^2 = 10.61$

df = 5

P < .10

CONTINUED

1 OF 2

WATCH (HOURS OF DUTY)

HOW RESPONDENT NOTIFIED THAT HELICOPTER AVAILABLE	MORNINGS		AFTERNOONS		EVENINGS		STRAIGHT DAYS		OTHER		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
ROLLCALL	1	1.0	2	3.8	6	3.4	2	2.8	0	0	11	2.7
RADIO	14	14.6	15	28.3	73	41.5	29	40.3	6	40.0	137	38.3
BULLETIN	0	0	0	0	0	0	1	1.4	0	0	1	.2
NOT NOTIFIED	76	79.2	30	56.6	83	47.2	40	55.6	9	60.0	238	57.8
OTHER	5	5.2	6	11.3	14	8.0	0	0	0	0	25	6.1

$X^2 = 4.95$
df - 16
P < .001

WATCH (HOURS OF DUTY)

#TIMES RESPONDENT REQUESTED HELICOPTER ASSISTANCE	MORNINGS		AFTERNOONS		EVENINGS		STRAIGHT DAYS		OTHER		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
NEVER	61	63.5	28	52.8	60	34.1	31	43.1	9	60.0	189	45.9
NEEDED, BUT DID NOT KNOW HOW	2	2.1	1	1.9	1	.6	0	0	0	0	4	1.0
ONE TIME	19	19.8	8	15.1	32	18.2	22	30.6	2	13.3	83	20.1
TWO TIMES	5	5.2	8	15.1	37	21.0	10	13.9	2	13.3	62	15.0
THREE TIMES	2	2.1	2	3.8	17	9.7	2	2.8	0	0	23	5.6
FOUR OR MORE TIMES	7	7.3	6	11.3	29	16.5	7	9.7	2	13.3	51	12.4

$X^2 = 46.07$
df = 20
P < .001

WATCH (HOURS OF DUTY)

# OF TIMES RESPONDENT ASKED TO ASST. HELICOPTER	MORNINGS		AFTERNOONS		EVENINGS		STRAIGHT DAYS		OTHER		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO	%
YES	23	24.0	22	41.5	81	46.0	29	40.3	5	33.3	160	38.3
NO	73	76.0	31	58.5	95	54.0	43	59.7	10	66.7	252	61.2

$X^2 = 13.19$
df = 4
P < .02

METHOD BY WHICH SCAR WAS EXPLAINED

HOW RESPONDENT NOTIFIED THAT HELICOPTER IS AVAILABLE	ROLLCALL		TV TRAINING		TRAINING BULLETIN		DEPT.ORDER/ DIRECTIVE		INFORMAL COMM.		NEVER EXPLAINED		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
ROLLCALL	7	5.5	0	0	0	0	1	6.3	1	2.0	2	1.1	11	2.7
RADIO	61	47.7	4	18.2	5	35.7	7	43.8	18	35.3	42	23.5	137	33.4
DAILY BULLETIN	1	.8	0	0	0	0	0	0	0	0	0	0	1	.2
NOT NOTIFIED	54	42.2	16	72.7	7	50.0	6	37.5	31	60.8	122	68.2	236	57.6
OTHER	5	3.9	2	9.1	2	14.3	2	12.5	1	2.0	13	7.3	25	6.1

$X^2 = 41.31$
df = 20
P < .01

POLICE DISTRICTS

RESPONDENTS ATTITUDES TOWARD CONTINUATION OF HELICOPTER PROGRAM	SUBURBAN FORCE		DENVER DISTRICT # 1		DENVER DISTRICT # 2		DENVER DISTRICT #3		DENVER DISTRICT #4		HEAD-QUARTERS		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
CONTINUED AT PRESENT LEVEL	8	8.4	17	18.5	12	17.9	13	18.1	10	18.9	7	26.9	67	16.5
CONTINUED AT INCREASED LEVEL	87	91.6	61	66.3	51	76.1	54	75.0	35	66.0	17	65.4	305	75.3
DISCONTINUED	0	0	12	13.0	0	0	5	6.9	6	11.3	0	0	23	5.7
CONTINUED AT LOWER LEVEL	0	0	2	2.2	4	6.0	0	0	2	3.8	2	7.7	10	2.5

$X^2 = 44.68$

df = 15

$P < .001$

POLICE DISTRICTS

WOULD MORE HELICOPTERS HELP IN WORK?	SUBURBAN FORCE		DENVER DISTRICT # 1		DENVER DISTRICT # 2		DENVER DISTRICT # 3		DENVER DISTRICT # 4		CENTRAL HEAD-QUARTERS		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
YES	90	94.7	57	59.4	48	71.6	55	76.4	34	61.8	16	61.5	300	73.0
NO	1	1.1	22	22.9	11	16.4	11	15.3	12	21.8	6	23.1	63	15.3
NO OPINION	4	4.2	17	17.7	8	11.9	6	8.3	9	16.4	4	15.4	48	11.7

$X^2 = 38.51$

df = 10

$P < .001$

POLICE DISTRICT

RESPONDENTS WHO FEEL SAFER IF HELICOPTER IS AVAILABLE	SUBURBAN FORCE		DENVER DISTRICT # 1		DENVER DISTRICT # 2		DENVER DISTRICT # 3		DENVER DISTIRCT # 4		CENTRAL HEAD-QUARTERS		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
YES	73	76.8	63	65.6	40	59.7	45	62.5	29	52.7	20	76.9	270	65.7
NO	16	16.8	24	25.0	21	31.3	18	25.0	19	34.5	6	23.1	104	25.3
NO OPINION	6	6.3	9	9.4	6	9.0	9	12.5	7	12.7	0	0	37	9.0

$X^2 = 14.69$

df = 10

P < .20

WATCH (HOURS OF DUTY)

WOULD MORE HELICOPTERS HELP IN WORK?	MORNINGS		AFTERNOONS		EVENINGS		STRAIGHT DAYS		OTHER		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
YES	61	63.5	35	70.0	142	79.8	52	72.2	10	66.7	300	73.0
NO	18	18.7	10	20.0	21	11.8	10	13.9	4	26.7	63	15.3
NO OPINION	17	17.7	5	10.0	15	8.4	10	13.9	1	6.7	48	11.7

$X^2 = 12.04$

df = 8

P < .20

PRESENT WATCH (HOURS OF DUTY)

RESPONDENTS WHO FEEL SAFER IF HELICOPTER AVAIL.	MORNINGS		AFTERNOONS		EVENINGS		STRAIGHT DAYS		OTHER		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
YES	46	47.9	31	62.0	128	71.9	54	75.0	11	73.3	270	65.7
NO	33	34.4	15	30.0	38	21.3	15	20.8	3	20.0	104	25.3
NO OPINION	17	17.7	4	8.0	12	6.7	3	4.2	1	6.7	37	9.0

$X^2 = 23.36$

df = 8

$P < .01$

PRESENT WATCH (HOURS OF DUTY)

RESPONDENTS ATTITUDES TO CONTINUATION OF HELI. PROGRAM	MORNINGS		AFTERNOONS		EVENINGS		STRAIGHT DAYS		OTHER		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
CONTINUED AT PRESENT LEVEL	20	21.5	6	12.5	29	16.3	10	14.1	2	13.3	67	16.5
CONTINUED AT INCREASED LEVEL	66	71.0	36	75.0	140	78.7	52	73.2	11	73.3	305	75.3
DISCONTINUED	7	7.5	3	6.3	6	3.4	7	9.9	0	0	23	5.7
CONTINUED AT LOWER LEVEL	0	0	3	6.3	3	1.7	2	2.8	2	13.3	10	2.5

$X^2 = 20.78$

df = 12

$P < .01$

AGE OF RESPONDENT

WOULD MORE HELICOPTERS HELP IN WORK?	21-25		26-30		31-35		36-40		41-45		46-50		51-55		OVER 55		TOTAL	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
YES	91	81.3	129	76.8	44	72.1	14	46.7	8	42.1	8	66.7	3	60.0	2	66.7	299	66.7
NO	8	7.1	22	13.1	11	18.0	11	36.7	6	31.6	3	25.0	2	40.0	0	0	63	15.4
NO OPINION	13	11.6	17	10.1	6	9.8	5	16.7	5	26.3	1	8.3	0	0	1	33.3	48	11.7

$X^2 = 34.50$
$df = 14$
$P < .01$

AGE OF RESPONDENT

RESPONDENTS WHO FEEL SAFER IF HELICOPTER AVAILABLE	21-25		26-30		31-35		36-40		41-45		46-50		51-55		OVER 55		TOTAL	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
YES	78	69.6	109	64.9	45	73.8	14	46.7	9	47.4	8	66.7	4	80.0	3	100.0	210	65.9
NO	19	17.0	43	25.6	14	23.0	13	43.3	9	47.4	4	33.3	1	20.0	0	0	103	25.1
NO OPINION	15	13.4	16	9.5	2	3.3	3	10.0	1	5.3	0	0	0	0	0	0	37	9.0

$X^2 = 22.90$
$df = 14$
$P < .10$

AGE OF RESPONDENT

RESPONDENTS ATTITUDES TOWARD CONT. OF HELICOPTER PROGRAM	21-25		26-30		31-35		36-40		41-45		46-50		51-55		OVER 55		TOTAL	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
CONTINUED AT PRESENT LEVEL	13	11.8	23	14.0	15	24.6	4	13.3	5	26.3	3	25.0	3	60.0	1	33.3	67	16.6
CONTINUED AT INCREASED LEVEL	93	84.5	133	81.1	41	67.2	16	53.3	10	52.6	7	58.3	2	40.0	2	66.7	304	75.2
DISCONTINUED	4	3.6	5	3.0	2	3.3	9	30.0	2	10.5	1	8.3	0	0	0	0	23	5.7
CONTINUED AT LOWER LEVEL	0	0	3	1.8	3	4.9	1	3.3	2	10.5	1	8.3	0	0	0	0	10	2.5

$X^2 = 66.91$
$df = 21$
$P < .001$

HOW IS RESPONDENT NOTIFIED THAT HELICOPTER IS AVAILABLE

IF REQUESTED, DID HELICOPTER RESPOND?	ROLLCALL		RADIO		NOT NOTIFIED		OTHER		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
YES	5	83.3	77	96.3	94	77.7	12	80.0	188	84.7
NO	1	16.7	3	3.8	27	22.3	3	20.0	34	15.3

$X^2 = 13.08$
$df = 3$
$P < .01$

END

92d Congress
2d Session

JOINT COMMITTEE PRINT

BENEFIT-COST ANALYSES OF FEDERAL PROGRAMS

A COMPENDIUM OF PAPERS

SUBMITTED TO THE

SUBCOMMITTEE ON PRIORITIES AND ECONOMY IN GOVERNMENT

OF THE

JOINT ECONOMIC COMMITTEE
CONGRESS OF THE UNITED STATES

January 2, 1973

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LETTERS OF TRANSMITTAL

DECEMBER 29, 1972.

To the Members of the Joint Economic Committee:

Transmitted herewith for the use of the Members of the Joint Economic Committee and other Members of Congress is a compendium of papers entitled "Benefit-Cost Analyses of Federal Programs."

The volume contains studies of several Federal programs from a benefit-cost point of view. They are intended to illustrate the usefulness of benefit-cost analysis in evaluation of public programs and to illustrate ways in which present analytical methods might be improved.

WILLIAM PROXMIRE,
Chairman, Joint Economic Committee.

DECEMBER 28, 1972.

Hon. WILLIAM PROXMIRE,
Chairman, Joint Economic Committee, Congress of the United States, Washington, D.C.

DEAR SENATOR PROXMIRE: Transmitted herewith is a compendium of 11 papers entitled "Benefit-Cost Analyses of Federal Programs."

This volume contains papers on a variety of programs, ranging from natural resource development to manpower training. They are intended to illustrate the usefulness of benefit-cost analysis in the decisionmaking process, and ways in which the analysis could be improved.

The committee is particularly fortunate in being able to include a survey of Federal program evaluation practices conducted by Senator William V. Roth, Jr. This survey illustrates the lack of adequate program evaluation practices among the executive departments and the independent agencies. It should be especially interesting to Members of Congress because Senator Roth suggests specific ways Congress can encourage the executive branch to correct the weaknesses in agency evaluative and analytical practices.

The compendium was prepared under the general supervision of Mr. Richard Kaufman, of the committee staff, assisted by Mr. Douglas Lee. Dr. Robert Haveman, of the University of Wisconsin, provided valuable advice. The committee is grateful to the experts who have given generously of their time in preparing the papers that make up the compendium.

The views expressed in the compendium are those of the contributors and do not necessarily represent the views of committee members or staff.

JOHN R. STARK,
Executive Director, Joint Economic Committee.

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REPORT ON A SURVEY OF FEDERAL PROGRAM EVALUATION PRACTICES

By Hon. William V. Roth, Jr., *a U.S. Senator From the State of Delaware*

I. Remarks on Federal Program Evaluation

Public Program Analysis and Evaluation for the Purposes of the Executive and the Congress

This report presents the findings of a study initiated by my staff and me in July of 1971. At that time we directed a questionnaire to 41 Federal agencies, seeking to put together a general picture of program evaluation and analysis in these agencies. This study seemed to us to be necessary to determine what sorts of improvements were needed in the information used by the executive and legislative branches in the allocation of scarce national resources. Much of the work in preparing this report has been performed by two very competent college student interns under the direction of a full-time member of my staff.

My entire approach to program evaluation and analysis is a common sense one. I intend the term "evaluation" to refer primarily to a process which measures the success of ongoing activities. Obviously there is an analytical aspect to this. The expression "analysis" has a broader meaning—including the consideration of hypothetical situations in planning for the future. Decisionmaking based on analysis is what I am really advocating—be it in the Congress or the Executive. To my common sense way of looking at it, this would be decisionmaking following upon a breakdown of problems into their constituent parts; an assembling of all pertinent, available facts; and the tying together of causes and effects.

My interest in making sure that the executive branch and the Congress have adequate evaluation and analysis to back up their decision making is derived from a desire to find a practical path to true fiscal responsibility. Evaluation and analysis contribute to this end by allowing us to better determine whether programs are accomplishing their intended goals; how these programs could be improved; and what new programs should be undertaken in the future.

Adequate analysis and evaluation would also permit us to compare the relative costs and achievements of various programs managed by one or a number of agencies. Any rational allocation of scarce public resources requires that some sort of cost-effectiveness or cost-benefit analysis be performed.

I have been led to an interest in the use of evaluative program data also as a result of my concern that sufficient program information be available for use by grant users. When I discovered that such user-

oriented material was not always adequate, I began to wonder if agencies were collecting and using output data. Grant-users, legislators, political-level executives, and program coordinators all stand to gain from improved program information of all sorts.

The use of analytical techniques is subject to a number of dangerous distortions. These include over-objectification, over-systematization, and use for advocacy by program managers and political executives. We must keep in mind that it is especially difficult to gauge whether social programs are successful. These programs necessarily have multiple goals which in their ultimate form are very hard to measure. Further, I think we need to guard against the erection of complicated formal structures of analysis which have no impact on decisionmakers.

Despite these pitfalls, my staff and I still feel that a reasonable, flexible approach to evaluation and analysis can contribute much to fiscal responsibility. This was President Nixon's argument when in a May 1970 memorandum to agency heads, he urged wider use of program evaluation. In initiating our survey of Federal evaluation practices, we did not wish to advocate any particular approach or technique. We mainly hoped to get some feeling for the extent and nature of evaluation activities in the Federal Establishment as a whole.

In July of 1971 my staff directed a questionnaire to 41 Federal agencies. We received written replies from 39 of these. In this questionnaire we concentrated especially on practices involved in evaluating ongoing Federal domestic assistance programs. However, as the staff proceeded with personal interviews and other contacts with agency evaluation people and interested parties, our scope of interest broadened to include the evaluation and analysis of most governmental activity.

I would now like to summarize the findings of our survey. The report we have prepared contains general summaries of the agency responses, as well as reports on each agency's reply. We have, of course, been limited by the accuracy and completeness of the agency responses. To as great a degree as possible we have simply summarized what the agencies have told us. Of course, in some instances it has been necessary to apply an amount of judgment in piecing together information from the direct answers as well as accompanying documents. It is also important to realize that the general summaries of the agency responses are necessarily only approximations of reality.

It seems to me most essential that agencies make serious efforts to define the short- and long-term goals of their programs. There is no denying the fact that legislative authorizations often do not pin down the purposes of authorizations. Further, by their nature those governmental efforts with social objectives usually have multiple objects. These realizations do not lead me to accept the often-made argument that we therefore cannot really assess the accomplishments of social programs.

An agency cannot possibly pursue its responsibilities in any coherent fashion without some goal orientation. Of course, it is usually possible to define and measure immediate outputs such as number of houses built, number of persons trained, etc. To accomplish the same with ultimate goals such as the improvement of housing or employment opportunities for a particular group in the society is a much taller order.

According to our survey, the definition of objectives and goals is is not a highly developed art among the executive departments and the independent agencies. Immediate outputs seem to be more frequently defined, and the large executive departments have gone somewhat further in this direction than the usually smaller independent agencies.

Once goals and objectives are outlined, techniques must be selected with which to determine whether agency efforts are meeting these standards. Among the major executive departments immediate outputs appear to be measured for most programs in a majority of departments. Ultimate effectiveness seems to be rather infrequently gaged. Turning to the independent agencies, again, immediate output was said to be assessed somewhat more commonly than ultimate effects. The extent of output measurement, of any sort, was reported as considerably more limited by these agencies than by the executive departments.

Program outputs must be related to program costs in order to effectively use program evaluation and analysis to determine priorities and allocate scarce resources. In other words, one must be able to categorize expenditures in the same terms as program activities. This process is of course complicated by the fact that Congress appropriates money in "input" terms, defined by organizational structure.

Our survey found the major executive departments to be further along than the other organizations in making use of cost benefit or effectiveness study. Nevertheless, in both cases many agencies said that they did not apply this technique to most of their activities or did not provide us with useful respnses to the query. As regards the use of some sort of formal PPBS by agencies, such use was almost nonexistent among independent agencies, while four executive departments claimed to do so.

In constructing our questionnaire to the agencies, we felt that is was essential to find something out about the organization of evaluation and analysis within various agenices. It only makes sense that there must be a proper distribution of resources between program operators and agencywide management. This distribution should allow program people to make use of their great knowledge of program operations for self-guidance and the guidance of top decisionmakers. Yet these top decisionmakers need to be able to reflect independently on this data and recommendations. To do this, they must have both independent informational as well as analytical resources. It just does not make sense to allow the civil servants who operate programs day-by-day and who may be conscientiously committed to them, to make final decisions about their role in an agency's overall effort.

Few executive departments or independent agencies, in response to our letter, described their evaluation apparatus as centralized. Decentralization seems to be the order of the day. Most departments and almost half the agencies noted the existence of a central unit with major evaluatory-analytical responsibilities. It is important that each agency determine, with guidance from the Executive Office of the President, what sort of formal structure of evaluation and analysis best meets its needs.

Sheer numbers of analysts, of course, may not be as important as their quality. For example, it is my understanding that the Department

of Health, Education, and Welfare considers a small staff of analysts to be adequate for that Department's needs. The Department of Agriculture has 11 analysts of 15 professionals in its Office of Planning and Evaluation, and the Department of Commerce's Office of Budget and Program Analysis disposes of the services of 20 out of a total of 147 evaluation personnel.

I am most hopeful that the Federal Government will in the future take more interest in encouraging State and local government capacity to manage intergovernmental aid minus extensive Federal requirements. Following upon this concern, in our questionnaire we asked agencies to comment on their efforts to foster evaluative ability among State and local grant recipients. Both executive departments and independent agencies made it clear that almost no programs to support improvements in evaluation and analysis exist. Similarly, almost no functional programs permit the use of money for such purposes.

If we were to help our States and localities develop more capacity for self-criticism, we might be able to eliminate much of the expensive redtape and bureaucracy now involved in administering Federal domestic assistance. As a consequence some of those at all levels of government who had formerly administered the endless requirements associated with categorical grants might be trained to access the accomplishments of grants-in-aid. It is interesting to note that a few departments and agencies have given evaluation responsibilities to their regional organizations.

It has always seemed to me that the improvement of evaluative and analytical practices in the Federal Establishment could best be achieved through the budget process. If the Office of Management and Budget, and for that matter the Congress, were to demand more analytical support for agency budgetary requests, I think we would see at least an increase in the amount of analysis and evaluation in the agencies. The quality of this might also improve if OMB and Congress possessed the ability to spot check its validity.

OMB involves itself in agency program evaluation primarily through: Issue letters which task agencies on special problems; the requirements for evaluative support set in OMB Circular A–11; studies it undertakes on its own; the work of the budget examiners; and through guidance provided to agencies by OMB's Evaluation Division. All evidence, including exchanges with OMB and the responses of agencies to our letter, lead to the conclusion that OMB involvement with substantive evaluation at the agency level is not great. Likewise, there is not a great deal of evidence indicating extensive independent substantive evaluation of agency activities by OMB.

With this laissez-faire attitude, it is difficult for me to understand how the executive can have adequate information to make tradeoffs among possible expenditures. Of course, we are all aware of the fact that the Office of Management and Budget has a tremendous number of tasks to perform—most of which it does quite well. A letter from Director Shultz of the OMB, presented as a part of the report, reveals some useful information concerning his agency's impact on Federal evaluation practices. Perhaps there is a role for the Domestic Council to play in offering leadership to the agencies, especially as regards to the evaluation of domestic assistance programs.

The General Accounting Office is an existing agency which provides independent evaluations of programs to Congress, as well as assistance to executive agencies. At a later time I plan to treat the question of increased evaluative and analytical resources for the National Legislature. A rather small portion of the executive departments, and an even smaller portion of the independent agencies, indicated in response to our inquiry that GAO was actively or regularly involved in evaluating the substantive accomplishments of their programs. They also stated that the Comptroller General's interest in their programs was quite often of a fiscal-procedural nature.

It should be noted, however, that the GAO has considerably increased its involvement in the evaluation of program accomplishments in recent years. By 1973 GAO estimates that of their 3,000 professional staff members about 32 percent will be involved in reviews of program effectiveness and program results. According to the same estimates only 10 percent of professional staff is currently concerned with purely fiscal audits. Comptroller General Staats has presented his view of the General Accounting Office's role in program evaluation in a letter included in this report.

It is clear that GAO has plenty of work to do and does much of it effectively. However, the Congress needs to have more independent evaluation of the impact of Federal governmental activity—by GAO, the Library of Congress, its own committees, or perhaps by some other body. The Legislative Reorganization Act of 1970 clearly assigns to the Comptroller General and the Library of Congress additional responsibility to perform substantive evaluations.

In our questionnaire we also inquired as to whether Federal bodies depended primarily on evaluation in house by full-time staff or on studies contracted out to private consulting firms, research foundations, or universities. A good majority of agencies throughout the Federal establishment reported that they depend primarily on in-house evaluation and analysis. There are only a few instances, such as with HUD's model cities supplemental grants, where program money is available for evaluation. Equally uncommon is the situation, such as with a number of HEW programs, where Congress or the Executive has earmarked specific funds for this function. One percent of program funds for HEW health programs and several Social and Rehabilitation Service programs is set aside by Congress for evaluation.

Besides on occasion allocating specific funds for the assessment of program accomplishments, the Congress in the 1967 Office of Economic Opportunity Amendments gave explicit instructions that the Director of OEO make a continuing effort to evaluate OEO efforts. These same amendments required evaluation by the Comptroller General.

In conclusion, it has been my hope that through these comments I can call attention to the need for the executive branch to improve and extend its attempts to measure the accomplishments of governmental activities and weigh these accomplishments against their costs. I feel that the study conducted by my staff suggests serious weaknesses in agency evaluative and analytical practices.

We in Congress can encourage the executive agencies to move in this direction in the course of committee hearings and by earmarking, where appropriate, program funds for evaluation and analysis when authorizing programs. We could also demand extensive analytical

support for requests for funds and authorizations. At the same time, we must turn to the improvement of our own capacity to use and independently generate analysis and evaluation. These are tools which, when sensibly put to use, greatly increase the possibility of making the maximum use of public funds.

II. Copy of Questionnaire Sent to 41 Agencies

U.S. Senate,
Washington, D.C., July 26, 1971.

Dear _____: I am gathering information for a study of program evaluation in Federal agencies which concerns itself with the whole process of evaluation, from the collection and reporting of raw data to the final comparative cost-benefit/effectiveness analyses. I would sincerely appreciate your cooperation in providing any available information in the following specific areas of concern:

1. How many domestic assistance programs as defined by the 1971 Office of Management and Budget Catalog of Federal Domestic Assistance does the agency administer?

To what extent are agency activities readily defined in terms of objectives and outputs conducive to measurement and evaluation of effectiveness (for example, PPB program structures or building block format)? How many programs are operated and monitored in terms of definite output measures and goals? (Note: "Output measures" does not describe measures of expenditure, but rather the ultimate results of these expenditures.)

2. For which programs are expenditure and output data evaluated (i.e., in terms of cost-effectiveness, alternative approaches, experimental variations, program side effects, efficiency, improved program strategies)?

3. How are the tasks of evaluation organized and distributed within the department/agency?

(*a*) How is the department/agency evaluation staff arranged (in terms of size and scope of activity)?

department/agency office of evaluation?
bureau and program evaluation staffs?
For State and locally administered programs, have evaluation staffs been developed at the State and local levels? Are there program funds authorized specifically for this purpose? (What is the role of State and local personnel in reporting or evaluating information?)

(*b*) What has been the role of OMB in evaluating department/agency programs?

independently of agency staff?
in cooperation with agency staff?

(*c*) What has been the scope of GAO activity in doing evaluation studies of department/agency programs?

(*d*) To what extent have evaluation studies been contracted out?

(*e*) To what extent are date reporting and evaluation performed by:

participating program staff?
independent staffs?

4. How has the evaluation staff been funded?

(*a*) individual program authorizations specifying evaluation studies of the program?

(*b*) the Secretary or director's administrative staff appropriations? (Were the funds utilized specifically designated for program evaluation in the budget authorization?)

(*c*) other?

5. Is evaluative information made available or could it be made available upon request for use by the legislative branch in considering authorization and funding levels of the various programs? (How much evaluative information is covered by executive privilege?)

6. Are there any projected innovations in the area of program evaluation in the agency?

Any suggestions, further information or examples concerning program evaluation would be greatly appreciated. Please direct such information to Kent Peterson of my staff.

Sincerely,

William V. Roth, Jr.,
U.S. Senate.

III. List of Agencies Responding to Questionnaire

Executive Departments

Department of State.
Department of the Treasury.
Department of Defense.
Department of Interior.
Department of Agriculture.
Department of Commerce.
Department of Labor.
Department of Health, Education and Welfare.
Department of Housing and Urban Development.
Department of Transportation.
Department of Justice.

Agencies

The Appalachian Regional Commission.
Atomic Energy Commission.
United States Civil Service Commission.
Environmental Protection Agency.
Equal Employment Opportunity Commission.
Farm Credit Administration.
Federal Power Commission.
General Services Administration.
Indian Claims Commission.
Inter-American Social Development Institute.
National Advisory Council on the Education of Disadvantaged Children.
National Aeronautics and Space Administration.
National Capital Housing Authority.
National Science Foundation.
Office of Economic Opportunity.
Overseas Private Investment Corporation.

Postal Service.
President's Council on Physical Fitness and Sports.
Securities and Exchange Commission.
Small Business Administration.
Tennessee Valley Authority.
U.S. Commission on Civil Rights.
U.S. Information Agency.
U.S. Tariff Commission.
Veterans' Administration.
Washington Metropolitan Area Transit Authority.
Water Resources Council.
Federal Home Loan Bank Board.

Note.—The following agencies were sent questionnaires, but did not reply in time to have their responses covered by this report:
Federal Trade Commission.
National Capital Planning Commission.

IV. Letter Regarding Program Evaluation Sent to Director George P. Shultz of the Office of Management and Budget

U.S. Senate,
Washington, D.C., July 22, 1971.

Attention: Mr. William A. Niskanen, Jr., Assistant Director for Evaluation.

Hon. George P. Shultz,
Director, Office of Management and Budget, Executive Office Building, Washington, D.C.

Dear Mr. Shultz: I am gathering information for a study of program evaluation in Federal agencies which concerns itself with the whole process of evaluation, from the collection and reporting of raw data to the final comparative cost-benefit/effectiveness analyses. I would sincerely appreciate your cooperation in providing any available information in the following specific areas of concern:

1. What is the size and structure of the OMB evaluation staff? What is the scope and distribution of OMB evaluation activity? Are there any projected innovations?
2. What is the relationship between the OMB evaluation staff and the evaluation staffs of the agencies?
   (*a*) How are the "tasks" of evaluation distributed between the two levels? (For example, data collection, program analyses, comparative program analyses, and so forth.)
   (*b*) What are the pressures acting on evaluation staffs at the two levels which might tend to decrease objectivity? An agency program analysis office has been described as "wearing two hats," it is initially "critical" toward an agency's programs, but then serves as an advocate of those programs vis-a-vis OMB. How does the OMB evaluation staff overcome these informational difficulties at the agency level? Are there similar distortive pressures within OMB?
   (*c*) Where should the emphasis for expanding and improving program evaluation be focused in view of the need for objective evaluative information?
      (1) Enlarging agency evaluation staffs?

      (2) Expanding the evaluation staff at the OMB level?
3. What are the procedures providing for a comparative overview in analyzing:
   (*a*) Programs with a similar goal?
   (*b*) Diverse groups of programs serving different goals?
4. How are the procedures for program evaluation integrated into the budgeting cycle?
   (*a*) How much evaluative information is requested from the agencies in the budgeting process? (samples of relevant budget circulars)
   (*b*) How much *"useful"* evaluative information *is provided* by the agencies in the budgeting process?
5. What is the role of the OMB evaluation staff in making or contributing to policy decisions? What are the structures and procedures involved in OMB's impact on policymaking? What, in your view, should the relationship between evaluation and policy-formation be?
6. What is the present OMB policy in using "executive privilege" to cover evaluative information? What is the impact of executive privilege on the quality of program evaluation information in the executive branch? If evaluative information were to be made public, would program evaluations then become less or more objective? (Should Congress develop its own office of program evaluation? If such a congressional office were established, at what levels of the evaluation process could data be shared, if at all?)
7. What is your reaction to Senator Mondale's proposal (S. 5—the Full Opportunity and National Goals and Priorities Act) which would create a Council of Social Advisers to perform an evaluative, policy—recommending role in analyzing Federal activity in areas of social concern?

What evidence could you give that adequate evaluation is being done in this area already by the present OMB/agency evaluation staff structure?

Any assistance you can provide on this important subject will be greatly appreciated.

Sincerely,

William V. Roth, Jr.,
U.S. Senate.

V. Director Shultz's Response to Senator Roth's Letter

Executive Office of the President,
Office of Management and Budget,
Washington, D.C., September 15, 1971.

Hon. William V. Roth, Jr.,
U.S. Senate,
Washington, D.C.

Dear Senator Roth: I value your interest in the Federal evaluation process and your support of our efforts to improve the information and analysis available to Federal policy officials. John Collins and Kent Peterson met with our Assistant Director for Evaluation, Bill Niskanen, to provide a general background for our response to your specific questions.

1. What is the size and structure of the OMB evaluation staff? What is the scope and distribution of the OMB evaluation activity? Are there any projected innovations?

The OMB Evaluation Division has 18 authorized positions, divided equally between a Special Projects Branch and an Evaluation Techniques Branch. Each professional staff member has a primary responsibility for one domestic program area and also contributes to the evaluation of selected Government-wide management and procedural problems. The major projected innovation is to give the Evaluation Division the responsibility for structuring the OMB Spring Reviews that provide the policy and budget guidance for agency preparation of their proposed budgets.

It is important to recognize that evaluation is a management technique that includes performance audits of existing programs, management information systems, and analysis of the costs and effects of proposed programs and policies. In this sense, most of the OMB staff is involved in evaluation. The specific role of the Evaluation Division is to improve the quality of evaluation throughout OMB by developing criteria, improving analytic techniques, assisting the other divisions, and by performing special projects.

2. What is the relationship between the OMB evaluation staff and the evaluation staffs of the agencies?

In general, this relationship is professional and informal, primarily involving the sharing of data, research results, analytic methods, and perceptions of problems. The OMB Evaluation Division does not supervise or specifically monitor the budgets and activities of the agency evaluation staffs. One developing aspect of this relation is the development and promulgation of evaluation guidelines in specific program areas; these guidelines are usually developed jointly by the OMB and agencies' evaluation staffs and are incorporated in OMB circulars.

(*a*) How are the "tasks" of evaluation distributed between the two levels? (e.g., data collection, program analyses, comparative program analyses, etc.)

Most of the data collection and program analyses are, and should be, conducted by the agency evaluation staffs and by the university and contract research community. OMB tries to assure that the specific studies of most direct interest to the Executive Office are performed, either by organizing a special project or by tasking an agency. The primary formal instrument for tasking an agency is an Issue Letter; these letters are now prepared in the summer for a response by the following spring and are usually restricted to studies of major importance. The OMB program examiners are continuously tasking the agencies for data and studies with a shorter deadline or of lesser importance.

(*b*) What are the pressures acting on evaluation staffs at the two levels which might tend to decrease objectivity? An agency program analysis office has been described as "wearing two hats," it is initially "critical" toward an agency's programs, but then serves as an advocate of those programs vis-a-vis OMB. How does the OMB evaluation staff overcome these informational difficulties at the agency level? Are there similar distortive pressures within OMB?

The agencies and OMB obviously have somewhat different institutional objectives—the agencies to promote programs for which they are responsible and OMB to constrain total spending and balance programs across the Government—and their respective evaluation staffs are bound to reflect these objectives. This problem is somewhat tempered by a developing sense of professional standards in the analytic community. In recognition of this problem, OMB's study requests to the agencies are increasingly restricted to information that does not directly threaten the agency's fundamental interests. In addition, OMB relies heavily on studies conducted outside of the Government and on studies by the OMB staff to provide parallel sources of information and analysis. We may not be sufficiently aware of similar distortive pressures within OMB, but it is probable that our current budget orientation sometimes makes us unduly critical of some spending proposals.

(*c*) Where should the emphasis for expanding and improving program evaluation be focused in view of the need for objective evaluative information?

(1) Enlarging agency evaluation staffs?

(2) Expanding the evaluation staff at the OMB level?

At the present time, there does not appear to be a general shortage of analysts in either the agencies or OMB. The primary present challenge is to make more effective use of the potentially available analyses by improving our review processes and, pending these procedural changes, an increase in the supply of analysts will not increase the amount of analysis that is effectively used. In contrast, there may be a greater payoff to increasing the number and quality of analysts working for Congress, an action that would also improve the quality of analysis in the executive branch.

3. What are the procedures providing for a comparative overview in analyzing—

(*a*) Programs with a similar goal?

(*b*) Diverse groups of programs serving different goals?

Most programs serve several goals, some of which are not well defined. Indeed, the necessary coalition for approval of a major program usually includes parties who support the program for quite different reasons. In recognition of the several goals of most Federal programs, OMB is increasingly using several different formats for reviewing the Federal budget and activities. These several formats include the necessary agency and appropriation aggregation, several types of program aggregations, resource-type aggregations, and selected Government-wide overviews of economic and management issues. We are developing review procedures to give increasing attention to the distributive consequences of Federal activities—by income class, demographic group, region, etc.—as well as the incentive effects on the various parties involved in carrying out Federal programs. Our review procedures are still in an experimental state, subject to the necessary procedures to review and publish the budget, but we believe we are working toward a more informative and effective process.

4. How are the procedures for program evaluation integrated into the budgeting cycle?

(*a*) How much evaluative information is requested from the agencies in the budgeting process? (Samples of relevant budget circulars.)

(*b*) How much *"useful"* evaluative information *is provided* by the agencies in the budgeting process?

Program Evaluation materials are submitted at several stages of the budget cycle. The results of major studies prepared by the agencies in response to the Issue Letters as well as studies performed within OMB receive greatest attention in the Spring Reviews. Agencies submit some program evaluation materials with their proposed budgets, both in response to OMB circular A–11 and to frequent informal requests by the program examiners. Some program evaluation material, prepared either by the agencies or within OMB, is included in the program books for the Fall Reviews. A representative Issue Letter and a copy of circular A–11 are enclosed. The usefulness of agency program evaluation information varies enormously; in general, the basic information on which the agency analysis is based is more useful to us than their analysis and conclusions.

5. What is the role of the OMB evaluation staff in making or contributing to policy decisions? What are the structures and procedures involved in OMB's impact on policymaking? What, in your view, should the relationship between evaluation and policymaking be?

The OMB Evaluation Division has no direct policy responsibility; its primary contribution to policymaking is to assure that the OMB policy officials have the best possible information and analysis on management and budget issues. OMB's impact on policymaking, of course, derives entirely from the powers of the President, and OMB's unique role as the only comprehensive staff in the Executive Office. Evaluation can be one of several important inputs to policymaking, but cannot be a substitute for the critical political decisions; evaluation should not be expected to resolve issues when there is a fundamental disagreement on objectives among well-informed parties.

6. What is the present OMB policy in using "executive privilege" to cover evaluative information? What is the impact of executive privilege on the quality of program evaluation information in the executive branch? If evaluative information were to be made public, would program evaluations then become more or less objective? Should Congress develop its own office of program evaluation? If such a congressional office were established, at what levels of the evaluation process could data be shared, if at all?

The President's policy is to use "executive privilege" to the minimum extent consistent with the full and frank discussion of policy alternatives within the executive branch and with the necessary coordination of administration proposals and consistent, of course, with the normal restrictions on classified material. In general, clearly, individual requests would have to be considered on a case-by-case basis.

As a general rule, the availability of the backup component studies might probably increase the objectivity of these studies, as they would be subject to review by a larger professional audience with, possibly, a wider range of interests. The release of studies that directly lead to a policy recommendation by appointed officials, however, would reduce the frankness of the internal policy discussion.

Because, generally, the basic data on which executive branch analysis is based would also be available to Congress, there would not seem to be any particular need for a separate congressional office of program evaluation, apart from existing committee staffs, but of course Congress would have to judge that for itself.

7. What is your reaction to Senator Mondale's proposal (S. 5—the Full Opportunity and National Goals and Priorities Act) which would create a Council of Social Advisers to perform an evaluative, policy recommending role in analyzing Federal activity in areas of social concern? What evidence could you give that adequate evaluation is being done in this area already by the present OMB/agency evaluation staff structure?

We do not favor the creation of a Council of Social Advisers as proposed by Senator Mondale. A council of this nature without a specific program or policy focus would most likely evolve into spokesmen for specific policies and would usually be excluded from the primary decision processes. In addition to the agency evaluation staffs, it is important to recognize that the Executive Office review of social programs and policies now benefits from the contribution of the Domestic Council staff, the Council of Economic Advisers, the Office of Science and Technology, and the Council on Environmental Quality as well as OMB, and these staffs include able social scientists from a range of professional disciplines.

I hope that these answers are responsive to your requests. Bill Niskanen can follow up on more details if this would be valuable. Again, thank you for your interest and understanding.

Sincerely,

(S) GEORGE P. SHULTZ,
Director.

VI. LETTER FROM COMPTROLLER GENERAL ELMER B. STAATS TO SENATOR ROTH REGARDING GENERAL ACCOUNTING OFFICE'S ROLE IN FEDERAL PROGRAM EVALUATION

COMPTROLLER GENERAL OF THE UNITED STATES,
Washington, D.C., May 5, 1972.

B–161740.

Hon. WILLIAM V. ROTH, Jr.,
U.S. Senate, Washington, D.C.

DEAR SENATOR ROTH: I appreciate the opportunity afforded me to look over the report which summarizes your findings dealing with Federal program evaluation practices. As mentioned in my letter to you of April 20, you may wish to include a copy of this letter in your report.

I certainly share your view that program evaluation and analysis can contribute much to fiscal responsibility and for this and other reasons most of our audit effort over the past several years has focused on the evaluation of management of Federal programs and the assessment of whether these programs are accomplishing the purposes which Congress intended them to accomplish.

The principal objective of the General Accounting Office is to render maximum assistance to the Congress, its committees, and

Members, consistent with our responsibilities as an independent, nonpolitical agency. Meeting this objective with our limited resources requires the judicious selection of assignments and the most efficient utilization of available staff in the conduct of those assignments. Therefore, except as otherwise required by statute or external requests, our basic audit policy is to direct available resources and talents to the areas in which they can be most effectively used to fulfill the greatest apparent need and benefit to the Government.

Implementation of our audit policy results in considerable audit coverage of some Federal programs while very little audit effort will be devoted to other programs. For instance, we have performed a number of program evaluations at the Environmental Protection Agency and the Departments of Defense; Health, Education, and Welfare; Interior; Agriculture; and Housing and Urban Development because these departments have many substantive ongoing programs which have a considerable impact on a large number of people and require sizable amounts of Federal funds. On the other hand, independent agencies such as the Inter-American Social Development Institute and the Overseas Private Investment Corporation have been in operation for only a little over a year and accordingly our work in these agencies has not been extensive at this point in time.

We are directing more of our efforts to providing the Congress and the Federal agencies with information on the progress made in achieving program objectives and on possible alternative approaches to accomplishing the objectives intended by Congress. For fiscal years 1971 through 1973 we estimate that of our 3,000 professional staff members about 21 percent, 28 percent, and 32 percent, respectively, were, or will be, concerned with reviews of program effectiveness and program results. In addition, a substantial portion of our manpower is expended on management evaluations which are designed to achieve greater economy and efficiency in Federal Government operations. Less than 10 percent of our professional staff is concerned with purely fiscal audits.

A significant part of our work is done in response to specific requests by committees of the Congress, often in direct support of their legislative or legislative oversight responsibilities. As a current and important example, we are supporting the Joint Economic Committee in its study of welfare programs by measuring, in six geographic areas, the extent to which poor persons receive benefits from the multitude of Federal programs intended for their aid. To the best of our knowledge, this effort is unique. Also, we have recently evaluated and will shortly report on the impact of a basic change, provided for by present legislation, in the method of distributing funds for maternal and child health programs on the provision of services to program beneficiaries. This work was done at the request of the House Ways and Means and Senate Finance Committees to assist in their consideration of the need for modifying the legislation.

Many of our reviews are concerned with important domestic programs. Following are some examples of our more recent efforts in this area.

1. We reported to the Congress that the solid waste demonstration grant program had limited impact in improving the solid waste disposal problem in the Nation.

2. A report to be issued to the Congress this month will discuss the progress and problems in reducing air pollution from automobiles.

3. A recently issued report to the Congress evaluates the effect of Federal expenditures on the economy of Johnson County, Ky. A similar study, undertaken at the request of Senator Edward Brooke, resulted in a report on our evaluation of the impact of Federal programs on economic development, employment, and housing in New Bedford, Mass.

4. Our report to the Congress on civil defense in the United States provided an evaluation of the development of a nationwide fallout shelter system.

5. In a report to the Congress last month, we assessed the dimensions of insanitary conditions in the food manufacturing industry.

6. Over a recent 3-month period, we issued five reports to the Congress on our assessment of the impact of the teacher corps program at various locations in the United States, and we will shortly issue a report on the impact of the program nationwide.

7. A report which will shortly be issued to the Congress will discuss how enforcement of housing codes can enhance achievement of the Nation's housing goal.

8. Two recent reports to the Congress provided evaluations of the housing and education programs for the American Indian.

These examples represent a small portion of the audit effort which we are devoting to program evaluations. We have already provided you with a copy of our annual report for fiscal year 1971. I am providing separately a partial listing of reports which we have issued during about the past 3 years, or which will be issued in the next month or two, on the agencies involved in your study. This listing includes about 200 reports directed to the status and/or accomplishments of Federal programs. From the information included in our annual report and in the listing, I think you will agree that our efforts in the area of program evaluations have been quite extensive.

It is obvious that some agency responses to your questionnaire were not complete concerning our past efforts in evaluating their programs. Some of the responses apparently were prepared by agency people who were not familiar with our work. Overall, I think it would be fair to say that our total effort in program evaluations has been quite substantial and that our progressive increase of both total and multidiscipline staff resources which we have applied in this area in the last 6 years evidences our deep interest in such evaluations. This is not to say that more should not be done. On the contrary, as you note in your report, the Legislative Reorganization Act of 1970, as well as other recent legislative actions, will require the General Accounting Office to place even greater emphasis on program evaluations.

We appreciate your interest in this subject and hope that you will support our program evaluation efforts. If we can be of any further assistance, please do not hesitate to call.

Sincerely yours,

ELMER B. STAATS,
Comptroller General of the United States.

VII. EXPLANATION OF REPORTS ON AGENCY RESPONSES

1. *Number of domestic programs.*—According to 1971 OMB Catalog of Federal Domestic Assistance.

2. *General description.*—A general comment on the quality of goal definitions, evaluative technique and organization, and also a mention, when necessary, of those characteristics of the agency program which are considered to prevent workable evaluation.

3. *Definition of goals and objectives.*—The degree to which the agency defines the short- and long-range goals of its programs, specifically in the short range the definition of output, and other productivity indexes, objectives.

4. *Technique of evaluation.*—The manner in which the agency measures productivity, effectiveness, and benefit to society against the costs of the program.

5. *Organization.*—The institutional structure for evaluation. How centralized or decentralized? What resources are available to the agency head? Who bears the primary responsibility for evaluation-independent staff or program staff? Also, specific numbers in specific staff evaluation functions.

6. *State-local evaluation.*—Are any grant funds available for State and local governments to evaluate their efforts under grants-in-aid or in general? What does the agency know about State and local capability in this area?

7. *OMB role.*—The role of the Office of Management and Budget in evaluating agency programs or in providing advice and direction in this area. Has this participation been independent or in cooperation with agency staff?

8. *GAO role.*—Scope of General Accounting Office activity in evaluating agency programs. To what degree have these been reviews of fiscal management and procedures in general, and to what degree reviews of the substantive accomplishments of programs?

9. *In-house versus contracts.*—How much evaluation is done by agency personnel and how much by contract or grant?

10. *Funding.*—How are funds for evaluation authorized—earmarked funds, administrative appropriations, agency heads' office appropriations, program funds, research and development appropriations, et cetera?

11. *Availability to Congress.*—The proportion of evaluative materials available to Members and committees of Congress. What are the procedures for making such data available? What role does executive privilege play in the release of evaluative materials?

12. *Innovations.*—The innovations projected by the agency in the evaluation field.

13. *Date of reply.*—Date on the agency reply to Senator Roth's questionnaire.

Note.—It should be kept in mind that in putting together the summaries of the agency responses, there has been an effort to rely mainly on information supplied by the agencies themselves. The accuracy of such information will, of course, reflect the accuracy and care taken by agencies in preparing their responses. It has often been necessary, however, to piece together the implications of agency replies, contained in both the answers to our questionnaire and in supporting materials submitted. Thus, some of the agency summarizations contain an amount of judgement on our part.

The reader will soon discover that the quality of information supplied by the executive agencies varies from agency to agency, as well as from topic to topic. In numerous cases, particular agencies provide no information in answer to certain questions. Also, particular questions may not apply to certain agencies.

VIII. Summary of Responses

Summary of responses of Executive Departments [1]

[11 departments included, 8 agencies in Department of Transportation]

	Executive departments [3]	DOT agencies [2]
3. Definition of goals and objectives:		
Ultimate goals defined:		
All programs	2	2
Most programs	2	1
Some programs	3	2
Output defined:		
All programs	2	2
Most programs	2	2
Some programs	5	4
4. Technique of evaluation:		
Some sort of PPBS	4	2
Cost benefit/effectiveness:		
Most programs	5	2
Some programs	3	3
Output measured:		
Most programs	5	3
Some programs	4	2
Ultimate effectiveness measured:		
Most programs	1	0
Some programs	3	1
5. Organization (of evaluation):		
Centralized or decentralized:		
Decentralized	6	4
Not clearly centralized or decentralized	3	2
Centralized	2	2
Existence of central office with major evaluatory responsibilities	9	5
Top-ranking evaluation official reported as an assistant agency head	3	1
Size of central evaluation staffs:		
State:		
Inspector General of Foreign Assistance (persons)		52
Agency for International Development (persons)		6
Defense:		
Systems Analysis (persons)		100
Comptroller (persons)		45
Administration (persons)		9
Installations and Logistics (persons)		1
Agriculture:		
Departmental level, Office of Planning and Evaluation (persons)		15
10 larger agencies (total persons)		28
Smaller agencies (total man-years)		8.4
Commerce: Central, Office of Budget and Program Analysis (persons)		[4] 20
HEW:		
Central, Assistant Secretary for Planning and Evaluation (persons)		6
Agencies (total persons)		116

See footnotes at end of table.

Summary of responses of Executive Departments [1]—Continued

[11 departments included, 8 agencies in Department of Transportation]

	Executive departments [3]	DOT agencies [2]
5. Organization—Continued		
Size of central evaluation staffs—Continued		
DOT Agencies:		
Coast Guard: Chief of Staff's Office		[5] 28
Federal Highway Administration		[6]
National Transportation Safety Board		[7]
Urban Mass Transportation Administration: Central, R. & D. Systems Analysis and Office of Program Planning (persons)		12
National Highway Traffic Safety Administration (persons on total staff)		50
Federal Railroad Administration: Central Program Planning Division (persons)		4
Departments with evaluation capability at the regional level	4	1
6. State-local evaluation: [8]		
Federal money available for evaluation by State and local governments:		
None	7	3
Program money	1	2
Specific funds	0	1
Other	1	0
7. OMB role:		
General comment by agencies:		
Considerable	1	1
Some	2	1
Limited	5	5
None	0	1
Normal fiscal budgetary involvement	2	6
Involvement in substantive accomplishments of programs:		
Considerable	1	2
Some	1	0
Limited	3	1
OMB does independent evaluation	3	1
OMB does evaluation in cooperation with agency	[9] 7	[9] 3
8. GAO role:		
General comment by agencies:		
Active or regular	3	4
Some	2	1
Limited	4	3
Fiscal-procedural involvement	4	7
Substantive involvement:		
Considerable	1	1
Some	2	1
Limited	1	0
9. In-house evaluation versus contracts: [10]		
Mainly or all in-house evaluation	6	5
Mainly out-of-house contracted evaluation	2	0
Considerable use of contracts	0	3
10. Funding: [11]		
Source of evaluation funds:		
General appropriations (salaries and expenses, administrative, operating expenses, agency head's office, research and development, etc.)	7	8

See footnotes at end of table.

Summary of responses of Executive Departments [1]—Continued

[11 departments included, 8 agencies in Department of Transportation]

	Executive departments [3]	DOT agencies [2]
10. Funding—Continued		
Source of evaluation funds—Continued		
Program money	2	3
Some funds, either general appropriations or program money, specifically earmarked for evaluation by Congress or the agency	2	0
11. Availability of evaluations to Congress: [12]		
All readily available	2	2
Generally available	1	3
Limitations on availability (as regards internal working papers, case-by-case approval, OMB approval needed, some classified)	3	2
Not generally available	1	1
12. Innovations in evaluation:		
Number of agencies where specific improvements in evaluation practices are mentioned	7	5

[1] It should be noted that in putting together the agency summaries as well as in this further summarization, there has been an effort to rely mainly on information supplied by the agencies themselves. The accuracy of such information will, of course, reflect the accuracy and care taken by agencies in preparing their responses. It has often been necessary, however, to piece together the implications of agency replies, contained in both the answers to our questionnaire and in supporting materials submitted. Thus, some of the agency summarizations contain an amount of judgment on our part.

[2] The agencies contained in the Department of Transportation are reported separately, since this is the way DOT answered our questionnaire.

[3] Since it is difficult to quantify the responses summarized in this report, these numbers should be taken only as general indications of reality. Under most of the categories dealt with in this summary, an agency will be counted under as many subcategories as its response yields information about. For instance, under "Definition of Goals and Objectives," an agency may or may not define both its ultimate goals and its immediate objectives. Many agencies provide no usable information on a number of questions, and are thus not counted.

[4] Of total of 147 persons.

[5] Of total of 50 persons.

[6] Small central staff.

[7] Little independent staff.

[8] As regards this category, and certain others, the question may not be applicable to some agencies if, for instance, they have no State or locally administered programs. This appears to be the case with the Department of State and a couple agencies of the Department of Transportation.

[9] One limited.

[10] The first and third categories are not mutually exclusive.

[11] Funds for evaluation may come from a number of sources in any particular agency.

[12] This response was the only one for which the Office of Management and Budget attempted to encourage an administrationwide reply.

Summary of Responses of Independent Agencies [1]

[29 Agencies Included, Office of Economic Opportunity Falls Within the Executive Office of the President]

	Number of Agencies
3. Definition of goals and objectives:	
Ultimate goals defined:	
All programs	[3] 1
Most programs	1
Some programs	7
Very limited or not at all	14
Output defined:	
All programs	2
Most programs	3
Some programs	6
Very limited or not at all	15
4. Technique of evaluation:	
Some sort of PPBS	4
Cost benefit/effectiveness:	
Most programs	3

See footnotes at end of table.

Summary of Responses of Independent Agencies [1]—Continued

[29 Agencies Included, Office of Economic Opportunity Fall Within the Executive Office of the President]

	Number of Agencies
4. Technique of evaluation—Continued	
Cost benefit/effectiveness—Continued	
Some programs	7
Very limited or not at all	14
Output measured:	
Most programs	4
Some programs	8
Very limited or not at all	14
Ultimate effectiveness measured:	
Most programs	0
Some programs	6
Very limited or not at all	17
5. Organization (of evaluation):	
Centralized or decentralized:	
Decentralized	8
Not clearly decentralized or centralized	13
Centralized	8
Existence of central office with major evaluatory responsibilities	12
Top-ranking evaluation official reported as an assistant agency head	4
Size of central evaluation staffs:	
Appalachian Regional Commission (Division of Regional Program Planning and Evaluation) (persons)	3
Atomic Energy Commission (Division of Program Analysis) (program staff vary from 1–8)	7
District of Columbia Redevelopment Land Agency (Evaluation Division of Office of Management and Evaluation) (persons)	4
Equal Employment Opportunity Commission (Office of Program Planning and Evaluation) (persons)	9
National Advisory Council on the Education of Disadvantaged Children (staff director and research secretary)	1
Office of Economic Opportunity:	
Office of Planning, Research, and Evaluation (persons)	18
Office of Program Development (persons)	9
Office of Health Affairs, Division of Program, Planning, and Evaluation (persons)	5
Office of Legal Services, Planning, Technical Assistance and Evaluative Division (persons)	3
Office of Operations, Headquarters (persons)	3
Each of 10 Regions (persons)	1
Overseas Private Investment Corporation (Vice President for Corporate Planning) (persons)	5
Small Business Administration (Assistant Administrator for Planning, Research, and Analysis) (persons)	6
U.S. Information Agency:	
Office of Director, Resources Analysis Staff (persons)	15
Office of Research and Assessment (persons)	86
Washington Metropolitan Area Transit Authority (Office of Program Control) (persons)	10
Federal Home Loan Bank Board (Office of Bank Management) (persons)	2
Number of agencies with evaluation capability at the regional level	5

See footnotes at end of table.

Summary of Responses of Independent Agencies [1]—Continued

[29 Agencies Included, Office of Economic Opportunity Fall Within the Executive Office of the President]

	Number of Agencies
6. State-local evaluation: [4]	
Federal money available for evaluation by State and local governments:	
None	14
Program money	1
Specific funds	0
Other	1
7. OMB role:	
General comment by agencies:	
Considerable	4
Some	7
Limited	7
None	3
Normal fiscal budgetary involvement	6
Involvement in substantive accomplishments of programs:	
Considerable	3
Some	7
Limited	3
OMB does independent evaluation	6
OMB does evaluation in cooperation with agency	13
8. GAO role:	
General comment by agencies:	
Active or regular	5
Some	5
Limited or not at all	16
Fiscal-procedural involvement	10
Substantive involvement:	
Considerable	3
Some	4
Limited or not at all	13
9. In-house evaluation versus contracts: [5]	
Mainly or all in-house evaluation	19
Mainly out-of-house contracted evaluation	1
Considerable use of contracts	7
10. Funding: [6]	
Source of evaluation funds:	
General appropriations (salaries and expenses, administrative, operating expenses, agency head's office, research and development, etc.)	19
Program money	6
Some funds, either general appropriations or program money, specifically earmarked for evaluation by Congress or the agency	3
11. Availability of evaluations to Congress: [7]	
All readily available	6
Generally available	11
Limitations on availability (as regards internal working papers, case-by-case approval, OMB approval needed, some classified)	8
Not generally available	0
12. Innovations in evaluation:	
Number of agencies where specific improvements in evaluation practices are mentioned	11

Note: See footnotes 1, 3, 4, 5, 6, and 7 for "Summary of Responses of Executive Departments." As regards footnote 4, a number of independent agencies do not appear to have programs administered by State and local governments. These include: District of Columbia Redevelopment Land Agency, Farm Credit Administration, Indian Claims Commission, Inter-American Social Development Institute, National Advisory Council on the Education of Disadvantaged Children, National Capital Housing Authority, Overseas Private Investment Corporation, Postal Service, Securities and Exchange Commission, U.S. Information Agency, and U.S. Tariff Commission.

IX. Reports on Responses of Executive Departments

Department of State

1. *Number of domestic programs.*—Seven programs listed by OMB, and 37 AID country programs.

2. *General description.*—AID programs and Department activities related to consular and administrative areas are evaluated, AID better than others. The seven Department programs, perhaps with the exception of the claims against foreign governments program, are considered not to be conducive "to measurement and evaluation of effectiveness."

3. *Definition of goals and objectives.*—AID activities are defined by "inputs, outputs, project purpose and program goal." Overall Department activities are reviewed in light of foreign policy objectives. None of the domestic aid programs are defined by goals or by output measurement.

4. *Technique of evaluation.*—PPBS considered to have been inadequate to quantitatively gage the effectiveness of the attainment of objectives. A new system—Policy Analysis and Resource Allocation (PARA)—is now being implemented to judge priorities in allocation and to improve efficiency. PARA does not cover the seven programs, however, which are not evaluated in terms of output or effectiveness measurement.

5. *Organization.*—Centrally, the Office of Inspector-General "conducts a continued evaluation program"—12 inspectors of overseas activities and 40 employees. The Department essentially depends on self-evaluation by each separate agency. Claims against foreign governments are evaluated within the office of the Assistant Legal Advisor for International Claims. AID—Director of Program Evaluation—six professionals and a program evaluation officer at each regional bureau—together these two meet biweekly as a program evaluation committee. "Evaluation in AID is decentralized."

6. *State-local evaluation.*—None.

7. *OMB role.*—"* * * involved primarily in the budgetary aspects of program evaluations in State." Also, has worked with Department staff in discussion of new programs.

8. *GAO role.*—The GAO "plays an active role in evaluating the Department's overseas programs." Reviews of AID focus on financial and management audits.

9. *In-house versus contracts.*—"* * * occasionally used in AID for in-depth evaluations"; Department itself has not gone out of house.

10. *Funding.*—Department's evaluation funded by salaries and expenses appropriations, though the Office of Inspector General of Foreign Assistance (IGA), as authorized, is funded through AID, military assistance program and Peace Corps appropriations. Cultural exchange evaluation will be funded in 1972 through the Mutual Educational and Cultural Exchange Act of 1961 budget. AID evaluations are funded through program and project authorizations.

11. *Availability to Congress.*—"Could be made available upon request." However, "internal working papers" could be withheld under executive privilege if it is felt that it is information incompatible to the security of the United States as defined by the President. The IGA reports are now available upon request.

12. *Innovations.*—PARA system, to integrate decisionmaking with resource allocation—no alteration, nevertheless, to output or cost-effectiveness.

13. *Date of reply.*—October 7, 1971.

Department of the Treasury

1. *Number of domestic programs.*—5 listed by OMB.

2. *General description.*—OMB currently reviewing the appropriateness of listing these Treasury programs, as they are of a service nature, provided to a "narrow group of service customers."

3. *Definition of goals and objectives.*—Focus in Treasury Department measurement is on both productivity and mission performance. However, definition of outputs varies in extent from agency to agency. In general, however, most Department activities have defined goals and objectives.

4. *Technique of evaluation.*—The Treasury Department employs some 30 different measurement systems. These 30 systems fall in the following four categories: Type A, manpower planning measures—to forecast labor requirements; Type B, unit cost measure—ratio of work units produced to production cost; Type C, work measure—comparison of units produced by a work center and some performance standard; Type D, productivity index—final output of an organization divided by total inputs.

5. *Organization.*—Nothing clear is stated. However, there are several implications which seem to indicate that the Department evaluation function is decentralized, with each individual agency directing the scope and intensity of the function within itself.

6. *State-local evaluation.*—No information provided.

7. *OMB role.*—No indication of the extent of involvement, though from the reply it is obvious that they are concerned. A joint study with GAO of Federal measurement systems was the catalyst which produced a compilation and overall evaluation of Department measurement systems.

8. *GAO role.*—No indication aside from the joint study mentioned above.

9. *In-house versus contracts.*—Nothing explicit, though as no mention was made of contract studies, and as Department evaluation is generally extensive, contract evaluation is probably limited if not nonexistent.

10. *Funding.*—No information provided.

11. *Availability to Congress.*—No information provided.

12. *Innovations.*—"* * * today's search for better measurement focuses on individual and organizational efficiency, and also on mission accomplishment."

13. *Date of reply.*—August 13, 1971.

Department of Defense

1. *Number of domestic programs.*—DOD administers 40 OMB programs.

2. *General description.*—A decentralized evaluation system, in which the degree to which goals are defined and output measured in cost-effectiveness terms varies.

3. *Definition of goals and objectives.*—Some programs are operated with regard to specific goals and objectives; no mention, however, was made of output goals, though output measurement has been integrated into PPBS.

4. *Technique of evaluation.*—DOD employs an extensive PPBS, composed of 62 measurement systems; however, there has been no

implementation of an overall productivity measurement system, though cost-effectiveness and cost-benefit studies are done relative to resource allocation. Also, DOD had devised an input/output measurement system as a way of measuring cost-effectiveness, though this system is not applied to intelligence, to health and environment programs, or with respect to the Defense contract audit agency.

5. *Organization.*—Program evaluation is decentralized. The Office of the Secretary of Defense: Assistant Secretary (Systems Analysis)—100 analysts; Assistant Secretary (Comptroller)—five senior analysts for data systems and 40 analysts who review the budget and deal with OMB; Assistant Secretary (Administration)—nine analysts on intelligence programs; Assistant Secretary (Installations and Logistics)—one officer coordinating the review of the Logistics Performance Measurement and Evaluation System reports; Defense Productivity Measurement Office (DPMO)—no specified numbers.

Army.—No specific program evaluation staff. *Navy*—no specified number, though the Office of the Chief of Naval Operations has programing and budgetary personnel; also, the Office of Program Appraisal maintains a small staff. *Air Force*—highly decentralized approach; no specific evaluation staff, though cost-effectiveness studies are performed by the Office of the Assistant Chief of Staff Studies and Analysis and by the Cost and Economic Analysis Division of the Office of the Comptroller of the Air Force.

Agencies.—(1) Defense Contract Audit Agency—no evaluation staff. (2) Intelligence Agency—no evaluation staff. (3) National Security Agency—Office of Assistant Director for Resource Management responsible for evaluation, no number. (2) Nuclear Agency—no staff. (5) Communications—Comptroller of the Defense communications agency coordinates evaluation. Thus, generally program staffs perform basic evaluation, though, with PPBS and program memorandum systems, this information is reviewed higher up.

6. *State-local evaluation.*—No mention made.

7. *OMB role.*—OMB reviews budget in cooperation with DOD staff analysts, but also maintains an independent approach; occasionally performs program evaluations.

8. *GAO role.*—Usually limited to fiscal analysis and rarely deal with performance or with cost effectiveness or cost benefit, now developing a program evaluation capability; does evaluate programs under the Logistic Performance Measurement and Evaluation System; since January 1, 1971, GAO has issued more than 100 evaluative reports on Navy programs; limits intelligence evaluation to manpower utilization and language training studies; maintains resident audit at National Security Agency.

9. *In-house versus contracts.*—Unable to determine the extent of contracting for evaluation; the preponderance of on-going evaluation in-house.

10. *Funding.*—Funds are not appropriated specifically for evaluation, either for staffs or for programs, in DOD budget.

11. *Availability to Congress.*—Available through the submission of acquisition reports, through GAO studies, Congressional hearings or by request. These requests would be handled on a case-by-case basis, due to classification.

12. *Innovations.*—New data bases and cross program methodologies planned for intelligence; revision of logistics performance measurement and evaluation system, including goal review and upgrading of performance objectives; input/output measures are in early stages of development and further refinement is planned; several areas of innovation within the military departments are currently being pursued.

13. *Date of reply.*—September 17, 1971.

Department of Interior

1. *Number of domestic programs.*—89 programs listed by OMB.
2. *General description.*—No information provided.
3. *Definition of goals and objectives.*—No information provided.
4. *Technique of evaluation.*—No information provided.
5. *Organization.*—Office of Assistant Secretary for Program Policy provides "evaluation-type studies," "economic analyses" of programs on "natural and environmental resource issues," and advice and coordination of "planning, program development, and review function." Office of Survey and Review provides "top level review and analysis in the area of financial management and in other management" areas in departmentwide activities. Apparently program Assistant Secretaries and bureau heads still have a role.
6. *State-local evaluation.*—No information provided.
7. *OMB role.*—No information provided.
8. *GAO role.*—No information provided.
9. *In-house versus contracts.*—No information provided.
10. *Funding.*—No information provided.
11. *Availability to Congress.*—No information provided.
12. *Innovations.*—Office of Assistant Secretary for Program Policy.
13. *Date of reply.*—September 21, 1971.

Department of Agriculture

1. *Number of domestic programs.*—85 OMB programs.
2. *General description.*—Revision of program structure based on OMB-McKinsey study in process. PPBS installed in some States and urban governments using DoA programs, in addition to which State agricultural experiment stations are funded for evaluations.
3. *Definition of goals and objectives.*—All Department programs have been defined in terms of objectives and outputs.
2. *Technique of evaluation.*—Output measures are used extensively, in addition to studies of impact on target groups and, where possible, "ultimate results" are studied. Expenditure and output data are evaluated in all areas listed in questionnaire. Where Department of Agriculture feels output measures impractical, systems capability measures, based on level-of-effort measurement, are employed. Ultimate result studies are used in connection with special studies.
5. *Organization.*—Office of Planning and Evaluation coordinates evaluation—15 full-time staff. Each agency required to have competent staff to analyze effectiveness of programs. For the 10 agencies, 28 full-time; smaller agencies have a total professional staff effort of 8.4 man-years. The Economic Research Service, under the Director of Agricultural Economics, contributes to program evaluation. In addition, project research under each program is conducted, based on cost/benefit ratios, etc., by the project staff.
6. *State-local evaluation.*—PPBS in some States and large urban governments using DoA programs, yet Agriculture has no information on extent of evaluation. State experiment stations do evaluation, most financed by States themselves. State extension also evaluated, funded by Federal, State, and local funds. *No program funds from*

Department of Agriculture are appropriated or authorized for State or local level evaluation.

7. *OMB role.*—Annually request special studies, or data on specific programs. Role has been limited, advisory rather than directive or critical, and Agriculture has received little feedback from studies conducted and submitted to OMB. Some improvement in the last year. No OMB studies independent of Department.

8. *GAO role.*—GAO reviews audit oriented rather than cost/benefit or goal- and objective-oriented evaluation. Specific areas of program abuse have been investigated.

9. *In-house versus contracts.*—Limited use of contracted evaluation, variable among agencies.

10. *Funding.*—Analytic staff is funded by appropriations from the Office of the Secretary. Agency staffs are funded by appropriations for agency administrative expenses.

11. *Availability to Congress.*—Availability and extent of executive privilege blanket determined by OMB guidelines. Distribution of evaluative information outside of executive has been "extremely limited."

12. *Innovations.*—Principal innovation is the revision of DoA's program planning and budgeting structure according to McKinsey recommendation. Also, Soil Conservation Service, Commodity Exchange Authority, and the Forest Service are making important evaluation innovations.

13. *Date of reply.*—September 8, 1971.

Department of Commerce

1. *Number of domestic programs.*—59.

2. *General description.*—Science and technology area a 1970 McKinsey pilot project.

3. *Definition of goals and objectives.*—All activities defined in terms of "building blocks" (281) related to agency objectives for 1973 budget.

4. *Technique of evaluation.*—A formal system of evaluation covering the department, which evaluates expenditure and output data. Over 40 in-depth studies are in process. All activities were being defined in terms of building block programs, related to agency objectives, for 1973 budget. An apparent effort to define output goals and more ultimate measures of effectiveness.

5. *Organization.*—Tied to budget and performed at all levels. Office of Budget and Program Analysis, with separate evaluation unit, monitors in-depth studies and conducts special studies for the Secretary. Office of Audits also a part of evaluation process. 20 of 147 evaluation personnel and 24 of 213 budget personnel at department level.

6. *State-local evaluation.*—Planning staffs, with evaluation functions (in-house and contractual) authorized and funded for economic Development Administration districts, Indian tribes, and regional action planning commissions.

7. *OMB role.*—One or two independent in-depth studies each year; selected issue studies in cooperation with agency.

8. *GAO role.*—1970–71, 11 reports and 6 letters—regular evaluations.

9. *In-house versus contracts.*—Most in-house—some contracting, by Economic Development Administration and regional action planning commissions during fiscal year 1970–71.

10. *Funding.*—General administration appropriation.

11. *Availability to Congress.*—Usually available to Congressional Committees. Much done as part of budget, must be cleared by OMB according to Circular A–10. Usually permitted to be released after budget presented.

12. *Innovations.*—Program structure and objectives being refined; more use of Census and inventory-type data.

13. *Date of reply.*—August 10, 1971.

Department of Labor

1. *Number of domestic programs.*—45 OMB programs.

2. *General description.*—Manpower Administration was a 1970 McKinsey pilot project.

3. *Definition of goals and objectives.*—For most activities these are defined.

4. *Technique of evaluation.*—Formal evaluation with full time staff in minimum wage enforcement and manpower. Informal and periodic for smaller programs. Measures of output and to some extent ultimate effectiveness.

5. *Organization.*—Centralized in Office of Programs Review and Audit and Office of Evaluation. Trying to provide top managerial decisionmaking needs.

6. *State-local evaluation.*—No mention.

7. *OMB role.*—From time to time requests studies in specific areas; results of evaluative studies used in OMB reviews.

8. *GAO role.*—Conducted evaluations of poverty programs and job bank activities.

9. *In-house versus contracts.*—Mostly done through contracts.

10. *Funding.*—Evaluation at program level from administrative expenses, at departmental level from appropriation to Office of Secretary. 1971—$700,000 for staff support and $4,600,000 for contracts in evaluation of manpower programs.

11. *Availability to Congress.*—Evaluative material available to Congress on request.

12. *Innovations.*—Attempting to identify top managements and bring results of evaluation to their attention.

13. *Date of reply.*—October 4, 1971.

Department of Health, Education, and Welfare

1. *Number of domestic programs.*—OMB programs, 302.

2. *General description.*—States that emphasis of program is on short-term performance; thus, objectives are operationally short term. General disenchantment with output measures in favor of measures of ultimate effectiveness.

3. *Definition of goals and objectives.*—Variability as to definition of programs by objectives. Cites social security program as one "not conducive to setting measurable objectives." Apparently a distinction between "broad goals" and measurable objectives. Many programs also have multiple objectives.

4. *Technique of evaluation.*—Broad program planning system, entailing a hierarchical classification system which enables a statement of broad agency goals, beneath which each program is listed and defined as to impact, funding, and measurement of activity-outputs.

No determination of the number of programs operated in terms of output measures has been made—cites "poor quality" of their output measures as reason.

5. *Organization.*—Management of evaluation resides in the Office of the Assistant Secretary for Planning and Evaluation (ASPE). Guidelines set by ASPE agencies develop evaluation objectives, subject to ASPE approval. Staff—ASPE—6; Office of Education—44; Social and Rehabilitation Service—15; Health Services and Mental Health Administration—16; National Institute of Health—30; Food and Drug Administration—5; Office of Child Development—6. Prior to this year, there was little regional formal evaluation; this year, ASPE received proposals for evaluation studies for fiscal year 1972.

6. *State-local evaluation.*—No mention.

7. *OMB role.*—Not a central role in HEW evaluation. They do their own analysis of selected programs and in the past have asked HEW to address specific problems.

8. *GAO role.*—Very limited in scope, usually involved in evaluation only at the request of members of Congress. In answer to these requests, GAO generally will contract out for such an evaluation.

9. *In-house versus contracts.*—Most evaluations are performed by contract/grant—fiscal year 1970 evaluation funds:

Type of organization:	*Percent of evaluation dollars*
Profit	45
Nonprofit	29
University	21
Government agencies	4
Independent consultants	1

Also, HEW plans to have OEO evaluate certain HEW programs, in addition to joint evaluations in related program areas with other departments.

10. *Funding.*—One percent of program funds authorized by Congress for evaluation of health programs, and several of the Social and Rehabilitation Service. Office of Education program evaluation authorized by Congress in specific amounts for each program. All other areas are funded through salaries and expense funds and research funds. Fiscal year 1971 evaluation fund allotment: 50 percent to directors of program to judge efficiency and effectiveness, 25 percent to offices of planning and evaluation at agency level, and 25 percent to Office of the Secretary for broad overview.

11. *Availability to Congress.*—No executive privilege cover, all available by request.

12. *Innovations.*—(*a*) Planned integration of evaluation with overall planning, (*b*) more rigorous evaluation plan guidance, (*c*) making sure evaluation studies are used in planning, and (*d*) plans to reinforce staff, quantity, and quality.

13. *Date of reply.*—October 18, 1971.

Department of Housing and Urban Development

1. *Number of domestic programs.*—OMB programs, 70.

2. *General description.*—"Broad concept of evaluation" which varies with the needs of the program. New programs are not evaluated until a reasonable volume of cases or projects completed.

3. *Definition of goals and objectives.*—Easier to quantify in housing production areas.

4. *Technique of evaluation.*—Appears as though cost effectiveness only clearly applied to housing production activities. Characteristics of families living in units considered. "Pragmatic" scrutiny in terms of timing, costs, and effectiveness.

5. *Organization.*—An Office of Program Evaluation reporting to the Deputy Under Secretary for Policy Analysis and Program Evaluation at the center. Each assistant secretary has 6–10 evaluation staff and each regional administrator 1–2. Office of Audit provides specific project evaluation assistance. Evaluation takes place at all levels.

6. *State-local evaluation.*—Model city, supplemental grant funds designate a minimum of 3 percent for evaluation by cities, which is reviewed by HUD staff. Most other community development programs do not have these arrangements.

7. *OMB role.*—No mention.

8. *GAO role.*—"Relatively active," but HUD may not be aware of all GAO surveys.

9. *In-house versus contracts.*—Most (about three-fourths) in-house, but some (about one-fourth) contracted. Six contracts/grants for 1971.

10. *Funding.*—Staff evaluation from Secretary's administrative funds; contract studies from administrative or research and technology appropriation. Model cities—earmarked part of supplemental grants funds for contract evaluations: 1970, $3,178,000; 1971, $13,264,000; 1972 $7,700,000 spent on technical assistance and evaluation contracts for model cities. More of this for technical assistance than for evaluation.

11. *Availability to Congress.*—Formal reports "are often" available and "some" contract studies "could be." Much evaluation is informal and thus not really suitable for release.

12. *Innovations.*—An integrated program management system.

13. *Date of reply.*—September 20, 1970.

Department of Transportation

DEPARTMENT WIDE

1. *Number of domestic programs.*—OMB programs, 24.

2. *General description.*—A "flexible" system to allow for wide differences among DOT's programs.

3. *Definition of goals and objectives.*—See individual agencies listed below.

4. *Technique of evaluation.*—See individual agencies listed below.

5. *Organization.*—Seems to be basically organized by constituent agencies. Deputy Under Secretary, centralized internal audit staff, and other staff offices of Secretary conduct departmentwide evaluation.

6. *State-local evaluation.*—See individual agencies listed below.

7. *OMB role.*—See individual agencies listed below.

8. *GAO role.*—See individual agencies listed below.

9. *In-house versus contracts.*—See individual agencies listed below.

10. *Funding.*—See individual agencies listed below.

11. *Availability to Congress.*—See individual agencies listed below.
12. *Innovations.*—"Currently examining . . . planning and evaluation capabilities."
13. *Date of reply.*—September 17, 1971.

FEDERAL AVIATION ADMINISTRATION

1. *Number of domestic programs.*—OMB programs, 4.
2. *General description.*—At time of response were developing a more integrated evaluation system which would monitor programs in output terms. Had an extensive formal and informal system of evaluation.
3. *Definition of goals and objectives.*—All programs defined in terms of objectives conducive to measurement and evaluation of effectiveness. These definitions being revised and strengthened.
4. *Technique of evaluation.*—"All programs" are "evaluated and appraised" but not monitored formally through output measures. Each of five services are an evaluation unit.
5. *Organization.*—Office of Appraisal, reporting to Administrator, is developing an integrated formal system for the agency. All levels take part in evaluation and appraisal, the former being more oriented to the needs of the operating level the latter to higher levels of management. Five different units of evaluation for each service provided. Office of Budget "oriented to respond to program activity as well as appropriation execution * * *."
6. *State-local evaluation.*—No programs for State and local evaluation.
7. *OMB role.*—Evaluates through budget submission and 10 subject matter areas earmarked for analysis.
8. *GAO role.*—Six recent studies discussed.
9. *In-house versus contracts.*—Do use contracted studies.
10. *Funding.*—At agency level, funds come from appropriation for "Director, staff, and supporting services"; program evaluation funded from program money.
11. *Availability to Congress.*—Unclear whether evaluative materials not brought into "legislative and appropriation processes" would be available.
12. *Innovations.*—"The Office of Appraisal has an appraisal and evaluation system order under development that will integrate the total formal evaluative efforts of the agency."

COAST GUARD

1. *Number of domestic programs.*—OMB programs, 2.
2. *General description.*—A PPB system which appears to define outputs and more ultimate objectives. Programs monitored in terms of cost-effectiveness and cost-benefits.
3. *Definition of goals and objectives.*—Output and benefit defined and measured.
4. *Technique of evaluation.*—PPB system which defines outputs and benefits and measures cost-effectiveness.
5. *Organization.*—About 50 positions in planning and programing. "Primary responsibility" with program managers and directors for reporting, but evaluation in Chief of Staff's office. The Plans Evaluation Division (13 persons), Programs Division (15 persons),

and PPB staff in the Chief of Staff's office. Each Coast Guard district employs a planning officer to evaluate programs.
6. *State-local evaluation.*—No State or locally administered programs.
7. *OMB role.*—After-the-fact appraisal. Little in cooperation with Coast Guard. Reviews budget document "independently," but mainly on basis of data supplied by Coast Guard.
8. *GAO role.*—Narrow, specific, and largely procedural, but extensive. May 1969—April 1971 describes seven studies.
9. *In-house versus contracts.*—About half contracted, 7–9 per year. Combination of two modes have led to a major evaluative study of each Coast Guard program in recent years.
10. *Funding.*—Central staff funded out of operating expense, and evaluation studies from Chief of Staff's contingency fund.
11. *Availability to Congress.*—Very little covered by executive privilege. Some apparently must be cleared by OMB.
12. *Innovations.*—Followup on accuracy of prior year's forecasts, improvement of data bank, and simplified "Delphi" techniques.

FEDERAL HIGHWAY ADMINISTRATION

1. *Number of domestic programs.*—OMB programs, 9,
2. *General description.*—Although no longer have a formal PPB system, attempts to appraise all programs in terms of output and measures of ultimate effectiveness.
3. *Definition of goals and objectives.*—Activities generally defined in terms of goals such as efficiency, safety, and environmental effects.
4. *Technique of evaluation.*—Claim to operate and monitor, "to the extent practical," all programs in terms of output and effectiveness measures, although no longer have a PPB system. Expenditures analyzed too.
5. *Organization.*—Office of Program and Policy Planning and Office of Program Review and Investigations have "small staffs" which occasionally use personnel from elsewhere. Emphasis appears to be on "participating program staff."
6. *State-local evaluation.*—Until 1970 no comprehensive effort to improve evaluation of individual projects and data reporting rather than comprehensive evaluation. 1970 Highway Act authorized National Highway Institute to train State and local employees.
7. *OMB role.*—Issues agency guidelines for evaluation and reviews results.
8. *GAO role.*—Continuous—nine studies in first two quarters of fiscal year 1972.
9. *In-house versus contracts.*—Most performed by participating program staff, but some by contract.
10. *Funding.*—Administrative funds.
11. *Availability to Congress.*—"Generally administratively restricted" but could "probably" be made available with OMB approval.
12. *Innovations.*—Feels current methods are adequate.

NATIONAL TRANSPORTATION SAFETY BOARD

1. *Number of domestic programs.*—No OMB programs.
2. *General description.*—Appears to possess an evaluation system which at least makes use of workload measures of output on a regular basis.

3. *Definition of goals and objectives.*—Seem to have defined goals and related workload measures to them.
4. *Technique of evaluation.*—Status of workload items monitored "regularly, in periodic and many impromptu meetings." Cost effectiveness/benefit analysis on a formal basis may be new. Mention use of "tracking" impact of recommendations.
5. *Organization.*—Little separate independent evaluation staff. Program managers, General Manager's staff, and one program review office take part.
6. *State-local evaluation.*—No information provided.
7. *OMB role.*—Does not describe any particular involvement. Mentions informal contracts, budget review, and distribution of papers and documents.
8. *GAO role.*—A number of reviews. Most recent aimed at determining how the Board determines allocation of resources and evaluates effectiveness of recommendations.
9. *In-house versus contracts.*—All in-house.
10. *Funding.*—General administrative appropriations.
11. *Availability to Congress.*—Both evaluative and fiscal data available.
12. *Innovations.*—Developing an expanded evaluation apparatus.

URBAN MASS TRANSPORTATION ADMINISTRATION

1. *Number of domestic programs.*—Six OMB programs.
2. *General description.*—A decentralized system with only limited use of cost effectiveness/benefit studies.
3. *Definition of goals and objectives.*—Definition of programs in terms of output goals difficult in most cases.
4. *Technique of evaluation.*—Expenditure and output evaluated in terms of cost effectiveness/benefit limited to individual research and development projects.
5. *Organization.*—Evaluation is inseparable part of a program manager's responsibility. A new Program Evaluation Division in Office of Program Planning (six professionals) and Systems Analysis Division of R. & D. staff (six professionals) involved in agencywide evaluation.
6. *State-local evaluation.*—Planning assistance funds available.
7. *OMB role.*—Not aware of any OMB participation.
8. *GAO role.*—No evaluation studies—concerned mainly with "criteria for implementing statutory requirements."
9. *In-house versus contracts.*—Some contracts for experimental designs and development of evaluation methodology.
10. *Funding.*—All personnel from S. & E. appropriation; contracts for development of experimental designs from R. & D. program funds; and evaluation studies as part of planning process technical studies program funds.
11. *Availability to Congress.*—Any evaluation data available to Congress and public.
12. *Innovations.*—New Program Evaluation Division; further development of quantitative measurement; and a data collection program which will involve greater State-local participation.

ST. LAWRENCE SEAWAY DEVELOPMENT CORPORATION

1. *Number of domestic programs.*—None.
2. *General description.*—A management information system which produces current information on a biweekly basis for evaluative as well as other purposes.
3. *Definition of goals and objectives.*—One of the purposes of the management information system is the definition of objectives.
4. *Technique of evaluation.*—States that management information system allows the "measurement of the costs and benefits of ongoing and proposed programs."
5. *Organization.*—Centrally organized in Office of Program Control. Performed by independent staff and "participating supervisory personnel in the Office of Operations and Maintenance."
6. *State-local evaluation.*—No information provided.
7. *OMB role.*—Budget review.
8. *GAO role.*—Yearly, commercial-type audit.
9. *In-house versus contracts.*—No contracts.
10. *Funding.*—Salary and expense appropriations.
11. *Availability to Congress.*—No real answer—seems as though DOT and OMB would decide.
12. *Innovations.*—None.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

1. *Number of domestic programs.*—One OMB program—involved with Federal Highway Administration in highway safety and development programs.
2. *General description.*—Activities directly administered by States on the whole. Requirement of multiyear State Comprehensive Highway Safety Plan and Annual Highway State Work Program encourage development of evaluation procedures. Three demonstration projects too, which are evaluated.
3. *Definition of goals and objectives.*—Plans encourage definition of objectives. Three demonstration programs have "essential program objectives" identified.
4. *Technique of evaluation.*—Three demonstration programs subject to evaluation by "system analysis techniques." An "evaluation monitoring system" under development.
5. *Organization.*—Evaluation at all levels. Impression given that independent, central capability only now being developed. Central staff is Associate Administrator for Planning and Programming who heads three offices: systems analysis, program planning, and program evaluation. Twenty professional and five clerical personnel on total planning, analysis, programming, and evaluation staff.
6. *State-local evaluation.*—Evaluation an integral part of State and local activity. Funding specifically provided.
7. *OMB role.*—Annual budget review and special studies of specific issues requested.
8. *GAO role.*—Limited. Some reviews of contracts and procurements. Currently conducting in-depth review of motor vehicle programs.

9. *In-house versus contracts.*—Some contracting, but hope to do more in-house. New demonstration programs done in-house.
10. *Funding.*—No specific funding—from regular administration portion of salary and expense appropriation.
11. *Availability to Congress.*—Does not really answer—much regularly provided.
12. *Innovations.*—Evaluation monitoring system; management information system; and planning and control system.

FEDERAL RAILROAD ADMINISTRATION

1. *Number of domestic programs.*—Two OMB programs.
2. *General description.*—Presently "no overall formal program review or program evaluation of ongoing or completed projects." Two areas are organized around PPB procedures.
3. *Defintion of goals and objectives.*—Activities funded from Railroad Research appropriation and Office of High Speed Ground appropriation are defined in terms of output, and to a lesser extent ultimate effectiveness. Other areas are not formally so defined.
4. *Technique of evaluation.*—Cost effectiveness study being developed primarily for planning new projects—will cover 85 percent of activity. Hope that this system will record output and be a basis for evaluation. Staff is sufficient to go into depth only in specific cases.
5. *Organization.*—Program Planning Division in Office of Administrator has only four professionals, thus "bulk of whatever limited data reporting and evaluation" is handled by program staffs.
6. *State-local evaluation.*—No State or local programs.
7. *OMB role.*—"Normal budget review."
8. *GAO role.*—"Limited scope."
9. *In-house versus contracts.*—"Several" in past.
10. *Funding.*—Office of Administrator, salaries and expenses, and program appropriations.
11. *Availability to Congress.*—Most would be public.
12. *Innovations.*—"Basic," "modest" plans. Project planning system being developed.

Department of Justice

1. *Number of domestic programs.*—31 listed by OMB.
2. *General description.*—Agency reply was not specific to questions asked; supporting material, though helpful, was limited in scope.
3. *Definition of goals and objectives.*—Extent to which goals are defined varies among agencies, with the Bureau of Narcotics and Dangerous Drugs good, and practically nonexistent in the Bureau of Prisons.
4. *Technique of evaluation.*—Department has defined four broad categories of measurement systems: "overall productivity indexes"—final outputs divided by physical inputs; "work measures"—physical work units compared to a performance standard; "unit cost measures"—relates physical work units to costs; "manpower planning measures"—method of forecasting manpower requirements. The degree to which any or all of these measures are employed varies among agencies.
5. *Organization.*—Appears to be somewhat decentralized, with functional evaluation being performed by agencies.

6. *State-local evaluation.*—No information provided.
7. *OMB role.*—No information provided, other than the mention of the joint OMB, GAO, CSC project, requiring study of evaluation techniques.
8. *GAO role.*—No information provided, other than the mention of the joint OMB, GAO, CSC project, requiring study of evaluation techniques.
9. *In-house versus contracts.*—No information provided.
10. *Funding.*—No information provided.
11. *Availability to Congress.*—"The question as to how much evaluative information is covered by executive privilege would of necessity be considered on an ad hoc basis."
12. *Innovations.*—"With respect to projected innovations in the area of program evaluation, the Department of Justice constantly seeks better ways of performing that function." Several substantive innovations were mentioned.
13. *Date of reply.*—February 29, 1972.

X. Reports on Responses of Independent Agencies

The Appalachian Regional Commission

1. *Number of domestic programs.*—11 listed by OMB.
2. *General description.*—No agency collects data for the Appalachian Region, thus making program evaluation difficult, though in theory it could be performed.
3. *Definition of goals and objectives.*—Though the Commission has an evaluation staff responsible for definition of productivity goals, this staff "* * * has encountered serious practical obstacles to this approach."
4. *Technique of evaluation.*—The agency has been unable, due to the limitations in data and in suitable methodologies, to make substantial use of sophisticated evaluation techniques such as cost-effectiveness measurement.
5. *Organization.*—The Division of Regional Program Planning and Evaluation, composed of three professionals, is responsible for central evaluation, supplemented by program staff where necessary. Additionally, in several program areas, operational staff are developing evaluation programs, and in several member States an evaluation capability is being developed.
6. *State-local evaluation.*—Nothing mentioned.
7. *OMB role.*—"The OMB has not been directly involved in any formal evaluation of Commission programs."
8. *GAO role.*—Response mentions only that the GAO has conducted one evaluation report, submitted to Congress in May 1971.
9. *In-house versus contracts.*—The Commission uses its own staff where possible; total cost for consultant services has been $135,000 so far.
10. *Funding.*—Staff has been funded by the Federal-State trust fund, and research and demonstration appropriations.
11. *Availability to Congress.*—All final evaluation reports as well as supporting research papers will be published.
12. *Innovations.*—None.
13. *Date of reply.*—August 18, 1971.

Atomic Energy Commission

1. *Number of domestic programs.*—31 listed by OMB.
2. *General description.*— In general, AEC evaluation appears to be extensive and practicable. However, the central staff for analysis, composed of seven professionals, must be hard put to review 31 programs.
3. *Definition of goals and objectives.*—Outputs are readily defined in all manufacturing programs, to a lesser extent in research and development activities, and not at all in basic research activities. For those research activities that are not conducive to output definition, other indicators (for example, man-years) are employed.
4. *Technique of evaluation.*—AEC employs a PPBS, under which all programs undergo evaluation of their costs and output. Alternative strategies are also considered.
5. *Organization.*—At the center, the Division of Program Analysis employs seven professionals. This Division conducts special studies and selective analysis. Studies of programs are generally performed by program analysis staffs, which vary in size from one to eight professionals. These studies are in turn reviewed by the Division of Program Analysis.
6. *State-local evaluation.*—None.
7. *OMB role.*—Evaluation has generally been done independently of AEC staff, though cooperation in special study requests has generally occurred.
8. *GAO role.*—As an example of GAO activity, three evaluation studies were reported to Congress from July 1, 1971 to August 15, 1971.
9. *In-house versus contracts.*—Contracting for evaluation studies has been extensive in several program areas; AEC's Division of Reactor Development and Technology has contracted out $400,000 per year in fiscal year 1969 through fiscal year 1971. Union Carbide Corp. maintains a permanent staff to perform cost-benefit analysis in two AEC plants. Several other private firms are also engaged by AEC.
10. *Funding.*—No separate identification of the evaluation staff is made in budgetary requests, though funds are included under program direction and administration.
11. *Availability to Congress.*—Evaluation information is provided to the Joint Committee on Atomic Energy. Executive privilege will be invoked only by the President on a case-by-case basis.
12. *Innovations.*—None.
13. *Date of reply.*—August 19, 1971.

United States Civil Service Commission

1. *Number of domestic programs.*—Nine listed in OMB 1971 catalog.
2. *General description.*—Apparently the Civil Service Commission misunderstood our questionnaire. They state that their programs are not typical of the grants and assistance programs listed by OMB, and thus, they do not lend themselves to the specific questions of our letter. However, why such programs as 27.003; Federal Employment for Disadvantaged Youth, 27.004; Federal Employment for Disadvantaged Youth, Summer, 27.005; Federal Employment for the Handicapped, etc., do not lend themselves to questions concerning evaluation is not explained, except that these are "ongoing programs."
3. *Definition of goals and objectives.*—No information provided.
4. *Technique of evaluation.*—No information provided.
5. *Organization.*—Bureau of Personnel Management Evaluation review overall program administrations.
6. *State-Local evaluation.*—No information provided.
7. *OMB role.*—No information provided.
8. *GAO role.*—No information provided.
9. *In-house versus contracts.*—No information provided.
10. *Funding.*—No information provided.
11. *Availability to Congress.*—No information provided.
12. *Innovations.*—No information provided.
13. *Date of reply.*—September 24, 1971.

District of Columbia Redevelopment Land Agency

1. *Number of domestic programs.*—Agency administers no OMB listed programs.
2. *General description.*—The Agency is responsible for District of Columbia urban renewal activity. Its programs and staff are financed from HUD.
3. *Definition of goals and objectives.*—Agency is "production-oriented" and thus almost all activity is operated and monitored in terms of output measures. Both short and long-range objectives are defined.
4. *Technique of evaluation.*—The Agency employs status reporting, impact studies and, as mentioned, extensive output measurement.
5. *Organization.*—Evaluation centralized in the Office of Management and Evaluation, with projected staff in the Evaluation Division of four professionals.
6. *State-local evaluation.*—Not applicable.
7. *OMB role.*—Fairly involved, with frequent contact concerning production goals, etc.
8. *GAO role.*—None to date.
9. *In-house versus contracts.*—Several have been done, though when Evaluation Division is fully staffed, most evaluation will be in house.
10. *Funding.*—Evaluation Division funded from administrative budget, with specific positions identified in requests.
11. *Availability to Congress.*—Could be made available upon request.
12. *Innovations.*—Not as yet.
13. *Date of reply.*—August 13, 1971.

Environmental Protection Agency

1. *Number of domestic programs.*—27 listed by OMB.
2. *General description.*—EPA only recently established, and several of the programs now under its control had no evaluation capability. Currently they are determining their need, with a planned specific unit to be shortly created.
3. *Definition of goals and objectives.*—Still under analysis.

4. *Technique of evaluation.*—EPA has recently developed a cost-effectiveness system, and generally employs experimental testing of alternative strategies.
5. *Organization.*—Assistant Administrator for Planning and Management is central element responsible for evaluation. In addition, each major program will have its own capability. Each regional office, managing State and local programs, has an evaluation capability.
6. *State-local evaluation.*—Nothing mentioned.
7. *OMB role.*—OMB has worked closely with EPA in evaluating programs.
8. *GAO role.*—GAO, in addition to close audit involvement, has completed numerous reviews of EPA programs.
9. *In-house versus contracts.*—None to date.
10. *Funding.*—Funds specifically designated for program evaluation.
11. *Availability to Congress.*—Has been available in past and presumably will continue to be.
12. *Innovations.*—Now developing evaluation techniques that will consider interprogram issues.
13. *Date of reply.*—August 18, 1971.

Equal Employment Opportunity Commission

1. *Number of domestic programs.*—Three listed by OMB.
2. *General description.*—The Commission just recently established a Commission-wide capability for program evaluation, and thus fiscal year 1972 will see the first results from this capability.
3. *Definition of goals and objectives.*—The Commission is now in the process of defining productivity goals for all programs.
4. *Technique of evaluation.*—Program expenditure and output data, evaluated on the basis of cost-benefit and cost-effectiveness measurement systems, are extensively collected.
5. *Organization.*—Office of Program Planning and Evaluation, with nine positions; there is currently no program staff evaluation.
6. *State-local evaluation.*—"* * * some States do evaluate their own programs. * * *" However, effective July 1, 1972 no State or local agency will receive funds from EEOC, "* * * unless it has prepared a long-term plan to maximize the impact of the funds it receives from EEOC."
7. *OMB role.*—OMB has been involved primarily in evaluation of the employment survey programs.
8. *GAO role.*—No record of any particular EEOC program evaluation.
9. *In-house versus contracts.*—Currently a total of 10 contracted research studies (none of which involve Commissionwide programs) and four more are planned for fiscal year 1972.
10. *Funding.*—Funds appropriated under administration expenses, and will be "specifically designated for program evaluation." Evaluation at the headquarters or regional level will be funded from program activity authorizations.
11. *Availability to Congress.*—Most information will be available upon request.
12. *Innovations.*—As mentioned above, the Commission has embarked upon on extensive planning and program evaluation, including cost/benefit and output/input studies.
13. *Date of reply.*—October 18, 1972.

Farm Credit Administration

1. *Number of domestic programs.*—None listed by OMB.
2. *General description.*—No domestic programs, and "accordingly, we have no related evaluation function to perform."
3. *Definition of goals and objectives.*—No information provided.
4. *Technique of evaluation.*—No information provided.
5. *Organization.*—No information provided.
6. *State-local evaluation.*—No information provided.
7. *OMB role.*—No information provided.
8. *GAO role.*—No information provided.
9. *In-house versus contracts.*—No information provided.
10. *Funding.*—No information provided.
11. *Availability to Congress.*—No information provided.
12. *Innovations.*—No information provided.
13. *Date of reply.*—August 30, 1971.

Federal Power Commission

1. *Number of domestic programs.*—Three listed by OMB.
2. *General description.*—The Commission feels that, due to the nature of the programs, involved economic analysis, specifically output and objectives definition and evaluation, is not practical.
3. *Definition of goals and objectives.*—"Many of the Commission's activities are not defined in terms of objectives and outputs which can be readily measured and evaluated as to their effectiveness."
4. *Technique of evaluation.*—Except for a general cost/benefit analysis performed for the Wholesale Natural Gas Service (35.003), expenditure and output data are not evaluated in terms of productivity, cost-effectiveness or alternative approaches.
5. *Organization.*—The little evaluation that is done is performed on a highly decentralized basis within each program by participating program staff.
6. *State-local evaluation.*—None.
7. *OMB role.*—Involvement limited in all three programs to limited budget review, in conjunction with program staff.
8. *GAO role.*—None.
9. *In-house versus contracts.*—None.
10. *Funding.*—While no funds are specifically authorized for evaluation, this function is financed through general staff funds.
11. *Availability to Congress.*—Availability varies for each program with "pertinent information" unrestricted from water resources (35.001) and natural gas (35.003); from electric power (35.002), however, "the nature of the program is not such that evaluative information is available for use in considering authorization on funding levels."
12. *Innovations.*—None, except a program to train regional inspection personnel for water resources.
13. *Date of reply.*—September 23, 1971.

General Services Administration

1. *Number of domestic programs.*—Eight listed by OMB.
2. *General description.*—Evaluation varies with each program, ranging from a good PPBS in those administered by the National

Archives and Records Service (NARS) to functionally nonexistent evaluation in the business services program (39.001).

3. *Definition of goals and objectives.*—Goals and outputs are defined in all programs except business service..

4. *Technique of evaluation.*—Those programs administered by the NARS are evaluated through the PPBS. Business services is evaluated by monthly regional summaries. All other programs employ output evaluation with regard to future planning.

5. *Organization.*—Generally, all evaluation is performed by central offices, with data reporting done by participating program staff.

6. *State-local evaluation.*—None.

7. *OMB role.*—OMB performs no evaluation role with respect to Business Services or those programs (39.004, 39.005, 39.006) administered by NARS. In those administered by the Property Management and Disposal Service (39.002, 39.003, 39.007), OMB acts in cooperation with the program staffs on various studies. The Federal Information Center (39.008) program is evaluated by OMB independently.

8. *GAO role.*—There has been no GAO evaluation of General Services programs, except a limited, periodic evaluation involvement in 39.002, 39.003 and 39.007.

9. *In-house versus contracts.*—None.

10. *Funding.*—GSA authorizes no funds specifically for evaluation. This activity is funded through either general operating expenses or program staff appropriations.

11. *Availability to Congress.*—Generally, all evaluation information can be made available upon request.

12. *Innovations.*—In all programs but 39.002, 39.003 and 39.007 for which new output measures are being developed, there are no innovations planned.

13. *Date of reply.*—September 3, 1971.

Indian Claims Commission

This is a temporary agency concerned with the adjudication of Indian claims arising prior to August 13, 1946.

1. *Number of domestic programs.*—None listed in OMB.

2. *General description.*—As the Commission is temporary, evaluation has not been formalized.

3. *Definition of goals and objectives.*—Work easily defined by outputs and goals, while reply is not explicit, output goals are set to quickly dispose of all claims.

4. *Technique of evaluation.*—"* * * accomplishments are evaluated for general effectiveness, with due allowance for variations in case complexity." Outputs defined readily.

5. *Organization.*—Evaluation "performed as regular duties by the Chief Counsel and his deputies, and reviewed by the Commission."

6. *State-local evaluation.*—None.

7. *OMB role.*—"* * * has cooperated with our staff in evaluation * * *"

8. *GAO role.*—"* * * has evaluated administrative procedures but not our substantive program."

9. *In-house versus contracts.*—None.

10. *Funding.*—No evaluation staff and no funds designated for such appropriated.

11. *Availability to Congress.*—Made available in support of appropriation requests. No executive privilege.

12. *Innovations.*—None.

13. *Date of reply.*—July 29, 1971.

Inter-American Social Development Institute

1. *Number of domestic programs.*—None listed by OMB.

2. *General description.*—ISDI created in 1969, and thus far has funded, no programs, though they are endeavoring to include evaluation processes within the format of those proposed.

3. *Definition of goals and objectives.*—No information provided.

4. *Technique of evaluation.*—No information provided.

5. *Organization.*—No information provided.

6. *State-local evaluation.*—No information provided.

7. *OMB role.*—No information provided.

8. *GAO role.*—No information provided.

9. *In-house versus contracts.*—No information provided.

10. *Funding.*—No information provided.

11. *Availability to Congress.*—No information provided.

12. *Innovations.*—No information provided.

13. *Date of reply.*—August 25, 1971.

National Advisory Council on the Education of Disadvantaged Children

1. *Number of domestic programs.*—Council does not administer any OMB programs.

2. *General description.*—Three-man staff involved "superficially" in the evaluation of the title I programs.

3. *Definition of goals and objectives.*—None.

4. *Technique of evaluation.*—Council employs a general review of all title I programs.

5. *Organization.*—One research secretary and a staff director involved with research projects "of a superficial nature."

6. *State-local evaluation.*—None.

7. *OMB role.*—OMB not involved.

8. *GAO role.*—None.

9. *In-house versus contracts.*—None at present.

10. *Funding.*—Funded from title I program funds.

11. *Availability to Congress.*—Available at any time upon request.

12. *Innovations.*—Plan to make greater use of the Office of Education research arm.

13. *Date of reply.*—August 10, 1971.

National Aeronautics and Space Administration

1. *Number of domestic programs.*—Two listed by OMB.

2. *General description.*—NASA states that their activities, primarily pioneering research and development, are not conducive to quantitative analysis.

3. *Definition of goals and objectives.*—Goals of NASA are not defined by measurable objectives and outputs to gage effectiveness.

4. *Technique of evaluation.*—"All major work efforts are evaluated periodically in varying detail in terms of cost-effectiveness, alternative

approaches, et cetera." NASA requests cost-benefit studies on such major investment projects as space shuttle program from out-of-house contracts.

5. *Organization.*—The Office of Administration is the "focal point" for NASA program evaluation. Generally the agency does not maintain a separate evaluation capability. Participating program staff "* * * perform the bulk of day-to-day and periodic evaluation."

6. *State-local evaluation.*—Nothing mentioned.

7. *OMB role.*—"OMB has evaluated programs both in cooperation with NASA staff and independently * * *."

8. *GAO role.*—GAO is required by law to make cost-benefit studies. Other reports have been made on efficiency.

9. *In-house versus contracts.*—Though there are at present several contracts, "* * * the predominant practice is in-house evaluation."

10. *Funding.*—Except for one program, all funding for evaluation is by program or management designation.

11. *Availability to Congress.*—Information is made available to the authorization and appropriation committees, though information contained in the President's budget estimate is "administratively confidential."

12. *Innovations.*—None.

13. *Date of reply.*—September 15, 1971.

National Capital Housing Authority

1. *Number of domestic programs.*—Four listed by OMB.

2. *General description.*—Operations limited to the District of Columbia. HUD controls all development and management programs.

3. *Definition of goals and objectives.*—None.

4. *Technique of evaluation.*—Agency does employ alternative approaches and experiments, but only as the result of arguments with HUD.

5. *Organization.*—No separate office; several staffs involved.

6. *State-local evaluation.*—Not applicable.

7. *OMB role.*—OMB not involved directly, but rather through HUD evaluation.

8. *GAO role.*—There has been no recent activity.

9. *In-house versus contracts.*—HUD task force was engaged under contract during the past 2 years.

10. *Funding.*—All evaluation funded through HUD by subsidy.

11. *Availability to Congress.*—"The release of such information would probably require approval of HUD or OMB or both* * *."

12. *Innovations.*—Currently attempting to develop a procedure for continuing evaluation of the Housing Authority.

13. *Date of reply.*—August 12, 1971.

National Science Foundation

1. *Number of domestic programs.*—Listed by OMB, 35.

2. *General description.*—The Foundation does not feel that objectives such as improving the educational system's scientific training capability can be measured in terms of quantification.

3. *Definition of goals and objectives.*—"Objectives generally are long term and qualitative in nature." Quantitative output measures are not well defined.

4. *Technique of evaluation.*—Formal program evaluation in terms of output and expenditure data "has not as yet been done* * *."

5. *Organization.*—What evaluation is done is performed on a decentralized basis principally by program staffs; however, the Foundation has established a central evaluation staff, independent of the operating units.

6. *State-local evaluation.*—Nothing mentioned.

7. *OMB role.*—No regularly scheduled activity, though special studies are occasionally requested.

8. *GAO role.*—Similar to that of OMB, limited to occasional evaluation study requests.

9. *In-house versus contracts.*—Contracting done only in specific instances, not as a general practice.

10. *Funding.*—The evaluation staff (three professionals) is funded through the administration directorate budget appropriations.

11. *Availability to Congress.*—Information made available is limited.

12. *Innovations.*—Study of evaluation staff activities.

13. *Date of reply.*—August 24, 1971.

Office of Economic Opportunity

1. *Number of domestic programs listed by OMB.*— 11.

2. *General description.*—Economic Opportunity Act requires that all programs of OEO be evaluated. Also, OEO has done or will do overall impact studies of all its programs.

3. *Definition of goals and objectives.*—Cites difficulty in developing output measures for social programs. Apparently some programs are defined in terms of objectives and short-term output measurement, however. Also, some programs have multiple and overlapping objectives.

4. *Technique of Evaluation.*—Little mention is made of the employment of PPBS, of cost-effectiveness studies, of efficiency gages, et cetera. Though often cited as a model, OEO's reply specifies no particular evaluation techniques.

5. *Organization.*—Office of Planning, Research, and Evaluation, 18 professionals evaluating poverty programs of OEO and other agencies; Office of Program Development, nine professionals evaluating demonstration programs of Office of Planning and Development; Office of Health Affairs, Division of Program Planning and Evaluation, five professionals; Office of Legal Services; Planning, Technical Assistance, and Evaluative Division, three professionals; headquarters level, Office of Operation, three professionals; one for general, one for migrant programs, and one for State and local grants; 10 regional offices each employ one professional.

6. *State-local evaluation.*—No funds apportioned to State or local governments. However, project grants are given to States to support State Economic Opportunity Offices, whose role is advisory: some State offices maintain full-time professional staff for evaluation; others maintain part time.

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7. *OMB role.*—Role limited to synthesizing OEO evaluations.
8. *GAO role.*—Numerous reviews of OEO's operations—Economic Opportunity Act amended 1967 directing GAO to review programs under act to determine efficiency as well as extent of achievement of objectives; issued 60 reports to Congress in 1969, and 1971 had 28 audits in progress by June.
9. *In-house versus contracts.*—Contracting out-of-house primary vehicle for evaluation—$4 to $6 million per annum on contracts. Most of 1 percent of budget set aside for evaluation goes to contracting.
10. *Funding.*—Staff funded from budget activity lines of programs to which they belong. No specific legislative evaluation authorization, though OEO maintains 1 percent policy.
11. *Availability to Congress.*—Final reports of contract evaluations are made public 60 days after OEO acceptance. Raw data and draft reports are not made available.
12. *Innovations.*—Policy experiments, before and after studies, new data bases.
13. *Date of reply.*—September 9, 1971.

Overseas Private Investment Corporation

1. *Number of domestic programs.*—Five listed by OMB.
2. *General description.*—The OPIC was formally organized on January 19, 1971, and no later than March 1, 1974, will submit an analysis to Congress concerning the possibility of transferring all or part of its activities to the private sector.
3. *Definition of goals and objectives.*—There is little definition of either long-term or short-term productivity goals. Crude output measures (for example, an input of $11 billion investment insurance is considered to have produced $4 billion in private investment) are employed.
4. *Technique of evaluation.*—Long lead time and difficulty in projecting eventual outcome are considered to be the two factors which make OPIC activities not conducive to evaluation in terms of cost-effectiveness, efficiency and cost-benefit analysis. OPIC does consider experimental variations.
5. *Organization.*—The Office of the Vice President for Corporate Planning, composed of five professionals, with the support of the Treasurer's Office, undertakes the bulk of OPIC evaluation. Program staffs participate in reporting data.
6. *State-local evaluation.*—None.
7. *OMB role.*—Undertake an independent evaluation.
8. *GAO role.*—Several aspects of the OPIC activities have been evaluated by the GAO.
9. *In-house versus contracts.*—Response indicates that several consultant firms have been contracted to study OPIC specific activity area benefit.
10. *Funding.*—Evaluation is funded through personnel appropriations.
11. *Availability to Congress.*—Most will be available upon request.
12. *Innovations.*—Output indicators are being developed.
13. *Date of reply.*—August 3, 1971.

Postal Service

1. *Number of domestic programs.*—One (six postal academies) OMB program.
2. *General description.*—At time of reply, were reorganizing and developing evaluative methods, consequently nature of practices unclear.
3. *Definition of goals and objectives.*—In 1965, instituted a PPB system and have defined "functions" for some programs. More emphasis on immediate output goals, which is sensible in light of the Service's task.
4. *Technique of evaluation.*—In 1965, a PPB system was instituted which allowed comparison of planned outputs with actual accomplishments. Uncertain whether this apparatus still exists. Output seem to be measured in terms of number of pieces, deliveries, cases, families served, et cetera. Many operations are judged to not have quantifiable output.
5. *Organization.*—Due to reorganization, unable to describe organization and size of evaluation staffs. In the past, evaluation staffs were frequently composed of part-time operating officials. Carried out at all levels with overall evaluation at headquarters.
6. *State-local evaluation.*—No mention.
7. *OMB role.*—Vague answer—OMB will review budget from an "informational viewpoint," to make sure it fits the President's program.
8. *GAO role.*—Twenty-four studies in 1970, dealing with "financial controls, revenue collection, and improvement of agency programs."
9. *In-house versus contracts.*—March 1971, 154 active contracts dealing mainly with postal hardware and mailing systems design.
10. *Funding.*—No specific designation. In-house from postal revenue and operating receipts, contractual from "Research, development, and engineering" appropriation.
11. *Availability to Congress.*—"In general" available, on "case-by-case basis."
12. *Innovations.*—Whole evaluation apparatus being reorganized.
13. *Date of reply.*—August 27, 1971.

President's Council on Physical Fitness and Sports

1. *Number of domestic programs.*—Eight programs listed by OMB.
2. *General description.*—Extent of evaluation varies on a program-to-program basis.
3. *Definition of goals and objectives.*—As mentioned above, extent varies by program, from nonexistent in the Governor's Council on Physical Fitness to very good in the national summer youth sports program.
4. *Technique of evaluation.*—Cost-effectiveness and alternative approaches, as well as output measurement, used in the national summer youth sports program (NSYSP). Physical fitness and sports information program employs output and effectiveness measures. Generally output used where deemed applicable, and ultimate effectiveness used frequently.

5. *Organization.*—Decentralized, with no separate staff. Evaluations are performed extensively by other agencies and organizations, such as the National Collegiate Athletic Association, OEO, et cetera, and by participating program personnel.
6. *State-local evaluation.*—No information provided.
7. *OMB role.*—None.
8. *GAO role.*—None.
9. *In-house versus contracts.*—No contracts to profit organizations; OEO has evaluated NSYSP, and has contracted with the Auerback Corp. for a study on NSYSP.
10. *Funding.*—No specific authorization.
11. *Availability to Congress.*—No information provided.
12. *Innovations.*—No information provided.
13. *Date of reply.*—November 15, 1971.

Securities and Exchange Commission

1. *Number of domestic programs.*—One listed by OMB.
2. *General description.*—The Commission maintained that measurement of ultimate effectiveness and productivity is difficult.
3. *Definition of goals and objectives.*—There is no definition of productivity goals, neither short nor long range.
4. *Technique of evaluation.*—Expenditure and work data are evaluated in terms of alternative approaches and improved program strategies.
5. *Organization.*—Highly decentralized, with the responsibility for program evaluation borne by the division or office concerned with the program.
6. *State-local evaluation.*—None.
7. *OMB role.*—Primarily involved in the budgetary process, though one study of Commission activities was completed.
8. *GAO role.*—None, except periodic audits.
9. *In-house versus contracts.*—No contracting by the Commission, though OMB has retained a consultant firm to review Commission organization and operations.
10. *Funding.*—Staff funded through general appropriation.
11. *Availability to Congress.*—Information is made available through the budgetary process or upon request.
12. *Innovations.*—A new, small program evaluation staff is planned for the recently reestablished Office of Executive Director.
13. *Date of reply.*—August 30, 1971.

Small Business Administration

1. *Number of domestic programs.*—Fourteen listed by OMB.
2. *General description.*—Most areas which are shown to be lacking have planned innovations either currently under implementation or in the developmental phase. With these, SBA evaluation should be good.
3. *Definition of goals and objectives.*—". . . we have no full-blown, ongoing system, readily defined in terms of objectives and outputs conducive to measurement and effectiveness."
4. *Technique of evaluation.*—PPBS, focusing on costs to the taxpayer and benefits to the small business community. Emphasis has thus been given to cost-effectiveness measurement.

5. *Organization.*—Centralized under the Assistant Administrator for Planning, Research, and Analysis—six professionals and one secretary. Field offices, participating program staff relatively uninvolved.
6. *State-local evaluation.*—No information provided.
7. *OMB role.*—According to reply, role has been extensive. OMB has been "cast in the leadership role for the establishment and implementation of PPB systems." SBA and OMB work closely in this regard.
8. *GAO role.*—No past involvement, though currently evaluating one program as part of its regular general audit.
9. *In-house versus contracts.*—"Studies contracted out on a very limited basis," paid for by funds for research.
10. *Funding.*—Evaluation staff funded by the administration's administrative staff appropriations. No specific authorization for evaluation in SBA budget allocation.
11. *Availability to Congress.*—"* * * could be made available." "This would require processing by the Office of Management and Budget, in accordance with procedures for the clearance of legislation and legislative materials."
12. *Innovations.*—Statement of mission, objectives, and priorities to be developed; first planning and evaluation capability in the Chicago—Region V—area.
13. *Date of reply.*—October 7, 1971.

Tennessee Valley Authority

1. *Number of domestic programs.*—Three listed by OMB.
2. *General description.*—Generally seems rather poor, with no staff, little out-of-house, no objective definition, and with no overall program goals or outputs established.
3. *Definition of goals and objectives.*—In response to question asking number of programs operated and monitored in terms of definite output measures and goals, TVA stated "none."
4. *Technique of evaluation.*—Program elements are defined in terms of specific outputs, but programs themselves are defined by goals so general that program evaluation is impossible. Evaluation, however, is "commonly used in expenditure and output evaluation of individual program elements."
5. *Organization.*—General manager bears overall responsibility, while operating officers share this responsibility. No State or local offices. No independent evaluation staff.
6. *State-local evaluation.*—None.
7. *OMB role.*—"* * * has requested specific evalutions, but has not directed or participated in any evaluation effort at the agency level."
8. *GAO role.*—"* * * has audited and evaluated technical procedures, but has not made program evaluations."
9. *In-house versus contracts.*—"Consultants may occasionally be used in evaluation studies * * *."
10. *Funding.*—Program evaluation funded through program operating budget.

11. *Availability to Congress.*—"* * * will be provided to the appropriate committees on request."
12. *Innovations.*—A permanent planning and evaluation staff, initially consisting of several professionals, is to be established under the Office of the General Manager.
13. *Date of reply.*—August 9, 1971.

U.S. Commission on Civil Rights

1. *Number of domestic programs.*—One listed by OMB.
2. *General description.*—Commission is primarily a factfinding and fact disseminating agency, with output primarily publications based on hearings et cetera.
3. *Definition of goals and objectives.*—"We judge our effectiveness on how far the Nation evolves on the road to equal opportunity."
4. *Technique of evaluation.*—An annual program planning process; each month progress reports submitted by operating offices, to determine how well program objectives are being met.
5. *Organization.*—Office of Management; evaluation done only on an agencywide basis; no staff person assigned to evaluation, but simply one of duties of Director of the Office of Management.
6. *State-local evaluation.*—None.
7. *OMB role.*—"* * * evaluation in cooperation with agency people."
8. *GAO role.*—"* * * has had no part in evaluation studies of the agency."
9. *In-house versus contracts.*—Only one time, a study of State advisory committees.
10. *Funding.*—Office of Management funded through staff appropriations.
11. *Availability to Congress.*—"* * * could be made available upon request."
12. *Innovations.*—None.
13. *Date of reply.*—August 9, 1971.

United States Information Agency

1. *Number of domestic programs.*—No programs listed by OMB.
2. *General description.*—Major activities are informational services and opinion shaping and sampling.
3. *Definition of goals and definitions.*—The USIA does not define, except in a very limited sense, productivity goals and objectives. Agency does employ a PPBS.
4. *Technique of evaluation.*—Though no specific cost-effectiveness measurement system, general references were made in the agency response to concern for optimum resource allocation, alternative approaches, and improved program strategies.
5. *Organization.*—Both organized on a centralized and decentralized basis. Office of Research and Assessment, composed of three sublevel staffs, major evaluative mechanism, with 86 positions. The Office of the Director also maintains a resource analysis staff—15 positions.
6. *State-local evaluation.*—None.

7. *OMB role.*—Essentially a budgetary role. Generally USIA works in conjunction with OMB staff.
8. *GAO role.*—Role "relatively limited", though GAO reports usually contain findings concerning USIA support of U.S. objectives.
9. *In-house versus contracts.*—None.
10. *Funding.*—No specific authorization for either personnel or program evaluative effort.
11. *Availability to Congress.*—Agency "* * * makes every effort to share its evaluative information upon request * * *" to Congress.
12. *Innovations.*—None.
13. *Date of reply.*—August 13, 1971.

United States Tariff Commission

1. *Number of domestic programs.*—Three listed by OMB.
2. *General description.*—Tariff Commission involved in initial phase, factfinding investigations. Also, there are time limitations.
3. *Definition of goals and objectives.*—These "investigations are not of a type which may be readily defined in terms of objectives and outputs conducive to measurement."
4. *Technique of evaluation.*—Data collected "regarding costs" used by staff for planning and budgeting.
5. *Organization.*—No separate evaluation staff. Commissioners and senior staff perform an "evaluative function."
6. *State-local evaluation.*—Not applicable.
7. *OMB role.*—Regular consultation with OMB by staff regarding budget and management.
8. *GAO role.*—"GAO has not, to our knowledge, conducted any evaluation studies of our programs."
9. *In-house versus contracts.*—None.
10. *Funding.*—No separate evaluation funds, regular personnel channels.
11. *Availability to Congress.*—Information used in support of budget requests; use of executive privilege unlikely.
12. *Innovations.*—Pondering the use of automatic data processing equipment.
13. *Date of reply.*—August 6, 1971.

Veterans' Administration

1. *Number of domestic programs.*—Thirty-eight listed by OMB.
2. *General description.*—VA is wary of input/output measurement, as it feels that the number of hospital beds provided, for example is not the real output of a program. However, such output measures are used extensively.
3. *Definition of goals and objectives.*—"All of our programs are operated and monitored in terms of quantitative outputs * * *." The reply lists each program and the types of outputs specifically measured. Definition of goals is not mentioned in the reply.
4. *Technique of evaluation.*—VA emphasized output and expenditure evaluation in relation to the efficiency and effectiveness (cost-

effectiveness) of program execution. This emphasis entails experimental variation and input/output analysis.

5. *Organization.*—Assistant Administrator for Management and Evaluation—central element reporting to Administrator; "at the bureau level, independent elements are also involved in the evaluation of program execution."

6. *State-local evaluation.*—"* * * no information about State or local evaluation staff. No Federal funds are authorized for this purpose."

7. *OMB role.*—"* * * routinely involved," through budgetary process with VA staff and independently; and through "general management improvement programs."

8. *GAO role.*—"* * * continuously active," turning out several reports annually. Their interest, however, is more restricted to administrative issues, rather than with program substance.

9. *In-house versus contracts.*—"We do not contract for program evaluation as such." However, occasionally program execution studies are contracted; for example, currently a study of automatic data processing is underway.

10. *Funding.*—No appropriations are specifically earmarked for evaluation. Generally, funds authorized through operating expenses.

11. *Availability to Congress.*—Readily available in all congressional budgetary submissions; and unless approved by the President, executive privilege will not be used.

12. *Innovations.*—Plans to improve general evaluation staff, as well as the development of additional measurement criteria for "weak-spot" programs.

13. *Date of reply.*—September 15, 1971.

Washington Metropolitan Area Transit Authority

1. *Number of domestic programs.*—No programs listed by OMB.

2. *General description.*—Not a Federal agency in the normal scope.

3. *Definition of goals and objectives.*—Not defined.

4. *Technique of evaluation.*—No PPB, or building-block format. Review annually of operations to stay within budgetary constraints. Also, a benefit-cost study contracted for—benefits exceeding costs 3 to 1 ratio.

5. *Organization.*—Office of Program Control—10 full-time staff—responsible for monitoring funds. District of Columbia and suburban jurisdictions have full-time staff to evaluate programs.

6. *State-local evaluation.*—See No. 5.

7. *OMB role.*—Evaluates both independently and in cooperation.

8. *GAO role.*—Agency subject to GAO audit.

9. *In-house versus contracts.*—One major cost-benefit study thus far out-of-house.

10. *Funding.*—Program evaluation expenses are included in the administrative budget.

11. *Availability to Congress.*—Information made available to the appropriate committees; any information deemed necessary will be available by request.

12. *Innovations.*—None.

13. *Date of reply.*—September 2, 1971.

Water Resources Council

1. *Number of domestic programs.*—One listed by OMB.

2. *General description.*—A task force reviewed agency practices in 1965. Proposals were tested, but have yet to be implemented.

3. *Definition of goals and objectives.*—There are long-range goals formulated in a general way. No short-range productivity goals conducive to measurement are formulated.

4. *Technique of evaluation.*—The only quantitative evaluation performed is a cost-benefit analysis, described as a ratio of costs to proposed contributions to long-term objectives.

5. *Organization.*—Grant requests are evaluated by Council staff and an interagency state grants committee. Data reporting is carried out by the requesting State gency.

6. *State-local evaluation.*—None.

7. *OMB role.*—OMB reviews budgetary proposals, independently of Council staff.

8. *GAO role.*—GAO has undertaken an independent evaluation of the States planning grants program administration.

9. *In-house versus contracts.*—None.

10. *Funding.*—Staff is funded under administration and coordination appropriations.

11. *Availability to Congress.*—Available upon request.

12. *Innovations.*—Following completion of the task force's recommendations review, final recommendations will be made to the President.

13. *Date of reply.*—August 16, 1971.

Federal Home Loan Bank Board

1. *Number of domestic programs.*—One listed by OMB.

2. *General description.*—Board is composed of three members; response answers questions only with regard to their one domestic program, housing opportunity allowance program.

3. *Definition of goals and objectives.*—"Evaluation of expenditure and output data in the aspects noted in your question (2) has not been feasible due both to the newness of the program and the limited period of operating experience."

4. *Technique of evaluation.*—As the program is administered by individual member institutions, the Board does not feel that agency activities and the evaluation of effectiveness are very related.

5. *Organization.*—Office of Bank Management (two persons) in coordination with the 12 housing coordinators at each district bank is responsible for evaluation.

6. *State-local evaluation.*—None.

7. *OMB role.*—"OMB's role in evaluation is essential to review program effectiveness * * *."

8. *GAO role.*—"* * * has not as yet been involved in the evaluation process * * * ."

9. *In-house versus contracts.*—"Only the storage and processing of statistical data is done through outside sources * * * ."

10. *Funding.*—"No funding of the evaluation staff has been provided."

11. *Availability to Congress.*—"* * * is always available * * * ." "No executive privilege has been claimed for any evaluative information."
12. *Innovations.*—"* * * no innovations are contemplated."
13. *Date of reply.*—February 25, 1972.

PROFILES OF ANALYTICAL STUDIES

This compendium is the latest in a series of committee documents dealing with the effectiveness of public expenditures. Because of the size and variety of public spending programs, they have a vast effect on the economy. The committee has stressed the need for much better capability for evaluating public programs as a primary requirement for improving the competence of the Federal Government to formulate public economy policy.

The need for more extensive and higher quality analysis of Federal programs is made abundantly clear in the survey made under the supervision of Senator William V. Roth, Jr., Republican of Delaware, which appears as the first study in this volume.

Using an easily understandable, common sense approach, he reaches some striking conclusions:

Executive departments and independent agencies do a rather poor job of defining the goals or objectives of the programs they administer.

Use of a formal planning-programing-budgeting system is almost nonexistent among independent agencies.

There are almost no programs to help State and local grant recipients improve their own evaluation and analysis. In fact very few programs permit money to be used for such purposes.

The Office of Management and Budget's inovlvement in substantive evaluation at the agency level is very limited.

There are only a few instances where program money may be used for evaluation.

One paragraph in Senator Roth's summary is especially noteworthy for both policymakers and economists:

The use of analytical techniques is subject to a number of dangerous distortions. These include over-objectification, over-systematization, and use for advocacy by program managers and political executives. We must keep in mind that it is especially difficult to guage whether social programs are successful. These programs necessarily have *multiple goals* which in their ultimate form are very hard to measure. *Further, I think we need to guard against the erection of complicated formal structures of analysis which have no impact on decisionmakers.* (Emphasis added.)

It is especially unfortunate that analysis has not been used more fully since all of the advantages originally discussed still exist and substantial advances have been made in quantifying many of the costs and benefits. But if benefit-cost analysis is to be implemented and used to its fullest potential, renewed efforts must be made by policymakers in both the executive and legislative branches of government. The economics profession has made significant advances in the level of sophistication of their analysis which should aid this task, but one thing is clear—benefit-cost analysis does not make decisions.

Analysis can provide an important and helpful tool for making decisions, but it is no more than a tool. Problems involving social policy and value judgments must be considered and weighed in conjunction with the results of benefit-cost analysis and the final decision made by the human policymaker.

The following papers will illustrate the need for better analysis, they will help bring policymakers up to date on some advances made by economists, and they will provide some examples of the ways benefit-cost analysis is applied to different types of programs. The data and analysis contained in individual papers is quite helpful and informative for the programs discussed, but the real value of the volume is in its illustrative nature.

The problem of price changes has been largely ignored in most benefit-cost analysis. The reason has been that even though price inflation may cause some distortion in the allocation of resources, it is a pecuniary change and does not reflect future gains in the value of real output. This problem, however, becomes significant when the price of project inputs and the price of project outputs change relative to each other. When this occurs, a real change in the value of outputs has taken place and should be explicitly considered in the analysis. The first paper, "Benefit-Cost Analysis and Technologically Induced Relative Price Changes: The Case of Environmental Irreversibilities" by Krutilla and Cicchetti, examines these relative price changes for a specific case, Hell's Canyon.

There are two basic causes of these relative price changes. The first is simply growth in technology. As technology advances new plants can be built to operate more cheaply and efficiently than the existing plants, thus making the old ones obsolete before they are worn out. This, in turn, lowers the price of inputs relative to outputs—especially when those outputs include limited natural resources. The second cause of relative price changes lies in the nature of the irreproducible environmental resources used. As population continues to grow with a corresponding growth in the use of environmental resources, the value placed on these nonproducible resources will rise relative to producible goods.

In order to explicitly take account of these causes of price changes, the authors develop two models; the technological change development model to estimate the present value of the benefits of building a hydroelectric facility, and the preservation model to estimate the benefits of preserving Hell's Canyon in its natural state which would be necessary to make society indifferent between the two alternatives. Once they know what the preservation benefits would need to be, the authors can compare them with a benefit estimate derived from the technological change model. They find that the actual preservation benefits are an order of magnitude greater than would be necessary for society to be indifferent between preservation and development.

While the authors point out that their analysis is not conceptually complete—there are other benefits which might be included—the paper nevertheless goes a long way toward improving the way economic analysis is applied to projects involving environmental irreversibilities. This analysis can provide a useful base for developing the general methodology necessary to evaluate proposed environmental projects in an unbiased manner.

The second paper, by Davis, Ingle, and Gillen, also examines an environmental program but using a slightly different approach. They look at the small watersheds program and the evaluation methods currently used by the Soil Conservation Service. As is too often the case when a Federal agency undertakes benefit-cost analysis, the Soil Conservation Service methods are seriously inadequate.

Using two case studies as specific examples, the authors calculate the maximum value of environmental costs which might be incurred before the project would be rejected. In some respects this is a subjective figure but it offers an easily obtainable number to use as a first approximation. It is also helpful to use this number in conjunction with the benefit-cost ratio for those projects that may be marginal. The authors do not discuss any induced relative price changes which would tend to lower the maximum they have calculated. They also revise the Soil Conservation Service estimates of benefits and costs to arrive at a more accurate ratio. The sensitivity of the ratio to relatively small changes is readily seen.

The paper by Robert Haveman points out one of the more serious shortcomings of benefit-cost literature as it has developed to date. Researchers and analysts have concerned themselves almost exclusively with examining the prospective benefits and cost of a proposed program: This, of course, must be done in order to make the investment decision. However, once the decision is made, the analysts have tended to go on to the next proposal and never look back. Ex-postanalysis—looking back—can be extremely helpful in discovering the shortcomings of the previous analysis. This is Haveman's topic.

Reexamining a water resource facility, for example, 10 years after it has been put in place is not quite as simple as it might first appear. Improvements will have been made in evaluation technology and statistical techniques. This will necessitate reestimating the ex-ante appraisal using original data but new methodology. The actual performance of the project must then be evaluated and this evaluation compared with the newly reestimated ex-ante appraisal.

Even the straightforward reasoning above contains certain problems. Evaluating the performance of a project is one of the most difficult. If, for example, the flood losses actually prevented by a flood control project are used as an estimate of the project's benefits, then the project's worth will be greatly overstated. This is because part of the undamaged property located on the flood plain would have located elsewhere if the project had not been constructed and therefore would have been undamaged in any event. While this property may contribute to the economy of one particular locale, it does so at the expense of another part of the country; the net benefit to the Nation's income is zero.

This last point is particularly important for policymakers to understand, because it has been included in the Corps of Engineer's computations of the benefits of projects presented to Congress. A complete discussion of the Corp's methodology used on a particular project is contained in a recent GAO report.[1] Clearly when a benefit-cost analysis presents the policymaker with incomplete or misinformatio it is a disservice rather than a useful tool.

[1] "Comptroller General's Report to Hon. Bob Packwood, U.S. Senate," *Congressional Record*, Sept. 21, 1972, S15543.

Having discussed these and other problems likely to be encountered in any ex-post analysis, Haveman continues to a conceptual discussion of the benefits to be derived from a waterway improvement in the context of the U.S. transportation industry. Once the conceptually correct method of determining ex-ante benefits is determined, he compares it with the current practice of the Corps of Engineers. A case in point illustrates the inadequancies of the analytical framework applied by the Corps. In part, the Corps is following methods of analysis dictated by legislation. From a policy standpoint, Congress would be better served by legislation which would allow the use of improved evaluation techniques. Once again the need for congressional understanding is illustrated if benefit-cost analysis is to be used to its fullest potential.

In the final section of his paper, Haveman provides an example of how a conceptually correct ex-post analysis would be undertaken for a specific case. This illustrates the problems typically encountered and possible ways to solve them. More importantly, it points out the shortfalls in the performance of ex-ante estimation when it is not refined and improved by the feedback from ex-post analysis.

The welfare mess is one that has received increasing attention in recent years, but since the 92d Congress did not deal completely with the problem, it will continue to haunt us. This makes studies of welfare proposals such as "Family Assistance Plan: An Analysis and Evaluation" by Bowden, Cain, and Hausman, particularly useful.

While the study is concentrated or an evaluation of the FAP proposal, its usefulness is not limited to a single plan. Any form of an income maintenance program is going to encounter essentially the same problems; this primarily involves integrating the various forms of financial assistance with one another and developing a Federal program that is compatible with the many different State and local assistance programs. This paper analyzes these problems and provides a helpful methodology to examine other welfare proposals that may be put forth. Additional problems such as work incentives, and incentives to family stability can be examined within an economic context, but the ultimate social decision must be made giving appropriate weight to the political considerations as well as the economic.

The fifth paper in this volume by Smolensky and Gomery gives an overview of the benefits, costs, and equity consequences of providing low-income families with decent housing through public ownership and subsidy programs. Although it does not include overall cost estimates—taxes are not considered—the study does illustrate the usefulness of benefit-cost analysis in examining benefit-in-kind transfer programs.

Benefit-in-kind transfer programs provoke a basic question: why is the transfer made in kind rather than in cash? Clearly there are indirect benefits to the total society which might not accrue if the direct beneficiary could choose cash. These and the more obvious direct benefits and the various ways they might be measured are discussed in the first section of the paper. The authors conclude that if the goal of public housing is to maximize the number of people who choose to move from substandard into standard housing at a given level of expenditures, our current programs will not achieve that goal. However, that this is the true or overriding objective of public housing is not obvious.

The second section of the paper is devoted to equity considerations which are presumably implicit in our housing goals. Based on the authors results, it would appear that other considerations have outweighed tenant equity. As the authors point out, the distribution of non-tenant benefits is beyond the scope of this analysis.

The final part of the paper discusses the implications of benefit-cost analysis for decisionmaking. The two most important conclusions are: (1) All of the objectives of our housing program should be spelled out in reasonable detail and (2) sufficient information must be available to adequately evaluate the program. Once again we see the importance of the ex-postanalysis discussed by Haveman.

The paper by Martin Feldstein on the medicare program is basically a look at a Federal program through an econometric model. This can be a very useful way of examining the benefits of a program, particularly when the impact on the private market is of concern. An econometric model provokes a whole set of questions about the interaction of Federal programs with the rest of the market; it also can provide some surprising insights into the answers.

By the end of its second year of operation, the medicare program has paid out over $8 billion in benefits and had had a substantial impact on the health care segment of our economy. Has this program lived up to the expectations of its authors? Whatever the answer, any program of this magnitude certainly deserves some careful scrutiny.

One of Feldstein's findings which policymakers may not have expected is that in spite of uniform national coverage, the benefits actually received vary widely among the different States. Again this relates to the problem of integrating Federal and State income transfer programs that was discussed earlier in the context of FAP by Bowden, Cain, and Hausman. Other findings relate to the impact medicare has had on the cost of health care in general—younger age groups are forced to pay higher prices; the impact of medicare on the use of health facilities by different age groups; the impact of medicare in different areas of the country with varying population density; the impact of medicare on different health facilities such as nursing homes, and so forth.

Although Feldstein does not make normative judgments about medicare, his analysis provides the basis for policymakers to make these decisions. Concurrently this type analysis should be very helpful in refining the program to reach its objective more efficiently and with minimal undesired side effects.

The last papers in this volume are devoted to programs that involve some kind of training or education. The most difficult problem in evaluating any program of this sort is to measure benefits in terms of how close they approach the program's objectives. Too often in the past, measures of these programs have focused on the visible inputs such as the number of participants or the physical facilities used. While this latter measure is more easily obtainable, it is virtually useless for evaluating the program.

The first of these papers is an evaluation of the Neighborhood Youth Corps by Somers and Stromsdorfer.[2] Since this program has the objective of encouraging potential high school dropouts to remain in school, it is extremely difficult to arrive at a single number to call the benefit-cost ratio. The benefits which can be quantified and used for program evaluation include the difference in earnings of two persons of comparable background—one of whom participated and one who did not, and changes in the probability of attaining a given level of education. Based on their findings, the authors conclude that the Neighborhood Youth Corps has had a significant impact on the enrollees' participation in the labor force and therefore on total earnings. The inschool program may be an effective social program but the value of the summer program, although it may serve noneconomic purposes is doubtful. They also conclude that income is not a dominant factor in the decision to drop out of school. For the policymaker, this implies that programs to succeed in encouraging potential dropouts to remain in school.

The next paper is an evaluation of the economic efficiency of remedial elementary education for disadvantaged adults by Myron Roomkin. Once again, there are many noneconomic consequences of basic education which must be considered in policymakers' decisions to grant or deny support for such programs.

Roomkin is more optimistic about the prospects for quantifying noneconomic benefits than many of his fellow researchers, but as he notes in the paper, if basic education programs are to be justified on economic grounds, then at a minimum the economic benefits such as increased individual earnings and improved productivity must be measured. He attempts this measurement using multiple linear regression analysis with such variables as average hourly earnings before training, amount of vocational training in addition to basic education, age, level of educational attainment, etc.

While the results may be disappointingly small and inconclusive for those who expected basic education to be the best approach to helping the disadvantaged, there are some positive and useful things to be learned from the study. One of the most interesting which is hinted but not thoroughly explored, is the relationship between basic and vocational education. This study suggested that with an increased level of basic educational attainment, subsequent vocational training may have much greater benefits.

Another paper in this final group is Bruce Davie's analysis of a vocational training program conducted by the Bureau of Indian Affairs. The method of analysis is necessarily and admittedly very simple and open to legitimate challenge, the assumptions underlying the analysis are highly questionable. The value of the paper, therefore, does not lie in the ratios calculated, but in illustrating the potential improvements that become obvious as program managers go through the exercise of calculating those ratios. These program improvements are the human resource corrollary to the analytical improvements discussed in the earlier paper by Robert Haveman.

The next paper is also concerned with vocational education but it looks at a different aspect. The study by Hu, Lee, and Stromsdorfer compares earnings and employment by vocational high school graduates with those of comprehensive high school graduates. By controlling for certain sociodemographic characteristics such as sex, IQ, race, and so forth, the authors are able to obtain good comparable estimates for earnings and employment differentials over a 6-year period.

[2] The authors use the term "cost-effectiveness" to describe their analysis. This term originally came from military analyses where the objective was specified and the problem was to find the least cost method of achieving it. The term has been broadened so that now it is used generically or interchangeably with "benefit-cost."

Although some of the statistical estimates have large standard errors the general conclusion is clear: noncollege vocational school graduates on the average do better in terms of earnings and employment than noncollege comprehensive school graduates. When costs and benefits are compared, vocational education—although more expensive—appears to be the better investment. One should note, however, that as the comprehensive school graduates gain experience in the labor force, the earnings gap between the two groups tends to narrow.

The final paper in this group examines several older benefit-cost analyses and compares the results. As it points out, there is such variation in the assumptions and data underlying the analysis that the ratios measured in one study are not necessarily comparable to those measured in another. The authors attempt to adjust for these differences and arrive at a comparable set of numbers. They point out, however, that "the numbers alone, without regard to the peculiar viewpoints and definitions behind each of the numbers used, are almost certain to be misleading."

In response to the problem of inadequate and inconsistent data, the study includes a list of recommendations addressed to the Congress. Even if no substantive changes were made in manpower programs, collecting this basic data and providing the recommended followup information could certainly contribute better informed decisionmaking.

BENEFIT-COST ANALYSIS AND TECHNOLOGICALLY INDUCED RELATIVE PRICE CHANGES: THE CASE OF ENVIRONMENTAL IRREVERSIBILITIES

By JOHN V. KRUTILLA *and* CHARLES J. CICCHETTI *

The application of economic analysis in public (and private) expenditure evaluation involves many simplifications. Since in a general equilibrium sense everything depends on everything else, the inclusion of all the interdependent variables of possible theoretical significance in analysis would overwhelm the analyst as well as the decision under consideration.[1] Accordingly, at best only the variables expected to have the preponderant quantitative significance are treated. It is assumed implicitly that the excluded variables would provide information insufficiently significant in a quantitative sense to warrant the added costs of more detailed treatment. Typically a consensus is developed by the practitioners in any field of application regarding the variables of greatest significance for the purpose being considered which will generally have its roots in a self-conscious examination of the warranted level of detail.

Thus, in the course of the development of benefit-cost analysis for public resource development programs in the United States, the question of the significance of expected future increases in the general price level came under serious examination by members of the coordinating group recommending benefit-cost procedures for Federal resource development agencies. It was recognized that while price inflation will result in some distortion in the allocation of resources, it nonetheless was a pecuniary phenomenon which should not be mistaken for future gains in the value of real output from the investment under consideration. Accordingly, the Subcommittee on Benefits and Costs of the Federal Inter-Agency River Basin Committee recommended in 1951 that the general price level, for purposes of project evaluation, be assumed to remain constant over the life of the project under consideration.

Following the Federal Reserve-Treasury Accord of 1951, interest rates and bond yields began to rise, accompanying the earlier and persistent rise in the general price level. The opportunity cost of capital, in public investments, soon began to exceed the interest rates used in public investment planning.[2] In response to the vigorous

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[1] See Roland McKean on the meaning and inevitability of sub-optimization, or partial equilibrium analysis, in *Efficiency in Government Through Systems Analysis* (New York: John Wiley & Sons, 1958), pp. 26-34.

[2] See John V. Krutilla, "Efficiency Goals, Market Failure, and the Substitution of Public for Private Action" in *The Analysis and Evaluation of Public Expenditures: The PPB System*, a Compendium of papers submitted to the Subcommittee on Economy in Government of the Joint Economic Committee of the Congress (Washington: GPO, 1969), Vol. I, p. 281.

effort to bring the two into greater conformity,[3] a counter argument was advanced. Since a stable price level for resource development projects' outputs was assumed, it was argued that it would be necessary to have interest rates for planning purposes continue below the market rate of interest (or yields on government long term bonds) in order to avoid introducing a spurious change in relative prices of project inputs and outputs. That is, a large part of the increase in the market rates of interest, it was implied, could be attributed to a premium required in yields of fixed-principal assets to compensate for the persistent erosion of their real value due to expectations of continued price inflation.[4] The distinction drawn between changes in the general prices' level and changes in relative prices has merit. Nonetheless there were many good reasons to introduce a consideration of changes in prices of project outputs relative to prices, or opportunity costs, of project inputs. That this was the case followed from the results of extensive research on the behavior of prices of extractive industry production relative to the prices of goods and services generally. The costs of extracting natural resource commodities and their market prices historically were shown to have remained either stable (for some) or actually declined (for others) relative to the price of goods and services in general.[5] Accordingly, since these were the commodities which were being produced, in part, as outputs of the public resource development programs, there was in fact an authentic change in the price of outputs of such programs relative to the general price level. But the changes were in a direction contrary to that which the proponents of a differential (lower) interest rate for planning purposes assumed to be required.

With authentic changes in relative prices of program inputs and outputs established, such changes, if demonstrated to be quantitatively significant, should be included among the items explicitly considered in benefit-cost analysis.

A related issue of a somewhat different character is also potentially relevant for consideration of changes in relative values. Many resource development programs result in the "reclamation" of lands representing natural environments or the development of arable land by the transformation of natural areas which themselves have a potential to yield services of value in their natural state. Similarly the development of hydro-electric power, and related water resource developments, in the process not infrequently convert free flowing streams and other bodies of water from their natural state to "working rivers." The conventional practice in benefit-cost analysis has been either to ignore, or to treat such services as "extra-economic." [6] As common property resources are often being used for such purposes, but only private

[3] During 1968 and 1969 hearings were held by the Joint Economic Committee coinciding with an effort by the Bureau of the Budget to move the rate used for discounting into greater conformity with yields on long term government bonds. See for example, *Economic Analysis of Public Investment Decisions; Interest Rate Policy and Discounting Analysis*. Hearings before the Subcommittee on Economy in Government of the Joint Economic Committee (90th Congress, 2nd Session), July 30, 31; August 1, 1968 (Washington: Government Printing Office, 1968).

[4] See testimony of Henry P. Caulfield, Jr., *ibid.*, p. 14.

[5] Neal Potter and Francis Christy, *Trends in Natural Resource Commodities: Statistics on Price, Output, Consumption, Foreign Trade, and Employment in the United States, 1870-1957* (Baltimore: The Johns Hopkins Press, 1962).

[6] See for example, *Proposed Practices for Economic Analysis of River Basin Projects*. Report to the Inter-Agency Committee on Water Resources, prepared by the Subcommittee on Evaluation Standards, Washington, 1958, p. 44; McKean, *op. cit.*, p. 61; John V. Krutilla and Otto Eckstein, *Multiple Purpose River Development* (Baltimore: The Johns Hopkins Press, 1958), p. 265; and Maynard M. Huffschmidt, John V. Krutilla and Julius Margolis, *Standards and Criteria for Formulating and Evaluating Water Resource Developments*. Report to the Bureau of the Budget, Washington, 1961, pp. 52-3.

property resources used in public (and some private)[7] development programs are counted as costs, the opportunity benefits foregone by the preemption of common property resources are conventionally overlooked. More significant than the exclusion of these opportunity costs as reflected in current demand, is the fact that the preempted resources are frequently irreproducible environmental resources. Accordingly, while the flow of extractive industrial commodities has been augmented at falling supply price historically due to gains in productive efficiency, an increase in demand for irreplaceable assets will result in growing relative scarcity and increase in relative value. There then appears to be an asymmetry in the implications of technological advance for the value of the different purposes to which such environmental resources will be devoted which will be reflected in changes in relative values.[8]

It will be the purpose of this paper to investigate the quantitative significance of taking these previously neglected considerations into account. We shall do so in the context of a currently controversial environmental case involving the Hells Canyon of the Snake River occurring between the Wallowa Mountains of Oregon and the Seven Devils Peaks of Idaho.[9]

A Multiperiod Model for a Hydroelectric Power Facility: The Developmental Case

The Hells Canyon represents the deepest gorge on the North American Continent. Due to the elevation differential from Canyon floor to its rim, most of the ecological life zones found in North America are represented in a horizontal distance of roughly half a mile. Because of its great depth, narrowness of its course in some reaches and the steepness of its walls, it represents both a unique geomorphological occurrence and perhaps the best remaining hydroelectric site in coterminous United States. Development of the site for hydroelectric power, of course, will represent an action with an irreversible environmental impact, thus foreclose one of the options presently available. Preservation of the natural environment of the remaining portion of the Canyon [10] will require forebearing the benefits from hydroelectric development. In short, the net benefits lost by the preclusion of one alternative course of action by adoption of its mutually exclusive alternative represents the opportunity cost of the selected course. In this section we shall evaluate the benefits of development considering all costs except for the opportunity benefits available from the area if retained in its present state.

As long as the price consumers are willing to pay exceeds the project's cost, the accepted method of estimating the net benefit of a hydroelectric development is to compare its costs with that of the most economical alternative designed to provide identical services. Since the services provided are the same, the gross benefits of the two alternatives being compared must be equal. The only net benefit

[7] Private developments on publicly-owned lands and water under license or permits such as private hydroelectric developments on navigable streams, mining on lands in public ownership, etc.

[8] John V. Krutilla, "Conservation Reconsidered," *American Economic Review*, September 1967, Vol. 57, No. 3, pp. 777-86.

[9] See, *In the Matter of Pacific Northwest Power Company and Washington Public Power Supply System* Projects Nos. 2243/2273, before the Federal Power Commission.

[10] It should be mentioned that approximately a half of the Canyon's two-hundred mile length has already been developed by the Idaho Power Company.

that one can claim will be the savings in cost that it can show rs compared with its alternative.[11]

This traditional measure of benefit is calculated at the time the hydroelectric power project is constructed and therefore implicitly assumes that the technology of alternative sources of energy is fixed over the entire life of the hydroelectric project. However, in a growing, technologically innovating economy, new thermal plants with new technology replace older less-efficient plants within the period typically taken as the life of a hydro plant. The improved technology and shorter life of alternative energy sources should be reflected in both changing energy and capacity costs and suggest an adjustment to the conventionally measured net benefits of a hydro facility.

The traditional unadjusted present value of the cost of the alternative source of electric power can be represented as follows:

$$PVC_a = \sum_{n=1}^{50} \frac{[C_I + E(8760F)]}{(1+i)^{n-1}}$$

where: n = the assumed life of the hydro facility (50 years)
C_I = constant annual capacity costs/KW of the alternative energy source
E = energy cost/KWH
F = the plant factor (assume to be 0.90)
i = the discount rate

The F term represents the plant factor, which is defined as the average power load over the relevant time period divided by the peak load. By operating under a rule of minimizing unit costs the system uses its most efficient plants first. The system will be managed in such a manner that those plants with the highest efficiency are utilized most fully; this policy will mean the newest plants will have the highest plant factor.

As any one plant in the system ages and new plants enter the system with improved operating efficiency and reduced unit cost, the older plant will be used a smaller proportion of the time. To take account of the impact of technological change, we recognize that as the alternative for the hydro facility begins to age, its plant factor will decline. The Federal Power Commission studies suggest that a thermal alternative enters with a high plant factor but declines to 0.20 by the 20th year.[12] We assume for computational simplicity that the plant factor declines from 0.90 in the initial year to 0.30 in the 20th year and replacement in the 30th year, that is, by an arithmetic factor of 0.03 per year.

This energy will be replaced each year by an equal amount of energy but at reduced costs from new, more technologically advanced additions as more efficient plants enter the system over time. In any given year the alternative cost of an equivalent source of energy to the hydro will be made up of the weighted average of today's and tomorrow's technology. Such an adjustment of the conventional formulation of the costs of the alternative is derived in appendix A.

[11] See, Peter O. Steiner, "The Role of Alternative Cost in Project Design and Selection," *Quarterly Journal of Economics*, Vol. LXXIX, No. 3, pp. 421-22 (August 1965). Proof of this statement is found in Appendix A.

[12] "Hydro-Electric Power Evaluation," F.P.C. No. P-35 (1968) and "In the Matter of . . . ," testimony of Dr. John V. Krutilla.

Furthermore, when the original thermal plant reaches 30 years of age it will be replaced by a new plant, therefore the effect of technological change on capacity costs will also be important. We can expect that a new capacity cost after 30 years will be equal to the present capacity costs reduced by the rate of technological advance.

We can express the present value of alternative costs adjusted for both capacity and energy cost changes with technological progress for the 50-year expected life of the hydro facility as:[13]

$$PVC'_a=[C_I+(8760)EF]\frac{(1-a^{30})}{(1-a)}-\frac{8760EK}{i}\left[\frac{1-a^{29}}{1-a}-29a^{29}\right]+$$

$$\frac{8760EK}{(1+r)(1+i)-1}\left[\frac{1-b^{29}}{1-b}-29b^{29}\right]+\left(\frac{1}{(1+i)}\right)^{30}\left([C_{II}+8760'E'F]\frac{(1-a^{20})}{(1-a)}-\right.$$

$$\left.\frac{8760E'K}{i}\left[\frac{1-a^{19}}{1-a}-19a^{19}\right]+\frac{8760E'K}{(1+r)(1+i)-1}\left[\frac{1-b^{19}}{1-b}-19b^{19}\right]\right)$$

where:

K = a constant representing the time decay of plant factor (assume .03)

r = the annual rate of technological change

$C_{II}=C_I/(1+r)^{30}$

$E'=\frac{E}{(1+r)^{30}}$

$a=\frac{1}{1+i}$

$b=\frac{1}{(1+r)}(1+i)$.

Using similar notation for the traditional measure of the present value cost of the alternative:

$$PVC_a=\sum_{n=1}^{50}\frac{[C_I+E(8760F)]}{(1+i)^{n-1}}$$

becomes:

$$PVC_a=[C_I+(8760)EF]\frac{(1-a^{50})}{1-a}.$$

Now we can determine the adjustment factor necessary to calculate the net benefits of a particular river as an input for the production of electric power, by adjusting the conventional measure of net benefits:

$$b_d=PVC_a-PVC_H,$$

where: PVC_H is the present value of hydro power costs

to show the impact of technological change on both energy and capacity costs of the alternative by dividing PVC'_a (adjusted) by

[13] See appendix A for this derivation.

PVC_a and recalculate net benefits using this adjustment factor as b'_d, by:

$$b'_d=\frac{PVC'_a}{PVC_a}\cdot PVC_a-PVC_H$$

$$b'_d=PVC'_a-PVC_H.$$

In table I the calculation of the percentage of unadjusted to adjusted costs

$$\frac{PVC_a}{PVC'_a}$$

is shown. The results of this adjustment are rather insensitive to various assumptions about i, r, and the three different mills per kilowatt-hour values, as used in the Hells Canyon case. However, when alternative costs (PVC_a and PVC_H) are close, the change in net differences may be significant.

TABLE I.—OVERSTATEMENT OF HYDROELECTRIC CAPACITY AND ENERGY VALUES BY NEGLECTING INFLUENCE OF TECHNOLOGICAL ADVANCES

Discount rate per year (i=)	Technological advance rate per year rt=	Conventionally estimated costs of the alternative as a percentage of the costs of the alternative when adjusted for influence of technological advance, for various capacity and energy costs			
		Dollars per kilowatt capacity	Mills per kilowatt-hour		
			Percent at 0.98	Percent at 1.22	Percent at 1.28
0.08	0.03	27.43	107.4	107.9	108.0
	.04		109.0	109.6	109.7
	.05		110.2	110.9	111.1
0.09	.03	30.08	105.9	106.4	106.5
	.04		107.2	107.7	107.8
	.05		108.2	108.8	108.9
0.10	.03	32.89	104.8	105.1	105.2
	.04		105.8	106.2	106.3
	.05		106.5	107.1	107.2

Source: "In the matter of . . . ." Op. cit., exhibit 670, table 1, p. 3, testimony of John V. Krutilla.

A Multiperiod Model for the Preserved Canyon

Consider next the preservation alternative. When the facility providing the service is a reusable, nondepreciating asset, such as a natural environment protected against destruction or degradation, the gross value of benefits is the area under the demand curve for each time period the natural area is used. If time is given the customary value of 1 year, the gross benefit of the natural area would be approximated by the sum of discounted annual benefits. This present value can then be compared with the capital investment (if any) plus the present value of annual operating costs (if any) and also the opportunity cost, or net present value of the most economical alternative use (b'_d) precluded by retention of the area for uses compatible with existing environmental conditions in the Canyon.

To establish the consistency in the treatment of the net developmental and net preservation benefits, we must also consider the net value of substitute environmental resources which might also provide experiences similar to those possible in the present canyon.

Since the canyon in an undeveloped state is a gift of nature, the costs, other than opportunity costs accounted for in b'_d, are zero. Additionally, Hells Canyon is in many respects unique,[14] thus the benefits to society from preserving attributes of uniqueness cannot be diminished by close substitutes, since none exist. However, some present uses of the Canyon, such as big game hunting, white water boating and fishing may occur with alternative environmental resources. If the present availability of these alternatives exceeds the present and expected future demand, the value of preserving the canyon for these uses, which is but one component of this excess supply, would be negligible.

At the present time wilderness areas comparable to Hells Canyon may be generally characterized in one of two ways. In some cases or for some uses they are managed so as to control and restrict use, i.e., ration the available supply. When certain areas are regulated in this manner, they will not be feasible alternative sources of supply for prospective users of Hells Canyon since they are already being used at or near capacity. In other cases environmental resources may be open to use without rationing. In such cases use will continue up to the point where congestion costs grow large and reduce net average benefits per user to zero. From the testimony in the case and the work of George Stankey [15] we may conclude that for activities which use the services of both the canyon and other environmental resources, reducing the supply by altering the canyon will prevent present and potential users from finding available like substitutes. Under the circumstances there would be no positive net alternative benefit, and preservation benefit is reduced to an evaluation of gross benefits for the activities provided at the preserved Canyon.

If the demand for the services of the area grows, congestion externalities eventually will arise. That is, a point will be reached beyond which the use of the area by one more individual per unit time will result in a lessening of the utility obtained by others using the area. We have taken this point to be the carrying capacity of Hells Canyon for the purpose of our analysis. If the marginal benefits of additional users exceed the marginal congestion costs they inflict on others, total benefits could be increased by relaxing this constraint. But, we seek to define a quantity of constant quality services the value of which represent a lower bound estimate of the preservation alternative. Implicit in this position, of course, is the assumption that pricing will be employed in practice to ration use to the constraint level.

Growth in the demand for services of the preserved area and a capacity constraint introduce some complications in the analysis. First, as income, relative prices, population and tastes change through time, the usual *ceteris paribus* assumptions must be relaxed. Accordingly, the shape and area under the demand curve may be expected to change with temporal shifts in the demand curve. Such shifts must be incorporated into the benefit estimating procedure and treated separately. Secondly, capacity constraint, since its value sets the

[14] See, Luna B. Leopold, "Quantitative Comparison of Some Aesthetic Factors Among Rivers," Geological Survey Circular 620 1969) also his testimony, "In Matter of: Pacific Northwest Power Company and Washington Public Power Supply System," Projects Nos. 2243/2273, before the Federal Power Commission.

[15] George Stankey, *The Perception of Wilderness Recreation Carrying Capacity: A Geographic Study in Natural Resources Management*, Michigan State University, Department of Geography, Ph. D. Thesis, 1971.

limit on the range over which the quantity demanded can be assumed without further adjustment, must be defined.

Taking the effect of population change first, a plausible hypothesis is that, given similar individual demand schedules for successive population, an increase in population will cause a constant percentage increase in quantity demanded for any given price. That is, if we expect relatively constant preferences and income distributions as the population grows, this would mean that the ratio of the percentage change in quantity demanded to the percentage change in population would be invariant with price, or that there would be a constant elasticity of quantity demanded to population size.

Two other components of the shift in the demand schedule result from changing consumer incomes and relative prices. With advances in technology it is expected that the stocks of producible goods per capita will increase and a concomitant drop in the price of these producible goods will occur. The price per unit or value of nonproduced goods in fixed supply would be expected to change relative to price of producible goods.

Hicks and Allen [16] by using a system of simultaneous partial differential equations have explained the necessary and sufficient conditions for relative price variation in a two-good world. These will be functions of the relative income elasticities, price elasticities, cross elasticities, percent of initial year's budget spent on each commodity and the elasticity of substitution. From their analysis we conclude that if (*a*) the present uses of Hells Canyon as a preserved environmental resource have poor substitutes among manufactured goods, (*b*) the income and initial price elasticities of demand for present uses of the Canyon are numerically larger than for manufactured goods in general, and (*c*) the percent of the budget spent on the good in fixed supply is smaller than on producible or manufactured goods in general, we would expect the relative price and therefore value of the good in fixed supply to grow over time relative to the price of manufactured goods. In short, we are assuming that the environmental services of an unaltered Hells Canyon are relative luxury goods in a two-good world.

To utilize the above criteria in a computational model, as economic expansion occurs, two conventional economic parameters are important. First, the income elasticity of manufactured goods and second, the cross-elasticity of demand of the price of Hells Canyon relative to the quantity of manufactured goods. For computational simplicity these two effects are combined to form a vertical shifter for the demand schedule.

It then follows that if a visit to Hells Canyon is considered a relative luxury good with no close substitute by a portion of the population (which considers manufactured goods as normal goods) the price

[16] Hicks, J. R. and R. G. D. Allen, "A Reconsideration of the Theory of Value," *Economica*, New Series Vol. I, 1934. In their analysis they provide a framework that can be used to determine the conditions sufficient for the price of a good in fixed supply to grow relative to the price of manufactured goods. These are that the elasticity of income for the good in fixed supply must exceed the elasticity of substitution which in turn must exceed the income elasticity of manufactured goods. If it is also expected that the price elasticity of manufactured goods is inelastic, then all three shifters for the demand curve of the good in fixed supply will be positive for quantity and price. These three shifters are the income elasticity, and the two cross-elasticities multiplied by their corresponding percentage price decrease and percentage quantity increase for the manufactured goods. See "Preservation vs. Development: Some Economic Issues," C. J. Cicchetti and J. V. Krutilla. Paper presented at the Econometric Society, New York, 1970.

or value that this group will be willing to pay for a visit to Hells Canyon would grow over time. Finally, we assume for computational simplicity a constant percentage increase in willingness to pay per percentage increase in income for a given quantity.

A third component of shift in demand indicated above was taste. The tastes or preferences of individuals may be thought of as affecting the numerical values or signs, the explicit elasticities of population to quantity (horizontal) and income to price (vertical) over time. For example, in the initial time period population might grow at, say, 1.5 percent per year but the quantity demanded at zero price might be growing at 10 percent per year. However, the rate of change of tastes for the population at large favoring this kind of recreational activity would begin to decline as a "saturation level" is approached so that eventually demand will reflect only additions to population and incomes rather than an increasing proportion of the population participating.

To this point we have avoided being specific about the nature of the "preservation values," and this has been deliberate. The services which a natural area of this sort can provide are several, the value of some of which have become measurable by advances in economic analysis, for example the value of some outdoor recreation resources, while the value of others are as yet intractable to economic measurement, for example, option value of preserving rare scientific research materials. For this reason we adopt an alternative strategem. We do not seek, directly, to learn the present value of services yielded from the Canyon if preserved in its present condition since we do not know how to measure it *en toto*. We ask rather what would the present value need to be to equal or to exceed the present value of the developmental alternative. And to get better insight, we ask additionally, what would the base year's annual benefit need to be, changing in response to real income and population growth, to have a present value equal to or greater than the developmental alternative. This latter step is of considerable analytical assistance by virtue of the difference in the relation between the initial year's benefit and total present value for the two competing choices of the area in question—preservation or development. This follows because of the asymmetry in the behavior of the value of the output streams from the two incompatible uses of the site as technology changes and the economy grows. We show this in exaggerated form for illustrative purposes in the present value computational models for the two below.

The development alternative:

$$b'_d = \sum_{t=1}^{T} \frac{b_o(1+r)^t}{(1+i)^t}$$

Where b'_d is the present value of developmental benefits
b_o is the initial, or base year's, benefits
T is the relevant terminal year for the development alternative
i is the discount rate
r is the simplified representation of the technological change adjustment for development benefits presented earlier.

The preservation alternative:

$$b_p = \sum_{t=1}^{T'} \frac{b_o(1+\alpha)^t}{(1+i)^t}$$

Where b_p is the present value of the benefits from preserving the area in its natural condition
b_o is the initial, or base year's, benefit
T' is the relevant terminal year for the preservation alternative
i is the discount rate
α is the rate of growth in annual benefits as qualitatively described above and quantitatively explained in detail in appendix B.

We assume that T and T', the terminal year for each choice, are determined by the year in which the discounted annual benefit falls to zero.[17] These values need not and probably would not be the same. For convenience in computation, we will select T and T' as the years in which the increment to the present value of net benefits of each choice falls to \$0.01 per \$1 of initial year's benefits.

Although the initial year's benefit of the developmental alternative may be quite large, and in fact the net present value as computed [18] is impressive, the initial year's preservation benefits may need to be only very modest, given the relation between α and i in the present computational model for preservation benefits. What we wish to do, then, is to compute present value of 1 dollar's worth of initial year's "composite" preservation benefits as explained in appendix B for use in determining what the total initial year's preservation benefits would need to be, to equal or exceed the present value of developmental benefits. We achieve our objective by dividing the present value of \$1 of initial year's benefits growing at a variable rate α into the present value of developmental benefits falling at a variable rate r. This calculation is the required initial year's preservation benefits which makes the two alternatives a matter of social indifference.

Quantitative Results and Sensitivity Analysis

In the case of the technological change development model, the quantitative results will depend on investment per unit capacity of the alternative thermal source, itself partly depending on the interest rate. In addition, the results will depend on the cost per kilowatt hour of thermal energy. Finally, the rate of advance in technical efficiency itself enters into the calculation of the difference between the results obtained when technological advance is, and when it is not, introduced explicitly into the analysis. For our purposes, we have relied on construction cost data provided by Federal Power Commission staff witness; [19] have used opportunity cost of capital of 9 percent, but with estimates provided alternatively using 8 percent

[17] For demonstration of the correctness of this criterion, see Anthony C. Fisher, John V. Krutilla and Charles J. Cicchetti, "The Economics of Environmental Preservation," *American Economic Review*, September 1972.

[18] The "net" present value, of course, does not reflect the opportunity costs of converting an existing recreational area into a hydroelectric storage reservoir, which is a principal task of this exercise.

[19] Testimony of FPC staff witness Jessell, "In the Matter of . . . ." Op. cit., and exhibit No. R-54-B.

and 10 percent for purposes of sensitivity analyses [20]; have used rates of technological progress of between 3 percent and 5 percent per year, to bracket what is believed to be the relevant range [21]; and have used energy costs, again supplied by FPC staff witnesses, of 0.98 mills per kilowatt hour in the early stage, ranging to 1.28 mills per kilowatt hour in the later period of analysis.[22] The adjustment factors for introducing the influence of technological change into the analysis were shown in table I.

The present value of a dollar's worth of initial year's preservation benefit (table II) is a function of both the rate of growth in annual benefits, α, and the discount rate, i. But from the discussion above, which is more specifically defined in appendix B, it is apparent that annual benefits do not grow at a uniform rate (α) over time but depend upon certain parameters. These are:

Parameters Affecting Preservation Benefits	*Symbol*
Annual Change in Use	γ
Annual Increase in Willingness to Pay	r_y
Recreational Carrying Capacity	k
Rate of Deterioration in Demand When Congestion Point is Reached	d
Year at Which Increase in Demand Equals Only Population Increase	m

Since k represents the time period when "recreational carrying capacity" is reached and is given by the capacity of the area to accommodate recreation seekers without eroding the quality of the recreational experience, k and γ are related.[23] The selection of the value of m of 50 years, with alternative assumptions of 40 and 60, was governed by both the rate of growth of general demand for wilderness or primitive area recreation, and the estimated "saturation level" for such recreational participation for the population as a whole. Finally, the range of values for r_y was taken from what we know about the conventional income elasticity of demand (as reinterpreted in the light of the expected lack of substitutes both in the present and over time), for this kind of recreation activity [24] and growth in per capita income over the past two or three decades.

Now, what do these models tell us which the traditional analysis of comparable situations requiring the allocation of "gifts of nature" between two incompatible alternatives does not?

Let us take for illustration, subject later to sensitivity analysis, the computed initial year's preservation benefit (table III) corresponding to i of 9 percent, r_t of 0.04, γ of 10 percent and k of 20 years, m of 50 years and r_y of 0.05; namely $80,122. Is this a preservation benefit we might expect to be equaled or exceeded by the first year the hydroelectric project would otherwise go into operation? In many cases we would have only the sketchiest information and would have to make such a comparison on the basis of judgment. In the case of Hells Canyon, we obtained rather better information and shall return

[20] A discount rate of 9 percent, with alternatives of 8 and 10 percent was the result of independent study. *See* Otto Eckstein and Arnold Harberger, "Economic Analysis of Public Investment Decisions: Interest Rate Policy and Discounting Analysis." Hearings before the Subcommittee on Economy in Government of the Joint Economic Committee, 90th Cong., 2d sess. (Washington: U.S.G.P.O., 1968). See also Seagraves, J. A., "More on the Social Rate of Discount," *Quarterly Journal of Economics*, Vol. LXXIV, No. 3 (August 1970).

[21] Data on technological change computed from Electrical World's biannual *Steam Station Cost Surveys*, 1950-68.

[22] Testimony of FPC staff witness Chavez, "In the Matter of . . . ." *Op. cit.*, and exhibit No. R-107-B.

[23] The particular values taken, that is, γ of 10 percent and k of 20 years, with alternative assumptions for purposes of sensitivity analyses, were chosen for reasons given in Krutilla testimony, *op. cit.*, transcript pp. R-5864-66 and R-5872.

[24] Cicchetti, Seneca, and Davidson, *The Demand and Supply of Outdoor Recreation* (Washington: Department of Interior, 1969).

TABLE II.—PRESENT VALUE OF $1's WORTH OF INITIAL YEAR'S PRESERVATION BENEFITS (GROWING AT α)

i=8%; m=50 years

r_y	γ=7.5% k=25 years	γ=10% k=20 years	γ=12.5% k=15 years
0.04	$134.08	$169.86	$173.90
0.05	211.72	263.49	262.12
0.06	385.10	467.30	449.00

i=9%; m=50 years

r_y	γ=7.5% k=25 years	γ=10% k=20 years	γ=12.5% k=15 years
0.04	$93.67	$120.07	$125.89
0.05	136.12	172.35	176.25
0.06	214.76	267.10	264.49

i=10%, m=50 years

r_y	γ=7.5% k=25 years	γ=10% k=20 years	γ=12.5% k=15 years
0.04	$69.28	$89.45	$95.71
0.05	95.15	121.91	127.68
0.06	138.17	174.85	178.66

Where:
i=discount rate.
r_y=Annual rate of growth of price for a given quantity.
γ=Annual rate of growth of quantity demanded at given price.
k=Number of years after initial year in which carrying capacity constraint becomes effective.
m=Number of years after initial year in which gamma falls to rate of growth of population.

TABLE III.—INITIAL YEAR'S PRESERVATION BENEFITS (GROWING AT THE RATE α) REQUIRED IN ORDER TO HAVE PRESENT VALUE EQUAL TO DEVELOPMENT

i=8%, m=50 years, r_t=0.04, b'_d=$18,540,000

r_y	γ=7.5% k=25 years	γ=10% k=20 years	γ=12.5% k=15 years
0.04	$138,276	$109,149	$106,613
0.05	87,568	70,363	70,731
0.06	48,143	39,674	41,292

i=9%, m=50 years, r_t=0.04, b'_d=$13,809,000

r_y	γ=7.5% k=25 years	γ=10% k=20 years	γ=12.5% k=15 years
0.04	$147,422	$115,008	$109,691
0.05	101,447	80,122	78,336
0.06	64,300	51,700	52,210

i=10%, m=50 years, r_t=0.04, b'_d=$9,861,000

r_y	γ=7.5% k=25 years	γ=10% k=20 years	γ=12.5% k=15 years
0.04	$142,335	$110,240	$103,030
0.05	103,626	80,888	77,232
0.06	71,369	56,397	55,194

Source: Exhibit No. R-671, "In the Matter of . . ."
Where: i=Discount rate.
r_y=Annual rate of growth in price for a given quantity.
γ=Annual rate of growth of quantity demanded at given price.
k=Number of years following initial year upon which carrying capacity constraint becomes effective.
m=Number of years after initial year upon which gamma falls to rate of growth of population.
b'_d=Present value of development (adjusted).
r_t=Annual rate of technological progress in the development case.

to the matter subsequently. But for now, we have the sum of $80,000 as the benchmark figure which we feel is necessary to justify, on economic grounds, allocation of the resource to uses compatible with retention of the area in its present condition. This sum of $80,000 compares with the sum of $2.9 million, which represents the "levelized" annual benefit from the hydroelectric development, when neither adjustments for technological progress have been made in hydroelectric power value computations, nor any site value (i.e., present value of opportunity returns foreclosed by altering the present use of the canyon) is imputed to costs. Typically then, the question would be raised whether or not the preservation value is equal to or greater than the $2.9 million annual benefits from development.

Let us now consider the readily quantifiable benefits from the existing uses of the Canyon. These are based on studies conducted by the Oregon and Idaho State's Fish and Game Departments, in collaboration with the U.S. Forest Service, and are displayed along with our imputation of values per user day in table IV below. From table IV one could argue, for example, that the preservation benefits shown are roughly only a third ($0.9 million to $2.9 million) as large as would be required in comparisons based on traditional analysis of similar cases. By introducing the differential incidence of technological progress on the mutually exclusive alternatives for the Hells Canyon, we have quite a different conclusion. The initial year's preservation benefit,

TABLE IV.—ILLUSTRATIVE OPPORTUNITY COSTS OF ALTERING FREE-FLOWING RIVER AND RELATED CANYON ENVIRONMENT BY DEVELOPMENT OF HIGH MOUNTAIN SHEEP

Quantified losses	Recreation days, 1969[1]	Visitor days, 1969[2]	Visitor days, 1976
Stream-based recreation:[3]			
Total of boat counter survey	18,755	28,132	51,000.
Upstream of Salmon-Snake confluence	9,622	14,439	26,000.
Nonboat access:			
Imnaha-Dug Bar	9,678	14,517	26,000.
Pittsburgh Landing	9,643	14,464	26,000.
Hells Canyon downstream:			
Boat anglers	2,472	1,000	1,800.
Bank anglers	9,559	2,333	4,000.
Total stream use above Salmon River	40,974	[4]46,753	84,000 at $5.00/day=$420,000.
Hunting, Canyon area:[5]			
Big game	7,050	7,050	7,000 at $25.00/day=$175,000.
Upland birds	1,110	1,110	1,000 at $10.00/day=$10,000.
Diminished value of hunting experience[6]	18,000	18,000	29,000 at $10.00/day=$290,000.
Total quantified losses			$895,000±25 percent

[1] "Recreation days" corresponds to definition as per supplement No. 1, S. Doc No. 97; namely, an individual engaging in recreation for any "reasonable portion of a day." In this particular study, time involved must be minimum of 1 hour, as per letter, from Monte Richards, Coordinator, Basin Investigations, Idaho Fish and Game Department.

[2] "Visitor day" corresponds to the President's Recreational Advisory Council (now, Environmental Quality Council) Coordination Bulletin No. 6 definition of a visitor-day as a 12-hr. day. Operationally, the total number of hours, divided by 12, will give the appropriate "visitor-day" estimate.

[3] Source: "An Evaluation of Recreational Use on the Snake River in the High Mountain Sheep Impact Area," survey by Oregon State Game Commission and Idaho State Fish and Game Department in cooperation with U.S. Forest Service, report dated January 1970 and memorandum, W. B. Hall, Liaison Officer, Wallowa-Whitman National Forest, dated Jan. 20, 1970.

[4] Not included in the survey were scenic flights, nor trail use via Saddle Creek and Battle Creek trails. Thus, estimates given represent an underreporting of an unevaluated amount.

[5] "Middle Snake River Study, Idaho, Oregon, and Washington" Joint Report of the Bureau of Commercial Fisheries and Bureau of Sports Fisheries and Wildlife in Department of the Interior Resource Study of the Middle Snake, tables 10 and 11.

[6] The figure 18,000 hunter-days is based on Witness Pitney's estimate of 15,000 big-game hunter-days on the Oregon side, and estimated 10,000 hunter-days on the Idaho side (provided in letter from Monte Richards, coordinator, Idaho Basin investigations, Idaho Fish and Game Department, dated Feb 13, 1970) for a total of 25,000 hunter-days (excluding small game; i.e., principally upland birds) in the canyon area, less estimated losses of 7,000 hunter-days. This provides the estimated 18,000 hunter-days, 1969 total, which growing at estimated 5 percent per year for deer hunting and 9 percent per year for elk hunting would total 29,000 hunter-days by 1976.

Note: Unevaluated losses: (A) Unmitigated anadromous fish losses outside impact area; (B) unmitigated resident fish losses; (1) Stream fishing downstream from High Mountain Sheep; (C) option value of rare geomorphological-biological-ecological phenomena; and (D) Others.

subject to reevaluation on the basis of sensitivity tests, appears to be an order of magnitude ($900,000 to $80,000) larger than it needs to be to have a present value equaling or exceeding the present value of the development alternative. Thus we get results significantly different from traditional analysis.

We must still consider the sensitivity of these conclusions to the particular values the variables used in the simulation model. Sensitivity tests can be performed with the data contained in tables I and II, along with additional information available from computer runs performed. Some of these checks are displayed in table V.

TABLE V.—SENSITIVITY OF ESTIMATED INITIAL YEAR'S REQUIRED PRESERVATION BENEFITS TO CHANGES IN VALUE OF VARIABLES AND PARAMETERS (AT i=9 PERCENT)

Variable	Variation in Variable		Percent change	Percent change in preservation benefit
	From—	To—		
r_y	0.04	0.05	25	39 to 49
r_t	0.04	0.05	25	25
k[1]	20 years	25 years	25	30 to 40
γ	10 percent	12.5 percent	25	−4 to +7
m	40 years	50 years	25	3

[1] The 25-percent change in years before capacity is reached translates into a 40-percent change in carrying capacity at the growth rate of 10 percent used here.

Given the estimated user days and imputed value per user day, it follows that the conclusions regarding the relative economic values of the two alternatives are not sensitive within a reasonable range, to the particular values chosen for the variables and parameters used in the computational models.

There is need, however, for another set of tests when exponential growth rates are being used. We might regard these as "plausibility analyses." For example, the plausibility of the ratio of the implicit price to the projected per capita income in the terminal year was examined and found to equal 2.5×10^{-3}. At today's prices and per capita income level this is comparable to a user fee of approximately $10. Similarly, the ratio of the terminal year's preservation benefit to the GNP in the terminal year can be examined for plausibility and is found to be 4.0×10^{-7} in the present example. This value compares with a ratio of the total revenue of the applicants' in 1968 to GNP of 5.0×10^{-4}. The year at which the growth rate in quantity of wilderness-type outdoor recreation services demanded falls to the rate of growth of population must also be checked to insure that the implicit population participation rate is something one would regard as reasonable. Such tests were performed in connection with the *Hells Canyon* case in order to avoid problems which otherwise would stem from use of unbounded estimates, and we found our assumed initial rates of 10 and 12.5 percent were conservative values.

Summary and Conclusions

Since the readily observed initial year's benefits were greater than the minimum value which was required to make the present value of the two alternatives equal, the analysis was concluded at that point. On the other hand, since the analysis relied implicitly on the price compensating measure of consumer surplus and does not include a

consideration of option value, that is, the economic value gained from preserving the option to visit the canyon in its present state for those members of society, who are not certain users of the canyon, the resulting estimate would therefore be a lower bound estimate of the preservation value. For circumstances in which the present value of the output stream from the developmental alternative would exceed that of the preservation alternative, as calculated above, a question might arise as to whether the comparative values are sufficient to justify the allocation to irreversible developmental purposes on economic grounds.

The analysis presented in this paper is important for a specific class of public works projects, which involve environmental irreversibilities. However, the general methodology is probably equally useful for all projects, which involve environmental irreversibilities. Presently, the National Environmental Protection Act of 1970 requires that all environmental irreversibilities must be outlined in an environmental impact statement. The methodology included in this current paper extends conventional benefit-cost analysis in such cases. While we have not developed a general methodology for all such cases, it is hoped that analysis of the type described above will be further extended and that the Congress will require the joint evaluation of the environmental impact statements (102 (C)) and benefit-cost analysis for such projects.

Appendix A

THE ALTERNATIVE COST ADJUSTMENT EQUATION

$$1<n\leq 30$$

$$C'_a{}^n = C_I + E8760\left[F-(n-1)K+\frac{(n-1)K}{(1+r)^{n-1}}\right]$$

and

$$C'_a{}^1 = C_I + E8760F$$

$$= C_I + E8760(F-(n-1)K) + \frac{E8760}{(1+r)^{n-1}}(n-1)K$$

$$= C_I + E8760F - E8760K(n-1) + \frac{E8760K(n-1)}{(1+r)^{n-1}}$$

$$PVC'_a(30) = \sum_{n=1}^{30} \frac{C'_a{}^n}{(1+i)^{n-1}}$$

therefore

$$PVC'_a(30) = \sum_{n=1}^{30}\left[\frac{C_I}{(1+i)^{n-1}} + \frac{EF8760}{(1+i)^{n-1}} - \frac{EK8760(n-1)}{(1+i)^{n-1}} + \frac{EK8760(n-1)}{(1+r)^{n-1}(1+i)^{n-1}}\right]$$

Each of these terms is a separate geometrical progression whose sum is given by the standard formula

$$s = f\frac{(1-c^n)}{1-c}$$

where
f=first term
c=common ratio
n=number of years this value is summed over.

The first two terms in $PVC'_a(30)$ have the same common ratio

$$\frac{1}{1+i}$$

which we will denote by "a", therefore if s_1 equals sum of first progression and s_2 equals the sum of the second progression, then

$$s^1 = C_I\frac{(1-a^{30})}{(1-a)}$$

and $s^2 = EF8760\,\frac{(1-a^{30})}{(1-a)}$

The third term has a common ratio of $\frac{1}{(1+i)}$ (or a) but is also multiplied by $n-1$

and can therefore be thought of as $(n-1)$ separate geometric progressions with this common ratio, a. The effect of this can be seen if we let the number of periods equal m, then:

$\sum_{i=1}^{m} ma^m$ becomes

$$a+a^2+\ \ldots\ a^m = a\frac{(a^m-1)}{a-1}$$

$$a^2+\ \ldots\ a^m = a^2\frac{(a^{m-1}-1)}{a-1}$$

$$a^3\ \ldots\ a^m = a^3\frac{(a^{m-2}-1)}{a-1}$$

$$\vdots$$

$$a^{m-1}+\ a^m = a^{m-1}\frac{(a^2-1)}{a-1}$$

$$a^m = a^n\,\frac{(a-1)}{a-1}.$$

By factoring out a common term $\frac{a}{a-1}$ we are left with

$$\frac{a}{a-1}\left[(a^m-1)+a(a^{m-1}-1)+\ \ldots\ a^{m-2}(a^2-1)+a^{m-1}(a-1)\right]$$

which becomes after summing and multiplying

$$\frac{a}{a-1}\left[ma^m - a^{m-1} - a^{m-2}\ \ldots\ -a-1\right].$$

Multiplying by $\frac{-1}{-1}$ we can reduce this to

$$\frac{a}{1-a}\,[a^{m-1}+\ \ldots\ a+1-ma^m].$$

Since the first m terms are also a geometric series they can be summed to form

$$\frac{(1-a^m)}{(1-a)}$$

and therefore

$$\sum_{i=1}^{m} ma^m = \frac{a}{1-a}\left[\frac{1-a^m}{1-a} - ma^m\right]$$

is a general result we can use to determine the sum of the third and fourth terms, s_3 and s_4 respectively.

In the case of s_3 the common term is "a" and the number of periods $m=29$, therefore

$$s_3=-\frac{a}{1-a}\,8760EK\left[\frac{1-a^{29}}{1-a}-29a^{29}\right],$$

but note

$$\frac{a}{1-a}=\frac{1}{i}$$

since

$$a=\frac{1}{1+i}$$

therefore

$$\frac{1}{i}=\frac{a}{1-a}$$

$$s_3=-\frac{1}{i}\,8760EK\left[\frac{1-a^{29}}{1-a}-29a^{29}\right].$$

In the case of the fourth term the common ratio is

$$\frac{1}{(1+i)(1+r)},$$

which we will call b. By using the same procedure as for the third term

$$s_4=\frac{b}{1-b}\,8760EK\left[\frac{1-b^{29}}{1-b}-29b^{29}\right]$$

and

$$\frac{b}{1-b}$$

is similarly reducible to

$$\frac{1}{(1+r)(1+i)-1}.$$

Therefore

$$s_4=\frac{1}{(1+r)(1+i)-1}\,8760EK\left[\frac{1-b^{29}}{1-b}-29b^{29}\right].$$

In a similar manner the PVC_a' (31,50) can be determined if we define

$$C_{II}=\frac{C_I}{(1+r)^{30}}$$

$$E'=\frac{E}{(1+r)^{30}}$$

and start the series off with a discount factor of

$$\left(\frac{1}{1+i}\right)^{30},$$

which we factor out of each term, then

$$PVC_a'(31,50)=\frac{1}{(1+i)^{30}}\left[[C_{II}+8760E'F]\left[\frac{1-a^{20}}{1-a}\right]-\frac{8760E'K}{i}\left[\frac{1-a^{19}}{1-a}-19a^{19}\right]+\frac{8760E'K}{(1+r)(1+i)-1}\left[\frac{1-b^{19}}{1-b}-19b^{19}\right]\right]$$

PVC_a' becomes the sum of $PVC_a'(30)$ and $PVC_a'(31,50)$ thus completing the derivation of the equation shown in the text.

$$PVC_a'=[C_I+(8760)EF]\,\frac{(1-a^{30})}{(1-a)}-\frac{8760EK}{i}\left[\frac{1-a^{20}}{1-a}-29a^{20}\right]+\frac{8760EK}{(1+r)(1+i)-1}\left[\frac{1-b^{20}}{1-b}-29b^{20}\right]+\left(\frac{1}{(1+i)}\right)^{30}\left([C_{II}+8760E'F]\,\frac{(1-a^{20})}{(1-a)}-\frac{8760E'K}{i}\left[\frac{1-a^{19}}{1-a}-19a^{19}\right]+\frac{8760E'K}{(1+r)(1+i)-1}\left[\frac{1-b^{19}}{1-b}-19b^{19}\right]\right)$$

where:

K=a constant representing the time decay of plant factor (assume .03)

r=the annual rate of technological change.

Appendix B

THE BENEFIT ESTIMATION MODEL FOR THE PRESERVATION CASE

Let:

b_o=\$1.00 of initial year's benefits.

P_o=initial vertical axis intercepts (see Figure I below).

Q_o=initial horizontal axis intercept.

D_oD_o'=initial year's composite computational demand schedule.

r_y=rate of growth in vertical component of shift, related to the increase in per capita income, assuming a constant (income-price) elasticity

$$\frac{\triangle P_H}{P_H}\cdot\frac{Y}{\triangle Y}\Big|Q=Q_o$$

γ=the historical rate of growth in the quantity demanded for $P=O$; i.e., horizontal component of demand shift at zero price. γ is constant up until capacity (year k).

k=the year the area reaches recreational carrying capacity.

d=the rate of decay of γ after year k which brings the rate of change in horizontal component of demand shift to rate of growth of population.

m=the year in which the rate of the horizontal component of demand shift equals the rate of growth of population.

i=rate of discount.

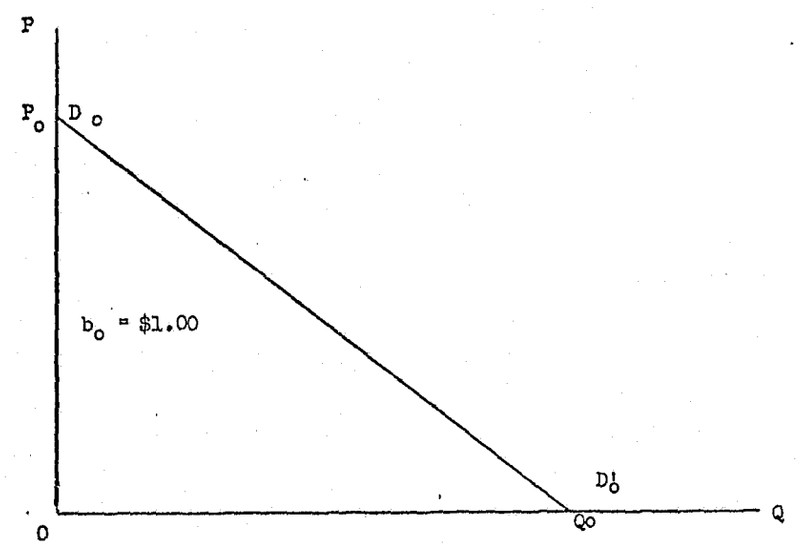

Figure I.—Demand curve in the initial year

$$P_t=(1+r_v)^t P_o$$

$$Q_t=(1+\gamma)^t Q_o \text{ for } t\leq k$$

$$Q_t=Q_{t-1}(1+\gamma_t) \text{ for } t>k$$

where

$$\gamma_t=\gamma(1+d)^{t-k}$$

and

$$d=\left[\frac{\gamma \text{ population}}{\gamma}\right]^{\frac{1}{m-k}}-1.$$

$$PV_{b^o}=\sum_{t=1}^{\infty}\frac{b_t}{(1+i)^t}$$

$$b_t=\frac{1}{2}P_tQ_t \text{ for } t\leq k$$

i.e., the area under the composite computational demand schedule $D_tD'_t$

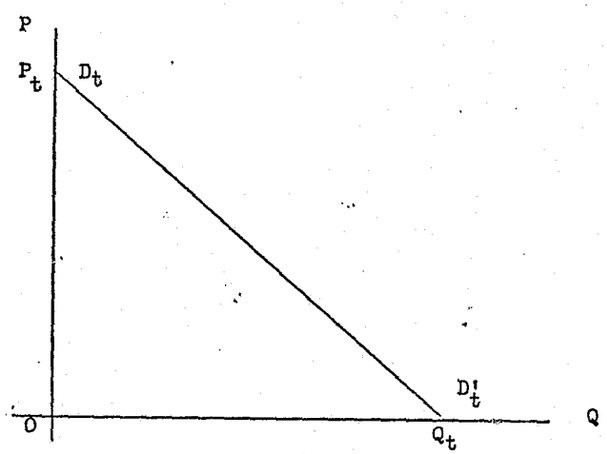

FIGURE II. Demand curve in year $t\leq k$

$$b_t=\frac{1}{2}P_tQ_t-\frac{1}{2}P^*_tQ^*_t \text{ for } t>k$$

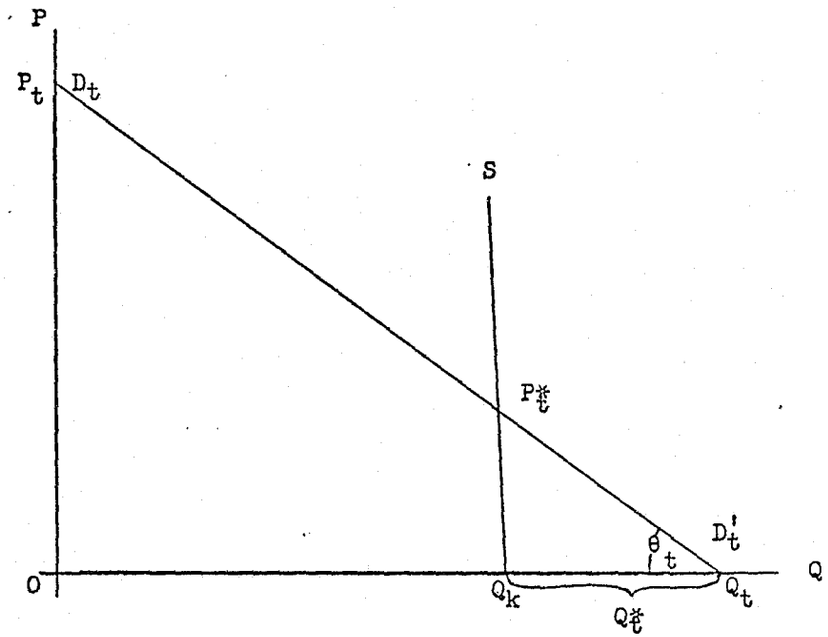

FIGURE III.—Demand curve in year $t>k$

where

$$\frac{P_t^*}{Q_t^*}=\tan\theta_t=\frac{P_t}{Q_t}$$

$\therefore$

$$P^*_t=Q_t^*.\frac{P_t}{Q_t}$$

and

$$Q^*_t=Q_t-Q_k$$

and

$$b_t=\frac{1}{2}P_tQ_t-\frac{1}{2}(Q_t-Q_k)^2\frac{P_t}{Q_t} \text{ for } t>k$$

$\therefore$

$PV_{b^o}=b_t(t\leq k)+b_t(t>k)$, appropriately discounted.

An important parameter of the system is the annual percent increase in benefits. This is derived as follows:

$$b_t=\frac{1}{2}P_tQ_t \text{ for } t\leq k$$

$$=\frac{1}{2}(P_o(1+r_v)^t)(Q_o(1+\gamma)^t)$$

$$=\frac{1}{2}P_oQ_o((1+r_v)(1+\gamma))^t$$

but

$$1=\frac{1}{2}P_oQ_o$$

$$\therefore \quad b_t=(1+r_v\gamma+r_v+\gamma)^t$$

$$\frac{db_t}{dt}=(1+r_v\gamma+r_v+\gamma)^t\, Ln(1+r_v\gamma+r_v+\gamma)$$

$$\text{annual percent change in benefits}=\frac{\frac{db_t}{dt}}{b_t}$$

$$\therefore \quad \frac{\frac{db_t}{dt}}{b_t}=\frac{(1+r_v\gamma+r_v+\gamma)^t Ln(1+r_v\gamma+r_v+\gamma)}{(1+r_v\gamma+r_v+\gamma)^t}$$

$$=Ln(1+r_v\gamma+r_v+\gamma)$$

$$\text{for } t\leq k$$

The rate of change in preservation benefits referred to in section 3, α, is identical to this value

$$\frac{\frac{db_t}{dt}}{b_t}$$

when t is less than capacity, but since tastes are expected to change when the Canyon becomes saturated, the rate of change in benefits begins to decline at capacity (k). Accordingly,

$$\frac{\frac{db_t}{dt}}{b_t}$$

is an upper bound and would exceed the α discussed in section 3 for the life of the Canyon.

Finally, the slope of the initial composite computational demand schedule (the area under which is equal to unity) may be varied and the effect measured, since:

$$P=a+sQ$$

$$\frac{P_o \cdot Q_o}{2}=1$$

and

$$P_o=P \text{ when } Q=0$$

$$Q_o=Q \text{ when } P=0$$

$$\therefore \quad P=P_o+sQ$$

$$s=\frac{P_o}{Q_o}$$

$$sQ_o=P_o$$

and

$$P_oQ_o=2$$

$$sQ_o^2=2$$

$$\therefore \quad Q_o=\sqrt{2/s} \text{ and } P_o=sQ_o$$

This last result allows for the calculation of benefits for various initial slopes as well as varying demand shifts and supply constraints, thus completing the general derivation for the computation of benefits through time for linear demand schedules.

By use of this model to calculate the present value of a dollar's worth of initial year's benefits, we can obtain, of course, the initial year's benefits required to justify retaining the canyon area in its present uses. The latter can be further decomposed by putting the initial year's benefits on an expected value per user basis. That is, if:

U_o = expected number of users in the initial year

B_o = the required initial year's benefits to justify preserving the canyon in its present condition

B_o/U_o = the expected average user value required to justify preserving the canyon area in its present type of uses.

Then this further decomposition permits us to observe the number of recreational (and/or other) users, estimate the average price or value per recreation day required, and compare this value or price with what is known about prices paid for similar types of recreational experiences.

AN ECONOMIC PERSPECTIVE ON THE SMALL WATERSHEDS PROGRAM

By ROBERT K. DAVIS, BARBARA J. INGLE, *and* WILLIAM J. GILLEN

I. THE SMALL WATERSHEDS PROGRAM

In 1954, Congress passed the Watershed Protection and Flood Prevention Act, subsequently amended, which provided for flood control, drainage, irrigation, water supply, and other water development within watersheds not greater than 250,000 acres. The act was an outgrowth of earlier Soil Conservation Service (SCS) demonstration projects and the Flood Control Act of 1936, both of which demonstrated a need for runoff and waterflow retardation and prevention of soil erosion in watersheds. More than 1,000 watershed projects have been approved, with as many as 2,000 additional applications as a backlog, indicating substantial success for the program.[1]

The program is composed of both structural and nonstructural measures, as demonstrated in the distribution of costs of the 100 projects which had been approved through June 1970. (Table 1 shows the percentage distribution of costs.) Structural measures comprised 72 percent of the costs; land treatment measures, including related technical assistance, amounted to 28 percent of the costs. Floodwater retarding structures and channel improvements are engineering measures designed to reduce flood damages either by storing or by speeding the drainage of floodwaters. The land treatment measures are the part of the program which carries out the original mission of soil conservation and flood retardation through conservation farming.

Flood plains protected by the structural measures become available for new or more intensive crop production; the farmer is thereby enabled to drain marshes and wetlands. The overall result has been an increase in the available cropland acreage. Anticipating this result, Arthur Maass, writing at the inception of the program, quoted USDA economic watershed surveys which stated that 80 to 90 percent of the benefits of the program would accrue directly to farmers as increased agricultural production.[2]

Since World War I the United States has achieved an expansion in the productivity of agriculture which has exceeded the growth of demand for farm products. The index of farm production per man-hour has tripled since World War II, from 49 in 1946 to 153 in 1965.[3] The Government has implemented many costly programs intended to maintain farm incomes and to keep production under control. In

[1] Statement by George R. Bagley, national vice president, National Association of Conservation Districts, before the House Subcommittee on Government Operations, June 10, 1971.
[2] Arthur Maass, *Public Policy*, Graduate School of Public Administration, Harvard University, Cambridge, 1954.
[3] *Food and Fiber for the Future*, Report of the National Advisory Commission on Food and Fiber, U.S. Government Printing Office, July 1967.

view of these efforts it is apparent that the social value of measures which result in additions to crop acreage and output is quite low, perhaps negative.

TABLE I.—*Installation costs by type of measure in watershed workplans approved through June 30, 1970*

	Cost in percent
Structural measures:	
Floodwater-retarding (FWRS)	30.1
Grade stabilizing	1.1
FWR & GS combined	.3
Multiple-purpose reservoirs (MP)	10.3
Other single-purpose reservoirs (SP)	.4
Channel improvement (CI)	23.2
Dikes and levees (D&L)	.5
Floodways and diversions (F&D)	.9
Debris basins (DB)	.4
Basic recreation facilities (BRF)	2.6
Critical area treatment (CAT)	.1
Miscellaneous structures (miscellaneous)	1.6
Total structural measures	72.3
Land treatment measures:	
Application of measures (Public Law 566)	.5
Application of measures (other funds)	23.5
Technical assistance (Public Law 566)	2.5
Technical assistance (going program)	1.2
Total land treatment	27.7
Total installation costs	100.0

Source: "Inventory of Benefits, Costs and Other Data for Public Law 566 Watershed Work Plans," Soil Conservation Service, USDA. April 1971.

Channelization and Agricultural Drainage

Channelization and wetland drainage are chiefly responsible for the increase in available cropland acreage. Channelization is the process of dredging, deepening, and straightening a natural stream to increase its capacity to hold runoff in times of excess precipitation. It is necessary at the same time to remove trees and brush for a distance of 20–100 feet from the stream banks. Farmers abutting the channels may then dig ditches or lay tile to conduct water into the channel and lower the water table on their land to the point where crops can be successfully grown. Swamps, marshes, and intermittent wetlands may be drained in this manner.

The policy of the Department of Agriculture in 1967 was that drainage of wetlands not presently in agricultural use could not be the primary purpose of assistance provided under the Small Watersheds Act.[4] Recently, Kenneth Grant, Director of the Soil Conservation Service, issued a memorandum in response to criticism of channelization. The memorandum disallowed any channelization for which the primary purpose was drainage. [5] However, drainage may still be a secondary objective, and drainage remains a large factor in the small watersheds program. The allocation of total installation costs for 1,001 watershed work plans approved for operations through June 30, 1970,

[4] J. T. Saunders and N. A. Back, "Wanted: Partnership to Manage Water," *Land*, The 1958 Yearbook of Agriculture, 85th Cong., 2d sess., H. Doc. 280, p. 354.
[5] Kenneth E. Grant, Watersheds Memorandum-108, USDA-SCS. Feb. 4, 1971.

show nearly one-third of the total, or $33,139,000, was allocated to agricultural drainage.[6] The difference between flood protection and measures which allow drainage may often be semantic and additional benefits may definitely be allocated from flood protection to drainage.

Environmental Costs

Those who favor drainage consider channelization an environmental improvement; yet it does result in identifiable environmental costs. Channelization creates a raw ditch cleared of overhanging boughs, thickets, and rushes along the shore. Habitat losses for fish and wildlife are severe. Stream bank habitat is a critical link in the ecology of most wildlife forms in the countryside. A recent study documented a 90 percent reduction in poundage of fish in channelized streams with negligible recovery 40 years later.[7]

Streams and marshes in the natural state provide recreation to a growing number of hikers, campers, canoeists, and others. Krutilla (1968) has argued that since the supply of natural environments is fixed in the United States, and since the demand for outdoor recreation is growing, then the value of such environments is increasing.[8] It follows that the environmental and recreational costs of channelization or drainage are also growing greater.

In conjunction with the subject of environmental costs it should be noted that the primary justification of channelization as a flood reduction measure itself remains a disputable point. John W. Emerson has made a case study of the channelization of the Blackwater River in Johnson County, Mo. He found that the doubled gradient caused by straightening the normally meandering stream increased the rate of erosion. "Since the present channel is much wider and deeper than it was when newly dredged, there have been bridge repairs and loss of farmland. Downstream reduction in channel capacity due to termination of dredging has cuased sedimentation and increased flooding."[9] Other conservationists observe that channelization and drainage have reduced local damage while transferring the problem to downstream areas, where increased drainage and flood problems have been noted.[10]

Consideration of Alternatives

There have undoubtedly been occasions when channelization or drainage has been the only alternative, and where the benefits of flood protection would justify the costs just described. However, alternatives are usually not considered, and the use of channelization has been incautious and indiscriminate.[11]

[6] "Inventory of Benefits, Costs, and Other Data for Public Law 566 Watershed Work Plans," compiled by the Natural Resource Economics Division, Economic Research Service, for the Soil Conservation Service, USDA, April 1971.

[7] Jack Bayless and William B. Smith, "The Effects of Channelization Upon the Fish Populations of Lotic Waters in Eastern North Carolina," North Carolina Wildlife Resources Commission, Division of Inland Fisheries.

[8] John V. Krutilla, "Balancing Extractive Industries with Wildlife Habitat," from *Transaction of the 33d North American Wildlife and Natural Resources Conference*, Mar. 11, 12, 13, 1968 (Wildlife Management Institute: Washington, D.C.).

[9] John W. Emerson, "Channelization: A Case Study," *Science*, vol. 173, No. 3994, July 23, 1971, p. 325.

[10] See *Stream Channelization* (part I), Hearings before a Subcommittee of the Committee on Government Operations, House of Representatives, 92d Cong., 1st sess., May 3 and 4, 1971. (See especially the pp. 83-89 articles by Flavil H. Griggs published in the Dyersburg (Tenn.) Mirror, Aug. 27, 1970.)

[11] *Ibid.* (See hearings for numerous examples). See also USDA Watershed Memorandum 108, in which SCS Director Kenneth Grant cautioned against indiscriminate use of channelization.

In its manuals and guides, the Soil Conservation Service indicates that its analysis of flood control measures is limited to considering structural and engineering devices. This effectively excludes consideration of the nonstructural alternatives which have come into use in the programs of some other construction agencies. By assuming that the structural measures are the only remedies for flood damage reduction, the Soil Conservation Service may produce more expensive and costly projects than if it were to incorporate nonstructural measures such as flood plain zoning, crop insurance, and land use adjustment. Since agricultural damage rather than structural damages and loss of human life typify the flood losses of many of these watershed projects, the possibilities for nonstructural alternatives would seem to be particularly great.

Consideration of these alternatives may effectively nullify the need for many flood reduction projects.

Conclusion

Around 1941, the Department of Agriculture reached the conclusion that land treatment had little effect on reducing major floods. Moreover, according to Maass, "officials of the Soil Conservation Service and of the Secretary's Office have tried to make it clear to committees of Congress ever since 1942 that upstream works cannot give adequate protection to a river basin and are not a substitute for downstream dams and channel work needed to protect urban centers." [12] Accepting this assessment, we are left with the conclusion that the program as presently designed does not function as a flood reduction measure below the controlled stream. Instead its implicit purpose has been to increase available cropland acreage and crop production on lands abutting and just below the floodwater-retarding structures and channelized streams. The practice of agricultural drainage in conjunction with channelization contributes to this increase. When the questionable social benefits of this practice are balanced against the certain social and environmental costs, the validity of many projects of the small watershed program is left in doubt.

These costs may or may not exceed the net benefits of a specified project. The proper procedure should be to evaluate the quantifiable benefits and costs before assessing the qualitative social and environmental costs. Up to this point the paper has examined some of the qualitative aspects of the watershed program. With this background, the remainder will analyze in specific monetary terms the benefit-cost ratios used by the Soil Conservation Service.

II. The Benefit-Cost Problem

A careful examination of SCS benefit-cost procedures reveals several ways in which the analysis may be improved and better made to serve its function of indicating the social worth of a project.

[12] Maass, *op. cit.*

Benefits

The benefits of the small watershed program are in large part inferred from increased agricultural production. Increased production results from reduced flood losses, diminished risk of flooding, improved drainage, and related land use changes. While reduced flood losses are readily seen to increase output, diminished risk of flooding also contributes to output by permitting a shift to more intensive land use and to higher value crops, or to restoration or reclamation of unproductive flood plains.

Attribution of increased output to particular features of a given project is a difficult and sometimes arbitrary distinction.[13] Table 2 shows the percentage distribution of benefits for 1,001 Public Law 566 projects.

What is important for this discussion is evaluation of the increased output. We referred earlier to the low social value of increased agricultural output.[14] ". . . The general principle that project services or products have value only to the extent that they are needed is inherent in any economic evaluation." [15] Thus, surplus and price supported crops have a value less than market price. Until 1966 the SCS evaluated net increases in output on the basis of Department of Agriculture projected long term prices (PLT). Since 1966, the SCS has used Department of Agriculture adjusted-normalized prices (AN).[16] AN prices are intended to reduce the influence of government programs in maintaining artificially high price levels. Since they do not eliminate the influence of government programs, AN prices exceed the actual social value of the commodity.

TABLE 2.—*Benefits from structural measures in watershed work plans approved through June 30, 1970*

[1,001 projects proportion of total annual benefits]

Type of benefit:	*Percent*
Flood damage reduction	46. 8
Changed land use: agriculture	2. 6
Changed land use: urban	1. 7
Intensified land use	7. 0
Other flood prevention	3. 6
Drainage	8. 4
Irrigation	4. 2
Other water management:	
Agriculture	. 5
Fish and wildlife	(1)
Other nonagriculture	. 5
Municipal and industrial water	1. 9
Recreation	12. 7
Incidental recreation	1. 1
Off-project benefits	1. 1
Redevelopment benefits	1. 6
Local secondary benefits	6. 3
Total	100. 0

[1] Not shown separately in early plans, included in other nonagricultural water management.

Source: "Inventory of Benefits, Costs and Other Data for Public Law 566 Watershed Work Plans," Soil Conservation Service, Washington, D.C., April 1971, table 4.

[13] *Economics Guide for Watershed Protection and Flood Prevention*, Soil Conservation Service, Washington D.C., 1964 with amendments, p. 6-4.

[14] The question concerns not only allotment crops, but non-allotment crops as well since these are often substitutes.

[15] *Economics Guide, op. cit.*, p. 1-3.

[16] John Vondruska, "An Economic Evaluation of Small Watershed Project Evaluation Procedures", University Microfilms, Ann Arbor, Mich., 1971, p. 197.

It follows that benefits which are inferred from AN output prices are still exaggerated. Table 3 indicates that supported prices are as much as 50 percent higher than competitive prices. Whatever may be said about the agricultural price support system, the effect of the price support system should be netted out in order to express the value to the society of an increase in the commodities in question.

To continue to avoid the appropriate evaluation of increased production is certainly inconsistent with desirable public policy as expressed by such bodies as the National Advisory Commission on Food and Fiber which recommended that

> . . . public funds for agricultural reclamation, irrigation, drainage and development projects should be justified on the basis of whether they represent the cheapest means of getting additional farm production if needed.[17]

The obvious response is to use some value substantially less than market price or AN price for evaluating the benefits of increased agricultural output. The direct benefits of crops that end up in storage is zero, the resources being used up contributing nothing to real national income, as Eckstein points out.[18] It is now SCS policy to omit benefits from new lands in their benefit analysis [19] but, of course, many projects have already been justified partially on the basis of returns from new lands.

Recreation benefits provide 13 percent of all project benefits. These benefits come from use of the impoundments created by Public Law 566 programs. The evaluations of the benefits appear to follow standard Federal procedures which have been adequately discussed elsewhere.[20] These essentially arbitrary evaluations may be varied within limits. Two deficiencies in the SCS analysis are: (1) Failure to deduct from its recreation benefits the value of recreation displaced from the site of the impoundment, and (2) failure to assess the marginal value of the recreation site; the latter would account for the reduction in recreation benefits arising from the availability of similar alternative recreation opportunities.

Secondary benefits are a large item in the total benefit distribution shown. However, the SCS does not include secondary benefits in its reported benefit-cost ratios. Nonetheless, in its tabular presentations accompanying projects it often fails to exclude secondary benefits and thereby implies a larger benefit-cost ratio than reported in the text of its project writeups. Since the *Economics Guide* states emphatically that "secondary benefits from a national viewpoint are not considered pertinent to the economic evaluation of Public Law 566 projects" [21] it is inconsistent that this ambiguous treatment of secondary benefits in project analysis is followed.

A minor source of benefits from watershed development is called "redevelopment" benefits. These refer to the benefits of using unemployed local labor or other unemployed local resources. Although

[17] S. O. Berg, Chairman, *Food and Fiber for the Future*, Report of the National Advisory Commission on Food and Fiber, U.S. Government Printing Office, July 1967, p. 21.

[18] Otto Eckstein, *Water Resource Development*, (Cambridge: Harvard University Press), 1958, p. 200.

[19] Statement of Kenneth E. Grant, Administrator, SCS, USDA, in *Stream Channelization*, Hearings before a subcommittee of the Committee on Government Operations, House of Representatives, vol. 1, p. 538-9.

[20] Marion Clawson and Jack Knetsch, *The Economics of Outdoor Recreation*, (Baltimore: Johns Hopkins), 1966.

[21] *Economics Guide, op. cit.*, p. 11-12.

TABLE 3

Crop and unit	PLT Michigan	1960-64 U.S. average	Normalized prices: Current United States	Normalized prices: Adjusted AN, United States	Brandow projection 1965 United States
Wheat (bushel)	$1.60	$1.77	$1.82	$1.30	$0.87
Corn (bushel)	1.40	1.08	1.09	1.05	.77
Oats (bushel)	.76	.62	.62	.60	.41
Barley (bushel)	1.12	.92	.91	.85	.62
Sorghums (56-pound bushel)		.98	1.03	.95	.68
Hay, all (ton)	18.20	22.40	22.00	22.00	
Dry beans, edible (hundredweight)	6.00	7.14	6.97	7.00	
Sugar beets (ton)	15.30	11.90	11.70	11.70	
Soybeans (bushel)	2.28	2.38	2.45	2.45	1.35
Cotton (pound)		.314	.315	.250	.21
Tobacco (pound)		.60	.60	.60	
Cabbage, fresh market (hundredweight)	1.95	2.28	2.29	2.29	
Carrots, fresh market (hundredweight)	1.81	3.32	3.34	3.34	
Celery, fresh market (hundredweight)	3.30	3.85	3.87	3.87	
Potatoes (hundredweight)	1.75	2.01	1.70	1.70	
Farm price indexes, USDA, 1910-14 base of 100:					
Prices received, all	235	240	243	233	[1] 190
Prices received, crops		231	236	217	[1] 175
Prices paid, all	265				
Prices paid, production items only		269	272	272	

[1] 21 percent less than 1959.

Sources: For PLT: USDA, ARS and AMS, "Agricultural Price and Cost Projections" (Washington, D.C.: USDA, 1957). For AN and related: U.S. Water Resources Council, "Interim Price Standards" (Washington, D.C.: The Council, April 1966); supplemented by (for vegetable crops) USDA, SCS, "Economics Guide" Notice 7 (Washington, D.C.: SCS, Mar. 26, 1968). Brandow's projections: Walter Wilcox, "Agriculture's Income and Adjustment Problems," U.S. Congress, Joint Economics Committee, "Economic Policies for Agriculture in the 1960's" (Washington, D.C.: U.S. Government Printing Office, 1960), pp. 14-17.

the advantages of using unemployed resources are real, it makes little sense to add the total payments made to these resources to "benefits." Instead the costs of the project could be reduced by an appropriate percentage based on the project's resource requirements and the degree of unemployment in the region.[22]

Costs

ASSOCIATED COSTS

The problems of cost analysis are several and difficult. SCS policy guides on the question of associated costs do not simplify the problem. Consider:

> Associated costs [are] the value of goods and services needed over and above project costs to make the immediate products of the project available for use or sale. They are usually considered as deductions from benefits. (*Economics Guide*, p. 3-39; Watershed Handbook, p. 103.016).[23]

Examples of associated costs are:

> . . . provision of streets and utilities, conversion from pasture to cropland, clearing woods, farm drainage and the like on agricultural land, additional barns, granaries, and equipment needed to handle the additional production (from *Economics Guide*, p. 3-39).

Another form of associated cost is land treatment measures, as land-leveling and on-farm drainage or irrigation systems.

> When land treatment measures are required to realize the benefits from structural measures, the cost of the necessary land treatment becomes an associated cost (*Economics Guide*, p. 3-39.)

[22] Robert H. Haveman and John V. Krutilla, *Unemployment, Idle Capacity, and the Evaluation of Public Expenditures*, (Baltimore: Johns Hopkins Press), 1968.
[23] "Watershed Protection Handbook," Soil Conservation Service, Washington, D.C., August 1967, with amendments.

Since land treatment measures account for more than a quarter of all project costs, they warrant careful consideration. However,

> [a]lthough their costs and physical effects must be estimated, no specific determination of monetary benefits from such measures is required for economic justification.[24]

As a reason for this exception, the Watershed Handbook does state:

> Experience has fully demonstrated that the combined private and public benefits from installation of land treatment measures will exceed their cost. [p. 102.02].[25]

The soundness of this proposition is not obvious, and in any case deserves more careful analysis.

The *Economics Guide* states that, "associated costs do not appear in the benefit-cost ratio"; but, "they are deducted from the gross benefit."[26] The apparent explanation of these contradictions is that SCS practice prescribed by the Watershed Handbook does not follow the principles established in the *Economics Guide* in the matter of associated land-treatment costs. The benefits of land treatment are also ignored, thus removing from the benefit-cost analysis a major part of project costs.

ENVIRONMENTAL COSTS

Earlier we referred to the substantial environmental costs that may result from small watershed projects. To be sure, environmental costs are elusive and not readily reducible to economic standards of measure and comparison. The National Environmental Policy Act of 1969[27] requires that environmental amenities and values be given appropriate consideration along with economic and technical considerations, and directs officials to develop methods and procedures for doing so.

We suggest that although there will always be much subjectivity in assessing environmental costs, the comparison of monetary benefits and costs with environmental costs can be made less incompatible.

One way of dealing with environmental costs would be as

$$C+X$$

where C is the accountable project costs and X represents the environmental costs of the project. The benefit-cost criterion with these costs included would be

$$B \geq C+X$$

Then we can calculate a break-even value for "X" as

$$B-C=X.$$

For the Lost River project in the example following, the first approximation of $B-C$ is $28,640. Thus, if the aggregated environmental losses are worth that much or more, the project is undesirable. That decision, of course, is still largely subjective, but it does give the analyst a figure with which to work, and is in contrast to current procedures which do not provide for concurrent economic and environ-

[24] *Ibid.*
[25] *Ibid.*
[26] *Economics Guide, op. cit.*, p. 3-40.
[27] 42 USC 4321 et. seq.

mental assessments. Further, it will highlight the ambiguous economic rationale for those projects where the benefit-cost ratio is close to one, as in Chicod, the second example following.

LAND ACQUISITION COSTS

Acquisition of land rights accounted for 16 percent of the total cost of 64 small watershed projects in fiscal year 1970. The weakness in the SCS treatment of these costs is in the choice of an appropriate discount rate. The SCS procedure is to discount these costs at the same rate as any other costs. As Eckstein notes, there is a certain attractiveness in so doing. However, these costs are not conceptually or practically the same as structural costs.

The problem is to determine the value of land as an annual amount in order to fit it to other annualized amounts in the benefit-cost analysis. The market value of land, which is the amount to be discounted, is derived from a private, locally determined rate of interest which includes not only the rate of return from the land, but also a factor for capital appreciation netted of the effects of inflation. It can readily be seen that the private rate of return will be greater than the usual discount rate applied to SCS projects.

When SCS applies the usual discount rate to market price, it substitutes that rate for the market rate. Invariably, the rate used is too low, and considerably understates the annual costs of the land. The Chicod example shows how the true rate is determined for a project.

The Discount Rate

The Soil Conservation Service conforms to Government policy in its use of the discount rate. Projects planned prior to December 24, 1969, used a discount rate equal to the rate of interest payable by the Treasury on securities outstanding which at original issue had terms to maturity of 15 years or more. Since that date the discount rate has been pegged at the yield rate of securities having 15 years or more until maturity which are sold during the year. When this formula was imposed, the discount rate for water projects immediately rose from 3.25 percent to 4.625 percent. The current rate (1972) is 5⅜ percent.

There are some persuasive arguments being made that this rate understates the real opportunity cost of capital in the economy today. A study for the Joint Economic Committee concluded that a discount rate of 10 percent would be appropriate for Government projects.[28] The Office of Management and Budget has adopted that rate for evaluating all Government investments outside the water resources field. The Water Resources Council has proposed 7 percent as an interim discount rate for water resources while at the same time adopting the OMB view that the opportunity cost of capital is the appropriate concept for arriving at the correct rate.

Without attempting to resolve either the theoretical or political issues involved, we conclude that both the current SCS rate and the historically lower rates of discount understate the opportunity costs

[28] Joint Economic Committee, U.S. Congress, *Economic Analysis of Public Investment Decisions: Interest Rate Policy and Discounting Analysis*, Report of the Subcommittee on Economy in Government, Washington, 1968.