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**Additional Precious Metals Can Be Recovered. LCD-77-228; B-163084. December 28, 1977. 27 pp. + 6 appendices (10 pp.).**

**Report to Secretary, Department of Defense; Administrator, General Services Administration; by Fred J. Shafer, Director, Logistics and Communications Div.**

**Issue Area: Facilities and Material Management (700); Materials: Conserving Scarce Raw Materials (1805).**

**Contact: Logistics and Communications Div.**

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**Congressional Relevance: House Committee on Armed Services; Senate Committee on Armed Services.**

The Federal Government is a large user of items containing gold and silver. In fiscal year (FY) 1976, Federal agencies recovered \$20.2 million in gold and silver from materials used in day-to-day operations. Additional gold and silver estimated at \$15.6 million could have been recovered. Demonstration projects have shown that the Department of Defense (DOD) can identify, segregate, and sort gold and silver items in electronic scrap and reclaim them economically. DOD is the largest recoverer of gold. Silver is used more extensively than gold; photographic and x-ray film contains silver, and film is used by all agencies. Findings/Conclusions: The Department of Defense recovers very little gold and silver from electronic scrap even though it has demonstrated that recovery is economically feasible. Instead, it continues to study the feasibility of such recovery and is selling items with gold and silver at scrap prices. Recovery from scrap in FY 1976 could have yielded an estimated additional \$11.6 million. Twenty-six Federal agencies recovered only 36% of the recoverable silver from photographic solutions. The other 64%, valued at an estimated \$4 million, was not recovered because some agencies do not have recovery programs and others are recovering less silver than they should. Federal agencies have not diligently managed recovery programs. Recommendations: The Secretary of Defense should: direct the Defense Logistics Agency to take the actions necessary to segregate precious-metal-bearing electronic scrap, accumulate it at selected locations, and extract the available gold and silver. The Administrator of the General Services Administration should require all agencies to immediately, and annually thereafter, survey their components to identify those using fixer and its estimated silver content. The Administrator should initially require these agencies to report semiannually to GSA on specified types of information and should follow up with these organizations to determine reasons why the agencies are not recovering the maximum amount of silver and the actions planned for doing so. (Author/SW)

04549



**UNITED STATES  
GENERAL ACCOUNTING OFFICE**

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## **Additional Precious Metals Can Be Recovered**

Federal agencies in fiscal year 1976 recovered \$20.2 million in gold and silver from materials used in day-to-day operations. But additional gold and silver estimated at \$15.6 million could have been recovered.

--The Department of Defense recovers very little gold and silver from electronic scrap even though it has demonstrated that recovery is economically feasible. Instead, it continues to study the feasibility of such recovery and is selling items with gold and silver at scrap prices. Recovery from scrap in fiscal year 1976 could have yielded an estimated additional \$11.6 million.

--Twenty-six Federal agencies recovered only 36 percent of the recoverable silver from photographic solutions. The other 64 percent, valued at an estimated \$4 million, was not recovered because some agencies do not have recovery programs and others are recovering less silver than they should.

General Services Administration needs to forcefully exercise its authority under its Government-wide responsibility for precious metals programs to insure that agencies are diligently recovering the maximum gold and silver.



UNITED STATES GENERAL ACCOUNTING OFFICE

WASHINGTON, D.C. 20548

LOGISTICS AND COMMUNICATIONS  
DIVISION

B-163084

To the Secretary of Defense and the  
Administrator of General Services

This report discusses the potential for Federal agencies to recover precious metals from material destined for disposal. Also discussed is a need for increased management attention by the Department of Defense, the General Services Administration, and all Federal agencies having potential to recover precious metals.

The report contains recommendations to the Secretary of Defense on page 13 and to the Administrator of General Services on page 24. As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Acting Director, Office of Management and Budget; the Senate Committee on Governmental Affairs; the House Committee on Government Operations; and the Senate and House Committees on Appropriations and Armed Services.

Sincerely yours,

*F. J. Shafer*  
F. J. Shafer  
Director

D I G E S T

Recognizing the need to remove gold and silver from such used items as batteries, electronic components, photographic and X-ray films, Federal agencies over the years established recovery programs under the Government-wide auspices of the General Services Administration. In 1976, \$20 million in silver and \$436,000 in gold were recovered under these programs.

Additional gold and silver in the Department of Defense's electronic scrap--estimated at \$11.6 million--and silver in many Federal agencies' photographic solutions--estimated at \$4 million--could have been recovered in fiscal year 1976 but were not.

GOLD AND SILVER RECOVERY FROM  
DEFENSE'S ELECTRONIC SCRAP

Demonstration projects have shown that Defense can identify, segregate, and sort gold and silver items in electronic scrap and reclaim them economically.

In 1975, items containing gold and silver were sorted from scrap at Hill Air Force Base, Utah, at a cost of \$27,000. Market value of this sorted scrap was \$154,000--over six times its normal sales value of \$25,000. (See p. 10.)

Another project in early 1976 showed recovery of gold and silver to be profitable. Electronic scrap from Hill Air Force Base was smelted and assayed, and \$46,000 in gold and silver was recovered. The value of the recovered metals was four times the recovery costs of \$11,600. (See p. 10.)

These projects demonstrate the feasibility of recovering gold and silver from electronic scrap. Defense, instead of recovering the metals, has continued testing such recovery. In the meantime, much electronic scrap is being sold at nominal prices.

GAO recommends that the Secretary of Defense direct the Defense Logistics Agency to segregate and recover gold and silver from electronic scrap.

The Defense Department stated that the Logistics Agency's responsibility to establish standards for recovery and to measure the efficiency and cost effectiveness of recovery efforts is already well defined. It said further that changes needed in the program would be determined after consideration of this report and of a report being prepared by the Defense Audit Service.

The issue is not whether responsibility has been defined, it is the continuing inaction of Defense in not insisting on Department-wide implementation of a demonstrated profitable recovery program. (See p. 13.)

#### SILVER RECOVERY FROM FIXER SOLUTION

In fiscal year 1976, Federal agencies recovered only 36 percent of the recoverable silver from fixer solution--a poor record. General Services has not forcefully exercised its role as monitor of the Government-wide precious metals recovery program. Nor has General Services assured itself that Federal agencies are in fact recovering the metals and that recovery is maximum. It receives data on silver recovered but not on how much could have been recovered. If General Services had pursued its role vigorously, it would have been aware that:

- Some agencies that should have had recovery programs, did not. (See p. 17.)
- There is a lack of cooperation within and among agencies to increase recovery. (See pp. 17 and 18.)
- Many components of agencies with recovery programs are recovering less than they should. (See p. 18.)
- Agencies using contractor services in the Washington, D.C., area are not recovering all silver in fixer. (See p. 18.)

Federal agencies have not diligently managed their recovery programs. Most are aware of how much silver they recover but are unaware of the efficiency of their programs. (See p. 19.) Had each agency management established the means to evaluate its programs, it could have identified problems related to the recovery of silver and taken corrective action.

The Administrator of General Services should

- require each agency to survey its components, set goals, and monitor recovery in relation to goals;
- require more stringent reporting by agencies that would enable it to evaluate individual agency silver recovery programs, thus causing agency management to focus more attention on its silver recovery programs; and
- follow up with agencies to determine why the agencies are not recovering the maximum amount of silver and the actions these agencies plan to take to do so. (See p. 24.)

Although the Administrator did not dispute GAO's findings and conclusions and agreed that the recommendations could be adopted, he set forth no positive plans to implement the recommendations. (See p. 27.)

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ABBREVIATIONS

DOD	Department of Defense
DLA	Defense Logistics Agency
GAO	General Accounting Office
GSA	General Services Administration
VA	Veterans Administration



## CHAPTER 1

### INTRODUCTION

The Federal Government is a large user of items containing gold and silver. These precious metals are used in batteries, electronic components, uniform buttons and insignias, and photographic and X-ray film. Recognizing the need to recover gold and silver, the Federal Government has become more involved in recovering them over the years.

--In 1954, the Navy began recovering silver from torpedo batteries.

--In the early 1960s, the Veterans Administration (VA) began recovery of silver from X-ray film.

--In 1968, the Department of Defense (DOD) began a worldwide silver recovery program. And in 1969, DOD started a gold recovery program.

--Finally in 1969, all Federal precious metals recovery programs were placed under the General Services Administration (GSA).

How well these programs are working and what benefits are resulting from them are the subject of this report.

### USE AND RECOVERY OF GOLD AND SILVER

Gold is used as a thin coating over some other base metal such as copper because it does not corrode. Much gold is used in electronic components; also some is used in uniform buttons and insignias, eyeglass frames, and other items used by the military services.

DOD is the largest recoverer of gold. In fiscal year 1976, it recovered 3,219 troy ounces valued at \$436,000. Most of DOD's gold is recovered at a facility in Pueblo, Colorado, by using various chemical processes to strip gold off base metal. Gold can also be recovered by smelting and then separating the base metals. DOD contracts with industry for the latter process.

Silver is used more extensively than gold. All film--photographic and X-ray--contains silver, and film is used by all agencies. Much silver is used by the Navy in batteries for submarines, torpedos, sonobuoys, etc. Silver is

also used in dental amalgams, electronic components, brazing alloys, and solder.

Silver recovery methods depend on the source. Commercially available equipment is used to recover silver from film that goes into solution during the development process. Silver remaining on the film is recovered by incineration and smelting the ash. Most other silver undergoes smelting.

In fiscal year 1976, the Federal Government recovered 4.4 million ounces of silver valued at \$19.8 million. DOD--the largest consumer of photographic materials--recovered \$17.1 million of silver mainly from these materials and from batteries used by the military services. VA with its many health facilities and associated X-ray units was the second largest recoverer with \$2.1 million of silver. Most other agencies reclaimed silver but in lesser amounts, virtually all of it from photographic materials.

Estimated silver recovered in fiscal year 1976 based on agency data and its market value follows.

<u>Agency</u>	<u>Troy ounces</u>	<u>Market value</u>
	(thousands)	
DOD	3,788.3	\$17,066.7
VA	487.6	2,140.8
GSA	47.5	208.6
Energy Research and Development Administra- tion	33.6	147.3
National Aeronautics and Space Administration	11.3	49.8
Interior	10.2	44.9
Health, Education, and Welfare	10.0	44.1
Agriculture	8.2	36.0
Smithsonian Institution	2.4	10.5
Government Printing Office	2.2	9.6
Library of Congress	2.1	9.1
Central Intelligence Agency	1.9	8.1
Commerce	1.8	8.0
State	0.4	1.9
Justice	0.2	1.0
Environmental Protection Agency	<u>0.2</u>	<u>0.8</u>
<b>Total</b>	<u><u>4,407.9</u></u>	<u><u>\$19,787.2</u></u>

Incentive to recover gold and silver is limited. DOD and the agencies which participate in its precious metals recovery program may use the precious metals as Government-furnished material on their contracts for manufactured goods and thereby reduce procurement costs. Other agencies generally sell reclaimed silver through GSA on the open market to the highest bidder. Some receive the sales revenue. For example, VA deposits this revenue in its revolving supply fund to benefit all its hospitals and clinics. Most others do not receive the revenue and it is deposited in the Treasury. (See p. 26 for further discussion of this subject.)

### PROGRAM RESPONSIBILITY

GSA is responsible for initiating Government-wide precious metals recovery programs. In the Federal Property Management Regulations, GSA directs each agency to evaluate recovery potential, implement recovery procedures, monitor recovery programs, and submit a consolidated annual report to GSA. Further, GSA directs each agency to establish and maintain a program for silver recovery from used fixer solution and scrap film.

Management of the recovery program varies among Federal agencies. Within DOD, program management is the responsibility of the Defense Logistics Agency (DLA). The Defense Property Disposal Service within DLA operates the program through its five regional offices--three in the continental United States and two overseas. The regional offices have a global network of 193 property disposal offices and recovery facilities at Colts Neck, New Jersey, and Pueblo, Colorado.

The VA silver recovery program management, policy, and direction is under the Department of Medicine and Surgery. Operational responsibility for recovery at the 170 VA hospitals/clinics is assigned to three VA supply depots in the continental United States. Each supply depot evaluates recovery potential, implements recovery procedures, and monitors program results at hospitals in its service area.

The remaining Federal agencies do not have extensive management organizations for their recovery programs. Generally, each has designated a silver monitor responsible for assuring recovery of silver from photographic materials and preparing consolidated reports to GSA. Program management and daily operations have been delegated to the many

components having recovery potential. These components determine the economic feasibility of recovering silver and the method of recovery and report their results to the agency silver monitor.

### SCOPE OF REVIEW

We evaluated the Federal agencies' efforts in maximizing recovery of precious metals. This evaluation required reviewing agency policies, procedures, and practices, as well as interviewing agency officials and personnel operating these programs.

Our evaluation was limited to recovery of precious metals from two major sources--electronic scrap and photographic material--because these sources offered potential to immediately increase recovery yields and could serve as examples of need for management improvement.

Because most civil agencies have decentralized program management, we used a questionnaire to obtain data from 251 components of these agencies to help us identify the maximum recoverable silver. In addition, we visited 44 DOD installations and Federal agencies to observe and inquire into the daily operations of their recovery programs. (See app. III.)

Most of our fieldwork was performed between May 1976 and January 1977.

CHAPTER 2

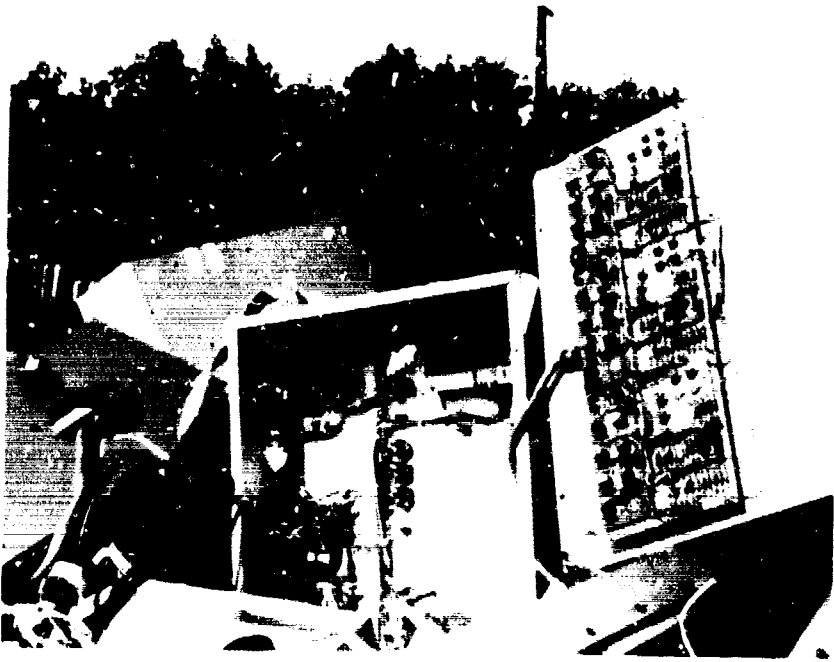
DOD'S ELECTRONIC SCRAP

CONTAINS GOLD AND SILVER

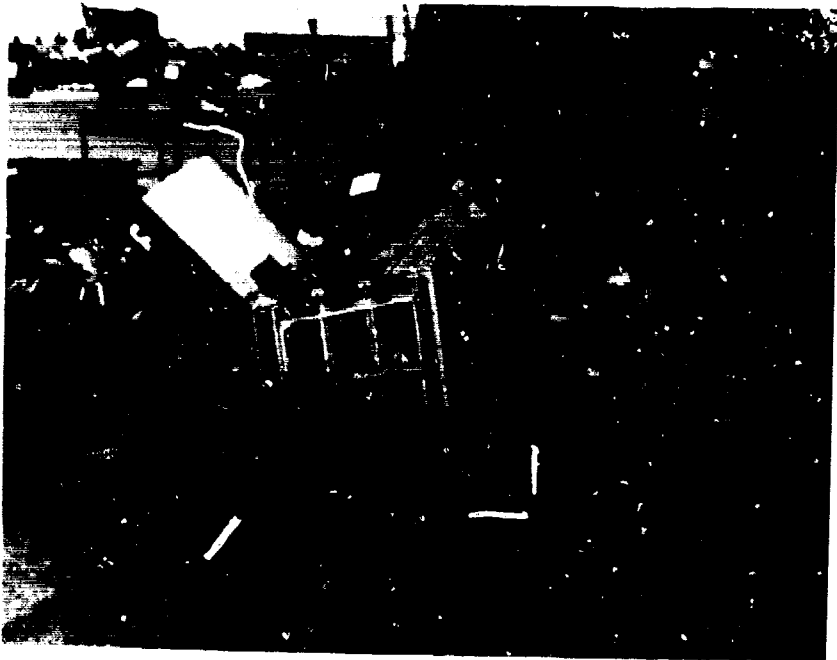
DOD has electronic scrap containing gold and silver located in the United States and overseas. Some of the scrap we observed is shown in the photographs below and on the next page.



DAVIS — MONTHAN AIR FORCE BASE TUCSON, ARIZONA

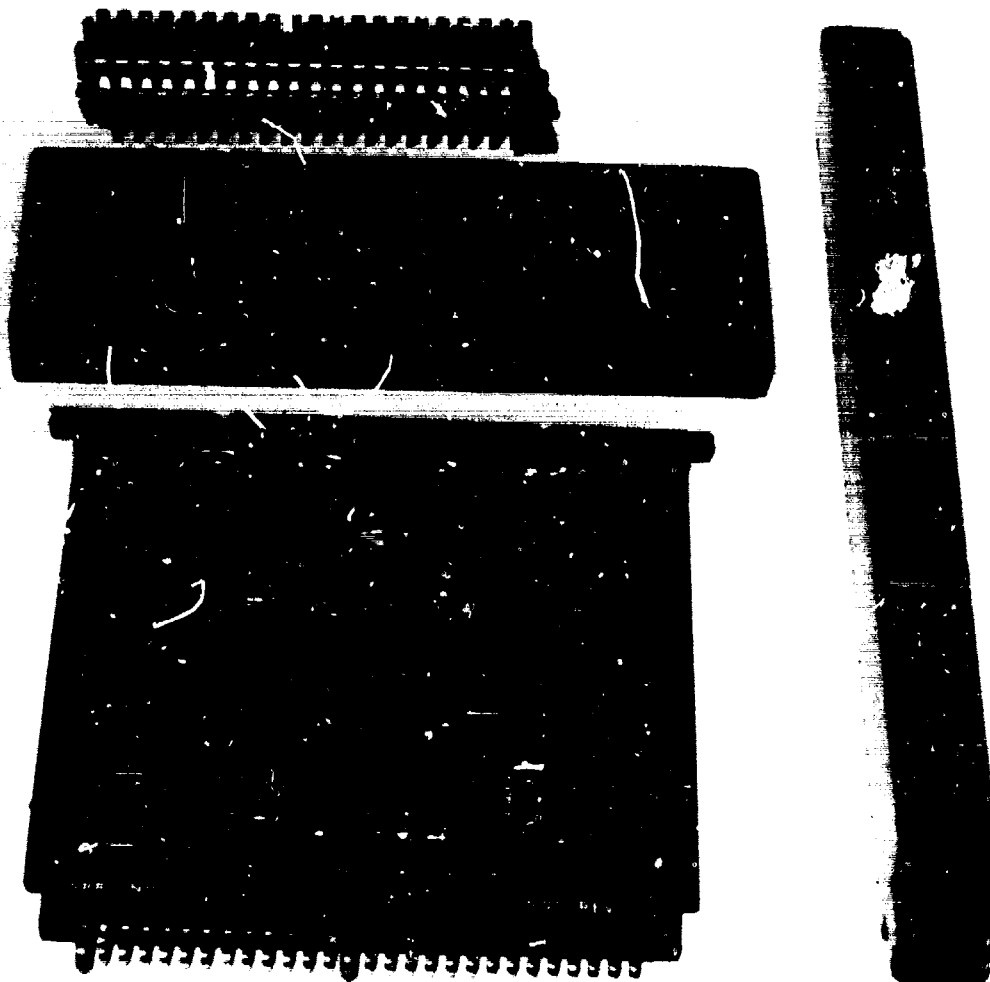


NAVAL AMMUNITION DEPOT EARLE, COLTS NECK, NEW JERSEY

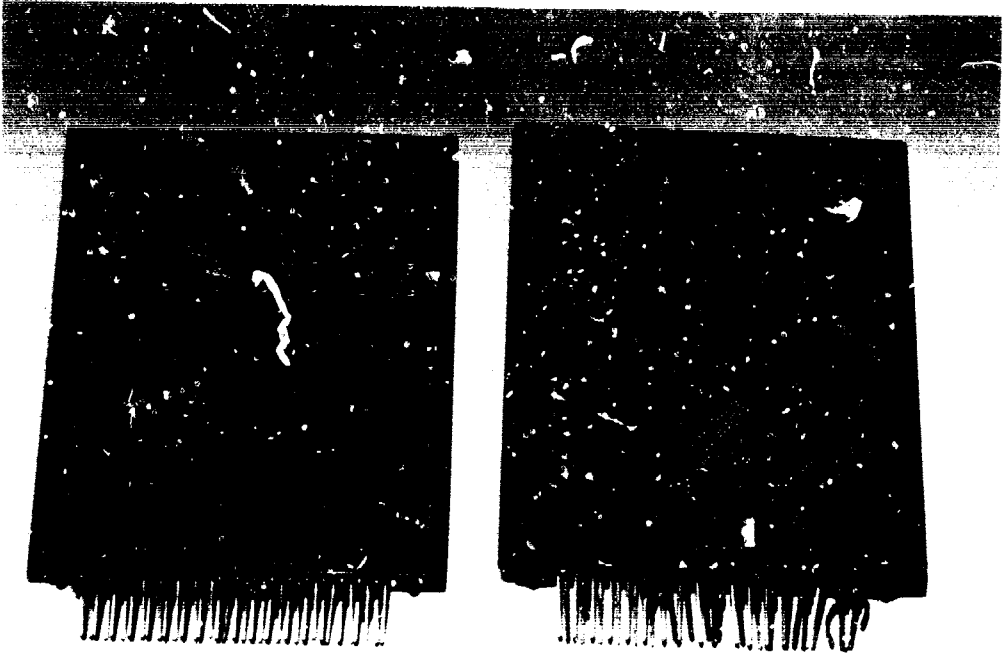


HILL AIR FORCE BASE OGDEN, UTAH

Gold and silver in this electronic scrap is in the form of plated pins, circuit boards, connectors, and contact points, as shown in the photographs below and on the next page.



ELECTRONIC CONNECTORS



CIRCUIT BOARD



CONTACT POINTS AND PINS



While DOD recovers large amounts of silver from batteries and other sources and some gold from uniform buttons and insignias and eyeglass frames, it has hesitated to recover precious metals from its largest source of gold--electronic scrap. The Defense Property Disposal Service assisted by the Bureau of Mines, Department of the Interior, has studied how to reclaim gold and silver from this scrap and found that it can be done at a reasonable cost. Despite this finding, the Disposal Service continues to study the feasibility of such recovery. In the meantime, much electronic equipment is being sold as scrap without recovering the gold and silver. We estimate that in fiscal year 1976 about \$11.6 million in additional revenue was lost because the gold and silver was not recovered.

#### IDENTIFYING, SEGREGATING, AND SORTING IS ECONOMICAL

The key to recovering precious metals from electronic scrap is identifying, segregating, and sorting, according to Disposal Service officials and researchers. Two Disposal Service offices have demonstrated that these functions are simple and economically feasible.

First, gold and silver in the scrap must be identified. Information on identifying gold and silver has been disseminated to the disposal offices by the Disposal Service in a series of memorandums entitled, "Tips on Precious Metal Recovery," and in a booklet containing pictures of items containing precious metals. A Disposal Service official stated that this information is all a person needs to identify gold and silver in electronic scrap.

Once identified, items containing gold and silver can be segregated and sorted. Segregating means screening components being scrapped and setting aside those containing items with precious metals. Sorting means extracting items containing precious metals from a component using common and simple tools, like screwdrivers, pliers, wire cutters, and punches. By disassembling the frame of a console, circuit boards may be pulled out by hand. Connectors can be cut from wires. Pins can be punched out of plastic holders.

Electronic scrap that is not segregated and sorted is sold for about 10 cents a pound. When segregated and sorted, this same scrap can be sold at a substantially higher price or the precious metals can be recovered.

### Example A

Electronic scrap (273,000 pounds) was segregated and sorted at Hill Air Force Base, Utah, in 1974 and 1975. Items containing gold and silver were sorted from this scrap at a cost of \$27,000. The market value of this sorted precious metals scrap was \$154,000 or over six times its normal sales value (\$25,000).

### Example B

At the Army Ammunition Depot, Pueblo, Colorado, in 1976, items containing precious metals were sorted from general electronic scrap. During a 3-month period over 1,500 ounces of gold were recovered from this scrap. The gold valued at \$139 an ounce resulted in a return of over 300 percent on recovery costs of \$45 an ounce. Included was a nominal sorting cost of about \$2 an ounce. (This particular project benefited from a student employment grant under which university students sorted the electronic scrap. The Disposal Service paid only a portion of its normal labor costs as the remainder was paid from grant funds. However, we estimate that if regular Disposal Service employees were used, recovery costs would have been about \$64 an ounce. This would still have resulted in a return of over 200 percent on recovery costs.

### RECLAIMING PRECIOUS METALS IS ECONOMICALLY FEASIBLE

The Ogden Region of the Disposal Service in early 1976 completed a project to ascertain the feasibility of reclaiming gold and silver from electronic scrap. Gold, silver, and copper worth over \$46,000 were recovered from scrap which ordinarily would have sold for \$800. After spending \$11,600 to recover the metals, DOD realized a net of almost \$34,000. (See app. IV.)

The project involved the Ogden Region providing administrative support and coordination, the Disposal Office at Hill Air Force Base segregating and sorting the electronic scrap, and the Bureau of Mines at Salt Lake City analyzing the reclaimed metal in bar and slag form to determine the precious metals content.

While the overall project was profitable, different types of items showed different results. Four items were

profitable and two were not. The profit or loss as well as the quantity recovered of gold, silver, and copper follows.

<u>Type of item</u>	<u>Gold</u> (oz.)	<u>Silver</u> (oz.)	<u>Copper</u> (lbs.)	<u>Profit or loss(-) per ton</u> (percent)
Electronic pins, chassis parts, and hardware	178	289	1,285	894
Contact connector strips with gold-plated pins in plastic	200	173	612	712
Circuit boards	38	168	313	64
Plugs and connectors	74	150	228	184
Black boxes intact (electronic systems in aircraft)	.4	77	89	-70
Black boxes partially disassembled	1	98	63	-68

In April 1976, the Ogden Region, based on its project, notified the Disposal Service that recovery of precious metals was feasible and economical for most items. DLA, in cooperation with the Bureau of Mines, is trying to develop economical ways to recover precious metals from black boxes.

#### TOTAL RECLAIMABLE METALS

We estimated the total additional revenues that could have been realized in fiscal 1976, had gold and silver been recovered from electronic scrap. This was done by projecting the results of the previously mentioned sorting and recovery projects at Hill Air Force Base and the Ogden Region over the entire 12.2 million pounds of electronic scrap sold by the Disposal Service in 1976. About \$11.6 million net additional revenue could have been realized. (See app. V.)

#### RECENT DOD ACTIONS

In December 1976, 6 months after our initial inquiries into precious metals recovery, DOD formalized its

January 16, 1974, memorandum with the issuance of a directive establishing policy and assigning management responsibility for the precious metals recovery program to DLA. Under this directive, DLA was to establish standards to measure the efficiency and cost effectiveness of recovery efforts based on quantity and value of precious metal content of items. DLA has taken some recent actions to recover gold and silver from electronic scrap on a larger scale than was being done prior to the Ogden Region project. DLA officials have stated, however, that they are not ready to take the final step of directing full recovery on a DOD-wide basis.

The Ogden Region has directed its disposal offices to sort electronic scrap. An Ogden official stated that it will take time for all the disposal offices to begin sorting but that some have begun. We visited two disposal offices and found they were sorting. Until the Ogden Region awards a contract for the recovery of gold and silver, all disposal offices are to stockpile the sorted scrap.

Several disposal offices in the Memphis Region of the Disposal Service have also segregated and sorted electronic scrap. This, however, was a limited effort to support a one-time project to further demonstrate the economic feasibility of recovering rather than part of a DOD-wide attempt to recover gold and silver from electronic scrap.

Officials of the Disposal Service are withholding judgment on the feasibility of recovering from all electronic scrap until the results are obtained from the demonstration project in the Memphis Region. This project, however, is behind schedule by several months. DLA officials believe that, on the basis of the two projects discussed in this report, the Disposal Service should recover precious metals from all electronic scrap. However, it has yet to direct recovery DOD-wide.

## CONCLUSIONS

Recovery of gold and silver from electronic scrap has been demonstrated by the Disposal Service to be both physically and economically feasible. While the Ogden Region has moved toward large-scale recovery, DLA is reluctant to direct recovery DOD-wide. Until this is done, electronic scrap will continue to be sold without the precious metals being recovered. When considering the volume of electronic scrap sold annually--12.2 million pounds in fiscal year

1976--millions of dollars in additional revenue could be realized annually if DOD would reclaim the total gold and silver from this source.

### RECOMMENDATION

We recommend that the Secretary of Defense direct DLA to take the actions necessary to segregate precious-metal-bearing electronic scrap, accumulate it at selected locations, and extract the available gold and silver.

### AGENCY COMMENTS AND OUR EVALUATION

In commenting on a draft of this report, DOD has reasserted its requirement that the costs of segregating scrap and recovering precious metals be compared to costs of alternative methods of disposition. (See app. I.) According to a DOD directive, DLA, as the program manager, is responsible for establishing standards to measure the efficiency and cost effectiveness of recovery efforts. It points out that this responsibility is well defined in the DOD directive issued in December 1976. Furthermore, according to DOD, changes needed in the program will be determined after it considers our report and a report being prepared by the Defense Audit Service concerning the precious metal recovery program.

We recognize the DOD directive has defined, and given to DLA, the responsibility for managing the recovery program which includes comparing the costs of alternative methods of disposing of precious-metal-bearing materials. The issue is not whether responsibility has been defined; it is the continuing inaction on the part of DOD to exercise its authority and to insist on Department-wide implementation of a recovery program that has demonstrated its profitability. Although components of the Disposal Service have demonstrated that recovery of gold and silver from electronic scrap can be a source of net revenues, DLA has not established a DOD-wide program to accomplish such recovery. Therefore, we believe that the Secretary of Defense should direct DLA to immediately establish procedures and controls which will insure the recovery of gold and silver from electronic scrap--already proven profitable--at all locations throughout the disposal system and measure the results.

## CHAPTER 3

### IMPROVE SILVER RECOVERY

#### FROM FIXER SOLUTION

Our review into the programs of 26 Federal agencies for recovering silver from photographic fixer solution showed that almost \$4 million of silver--64 percent of the total recoverable silver--went down the drain in fiscal year 1976. Although GSA has Government-wide responsibility for precious metals recovery, it has not insured that agencies (1) are in fact recovering precious metals and (2) are recovering maximum amounts. Further, agencies responsible for the actual recovery do not know how efficient their programs are because they (1) do not know who should make the recovery, (2) have not established program goals, and (3) do not monitor results. Until GSA and these agencies focus their attention on this program, most silver recoverable from fixer will continue to be lost.

#### MAXIMUM RECOVERABLE SILVER

We estimate that in fiscal year 1976, 26 Federal agencies could have recovered from fixer solutions a maximum of about 1.4 million troy ounces of silver. Actual recovery, based on agency data, was 507,000 troy ounces--a 36-percent rate of efficiency.

We estimated the maximum recoverable silver from the number of gallons of fixer used, as reported by the agencies, and potential recoverable silver data provided to us by the manufacturers of silver recovery equipment.

The equipment manufacturers said that the average gallon of used fixer contains 0.5 ounce of silver. The industry uses this figure as a rule of thumb that is based on the manufacturers' analysis of several thousand samples of used fixer from Government and commercial firms. This average was substantiated by our analysis of Disposal Service data for certain DOD photographic and X-ray facilities consuming 584,000 gallons of fixer annually.

The equipment manufacturers advised us that centralized batch processing with electrolytic silver recovery equipment is the most efficient method for extracting silver from fixer. Under this method, used fixer is transported to a central point and placed into the tank of the electrolytic

recovery unit where the silver is drawn out of fixer. These manufacturers stated that this method can recover up to 95 percent of the silver and that other methods will be less efficient. A Bureau of Mines investigation of health facilities in the Salt Lake City area confirms this efficiency.

Metallic replacement cartridges are widely used and if used properly can, according to manufacturers, also recover up to 95 percent of the silver from fixing solutions. The cartridge is a plastic container packed with iron in the form of steel wool. The fixer flows through the steel wool on the way to the drain. Through chemical reaction, the iron replaces the silver in the solution and the silver drops out and falls to the bottom as metallic sludge. According to experts in the field, the most effective way to use cartridges is to have them connected in tandem so the fixer flows through both cartridges before it goes into the drain. When only one cartridge is used in the recovery operation, it is necessary to frequently test the off-flow with litmus paper to assure that it does not contain silver.

While the 26 agencies recovered 36 percent of the maximum recoverable silver, the rate of recovery for individual agencies ranged from zero to 90 percent. DOD had the largest recovery potential but had one of the lowest rates of recovery--21 percent. VA had the second largest potential and recovered 79 percent. Agencies with small recovery potentials generally did not recover any silver. The following table shows the individual agencies' maximum recoverable silver, 1/ efficiency rate, and the market value of silver.

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1/Computed as follows:  $\frac{\text{Gallons of fixer consumed}}{\text{Yield per gallon}} \times 95 \text{ percent}$

Silver and Fixer Data  
FY 1976

<u>Organization</u>	<u>Fixer consumed</u> (gallons)	<u>Silver</u>		<u>Efficiency rate</u> (percent)	<u>Market value</u>	
		<u>Recoverable</u>	<u>Recovered</u>		<u>Recoverable</u>	<u>Recovered</u>
		<u>----- (troy ounces) -----</u>				
DOD	2,000,000	950,000	198,694	751,306	\$4,170,500	\$3,298,233
Veterans Administration	493,630	296,178	235,361	50,917	1,300,221	266,986
National Aeronautics and Space Administration	61,608	29,264	9,306	20,958	128,468	36,463
Energy Research and Development Administration	56,206	26,698	24,005	2,693	117,204	105,382
Interior	40,901	19,428	9,882	9,546	85,289	43,382
Health, Education, and Welfare	39,842	18,925	10,047	8,979	83,081	44,106
Agriculture	37,788	17,949	8,125	9,824	79,796	35,669
Justice	27,348	12,990	220	12,770	57,026	56,060
Central Intelligence Agency	10,788	5,124	1,853	3,271	22,494	8,135
U.S. Information Agency	8,652	4,119	(a)	4,110	18,043	-
Smithsonian Institute	7,956	3,779	2,382	1,397	16,590	10,457
Library of Congress	7,200	3,420	2,071	1,349	15,014	9,092
GSA	6,084	2,890	2,301	589	12,687	10,101
Government Printing Office	5,904	2,804	2,199	615	12,310	9,510
Transportation	5,682	2,699	(a)	2,699	11,849	-
Treasury	5,412	2,571	(a)	2,571	11,287	11,849
Commerce	4,330	2,057	1,352	705	9,030	3,095
State	1,950	926	426	500	4,065	1,970
Environmental Protection Agency	1,020	485	219	267	2,129	957
Small Business Administration	300	142	(a)	142	623	-
Labor	276	131	(a)	131	575	575
Housing and Urban Development	144	68	(a)	68	299	299
Federal Trade Commission	120	57	(a)	57	250	250
Interstate Commerce Commission	120	57	(a)	57	250	250
Civil Aeronautics Board	102	48	(a)	48	211	211
Federal Communications Commission	72	34	(a)	34	149	149
<b>Total</b>	<b>2,823,435</b>	<b>1,402,834</b>	<b>507,432</b>	<b>895,402</b>	<b>\$6,158,440</b>	<b>\$2,227,627</b>
						<b>\$3,930,813</b>

a/Did not recover. While the amounts of fixer generated by some agencies appear small, we have been advised that recovery of even small amounts of silver is economically feasible.



NEED FOR GSA TO BETTER MANAGE  
GOVERNMENT-WIDE PROGRAM

As the Government-wide manager of silver recovery from photographic materials, GSA requires annual reports from the agencies on how much silver was recovered from fixer. These reports are received, but they are not sufficient for GSA to determine if all agencies that should be recovering are doing so and to evaluate whether maximum recovery is achieved. GSA has not established the necessary management controls and reporting to assure itself that the recovery program is effective.

Had GSA required agencies to report on the number of components using fixer and what was being done with the fixer, it would have been aware that some agencies were recovering a large percentage of silver and some were not. With adequate reporting, GSA would have had a basis for determining how the good performers do it and would have been able to inform other agencies of the more successful techniques. Silver monitors within each agency would have been able to better evaluate recovery results from individual photographic processing facilities. Further, if GSA had required data enabling it to evaluate agency recovery programs, it would have been in a position to inquire of the agencies why maximum recovery was not achieved and what actions were planned to achieve it. Such inquiries in fiscal year 1976 would have disclosed the following conditions.

Example A

There is a lack of intra-agency cooperation to increase recovery results.

--The Energy Research and Development Administration at Oak Ridge, Tennessee, has 17 components that process film and use fixer. Although all components are at Oak Ridge, 5 recover silver and 12 do not. We estimate that over 2,100 ounces of silver annually are not being recovered.

--At Fort Carson, Colorado, the Army hospital is recovering silver from fixer solution. At the same time, we found two other components at this military installation not recovering. We estimate the two components annually use 1,150 gallons of fixer having a silver content of 264 ounces.

### Example B

There is a lack of interagency cooperation to improve upon program results. In Manila, for example, the VA Out-patient Clinic and the printing plant for the U.S. Information Service recover silver from used fixer. Yet, in the same location, we found the U.S. Embassy dispensary discards fixer without recovering the silver.

### Example C

Many components within various agencies are not recovering because they (1) consider it uneconomical to do so, (2) have not been provided equipment, or (3) are unaware of the silver recovery program.

--For the 20 agencies surveyed by our questionnaire, 103 of the 251 components responding are not recovering. These components consume about 30,000 gallons of fixer annually with an estimated silver content of 15,000 ounces.

--We visited 13 military installations and found 14 components not recovering. We estimate these components annually use 5,100 gallons of fixer with a silver content of 3,600 ounces.

### Example D

Agencies using contractor services in the Washington, D.C., area are not recovering all the silver from fixer solutions. Under the GSA contract, the contractor recovers the silver, refines it, and pays the Government a percentage of the current market price for silver. We checked contractor-installed equipment at 10 facilities and observed five instances of silver going down the drain because contractor personnel did not adequately monitor the equipment. The contract does not require the contractor to pay for the lost silver.

The above-mentioned data would provide GSA with insights into agency efficiency and the causes underlying low efficiency rates. In addition, it would cause agencies to focus more management attention on their silver recovery programs. The agencies are responsible for managing their own programs efficiently and using the most effective means for recovering silver.

## NEED FOR AGENCIES TO BETTER MANAGE RECOVERY FROM FIXER

GSA's stated policy is that each agency is responsible for its own program for recovering silver from fixer solution. Such responsibility requires identifying agency components using fixer, implementing recovery methods, and monitoring program results. Most agencies are aware of how much silver they recover. But most are unaware of how efficient their programs are because they do not know who should make the recovery, have not established program goals, and do not monitor results by component. Further, had GSA insisted that agency management establish the means to evaluate its program, GSA and the agencies could identify problems related to the actual recovery of silver and take corrective action.

## DATA CAN BE OBTAINED FOR EVALUATION PURPOSES

To evaluate silver recovery programs for fixer, an agency needs data on the amounts of fixer and film used, the silver content of fixer, and the silver recovered. We found that this data is easy to obtain within the agencies.

VA has demonstrated that agencies can evaluate their silver programs. It sets annual goals for each of the 170 VA hospitals. The goals are set by the supply depots based on X-ray film data supplied by the hospital and film manufacturers' information on the quantity of silver recoverable from fixer used to develop films.

Recovered silver is shipped to the depots by the hospitals. Supply depots monitor the operations by comparing results to goals. When necessary, supply depot personnel examine the hospitals' recovery operations to improve efficiency.

DOD's Property Disposal Service has not set recovery goals--maximum recoverable silver--for the many DOD facilities using fixer, but it has demonstrated that it can obtain the data needed to set goals. We found also that it can identify the silver recovered by facility. Therefore, we believe the Disposal Service has the means to evaluate the DOD silver recovery program.

The Disposal Service has some data on fixer usage for 228 locations around the globe which, collectively, use

1.1 million gallons of fixer annually. For many of the DOD facilities at these locations, a simple litmus paper test was used to determine the silver content of the fixer. The Disposal Service could set recovery goals for these facilities.

It cannot, however, set DOD-wide goals because it does not have fixer and silver content data for all DOD facilities. The records maintained at the Disposal Service's recovery office at Colts Neck, New Jersey, show that 192 additional locations recovered silver from fixer in fiscal year 1976. Further, our analysis of the data for the 228 locations showed many instances where data was included for medical and dental components but not for other components normally found at military installations, such as photographic laboratories, industrial X-ray laboratories, printing plants, and hobby shops.

Disposal Service officials are aware of the lack of data for many DOD components consuming hundreds of thousands of gallons of fixer annually with some silver content. They had placed high priority on obtaining such data in fiscal year 1977. This data, however, was to be used to make sure that each facility had adequate recovery equipment rather than to set goals.

Our visits to other Government agencies and the responses received to our questionnaire showed that these agencies can determine the amount of fixer used annually. With little additional effort, silver content can be determined either by the method VA uses or that used by some of the DOD activities as discussed above.

#### EVALUATION CAN HELP IDENTIFY PROGRAM PROBLEMS

The ability to evaluate the silver recovery program can assist in identifying problems precluding recovery of the maximum amounts of silver. We believe program evaluations would have enabled the agencies to identify problems hampering recovery of silver and would have provided a basis for taking corrective action. Some problems we identified follow.

#### Cartridges used to recover silver

Much silver is lost when metallic replacement cartridges are used because personnel do not adequately monitor their use. When fixer passes through the cartridge too

fast or when most of the steel wool has disintegrated, recoverable silver flows through the cartridge and down the drain. The effectiveness of cartridges must be tested frequently through the use of litmus paper. Knowledgeable individuals informed us that they can determine whether cartridges have been used effectively from physical examination of their contents.

--In 1974 silver was recovered from 885 cartridges used by 123 DOD facilities. Silver recovered averaged 35 ounces a cartridge and ranged from zero to 122 ounces. Of the 885 cartridges, 54, or 6 percent, contained no silver. Based on industry's rule of thumb that the average gallon of used fixer contains 0.5 ounce of silver and manufacturers' recommendations that 220 gallons should pass through most cartridges before they are depleted, we believe that average recovery should be near 100 ounces of silver per cartridge.

--In 1976 the Disposal Service recovery operation at Colts Neck opened 140 cartridges received in the preceding 2 years to determine whether they had been used properly. Most cartridges--103, or 74 percent--had not been used properly.

--At 7 DOD facilities visited, we checked 29 cartridges and found 12 instances where silver was flowing down the drain. The silver content of the fixer going into the drain from these cartridges ranged from 0.1 to 1.25 ounces a gallon.

--At 7 locations serviced under the GSA contract, we found three instances where the fixer going from the cartridge to the drain contained silver.

Most technicians we visited at DOD facilities were aware that periodic testing of the cartridge was necessary to prevent loss of silver but few were able to explain why silver was being lost. Generally, their explanations indicated a lack of understanding on when the cartridge should be changed.

## Electrolytic recovery equipment on line with processors

Silver was being lost when electrolytic recovery equipment was hooked directly to the film developing processor. We attributed the losses to inefficiencies in the method itself and inaction by personnel operating the equipment.

When electrolytic equipment is attached directly to the processor, fixer flows from the processor to the electrolytic equipment where it is to be desilvered. Whenever the electrolytic equipment is full and silver-laden fixer continues to flow into it, the fixer containing silver overflows into the drain.

--Disposal Service data for the 228 locations identified 127 online electrolytic units. This data shows that 14 units had silver in the fixer going to the drain.

--During our visits to DOD installations, we observed five recovery units. Our tests of the fixer at the drain disclosed two instances of silver being lost.

--In similar tests for 11 facilities at civil agencies, we found 4 cases where silver was being lost.

Our review of Disposal Service data and visits to military installations also disclosed instances where silver was lost because of a lack of action by operating and maintenance personnel.

--At the 228 locations, the Disposal Service identified 8 electrolytic recovery units losing silver because they needed repair or replacement. Five of eight were inoperable.

--At one Army hospital audited by the Army Audit Agency, 1,433 ounces of silver were lost in 1976 because (1) recovery units were not turned on, (2) a recovery unit was not repaired for 2 months, and (3) silver sludge in the holding tanks was not reclaimed.

--A Navy hospital we visited had two recovery units broken down, one for 8 months and the other 2 months, in fiscal year 1976. Because these breakdowns

were not corrected promptly, we estimated 1,420 ounces of silver went down the drain.

--We found a Navy dispensary had one recovery unit to service two X-ray machines, but only one was hooked up to the unit. About 480 ounces of silver annually was being lost.

### AGENCY ACTIONS TO IMPROVE SILVER RECOVERY

Some actions are underway in the agencies to improve silver recovery in the future. Not in all instances, however, will the actions enable management to evaluate their programs.

VA, which makes extensive use of the centralized batch processing method of recovery and has set goals for each hospital, is conducting pilot programs at a few hospitals to see if additional internal controls are needed. These controls are intended to insure that all fixer is in fact being processed through silver recovery equipment and that equipment is used properly to recover the maximum silver.

The Disposal Service is doing two things that should increase program results. First, it is exploring with a few military installations the feasibility of using the centralized batch processing method of recovery. Second, it is trying to identify all facilities using fixer and make sure they have adequate equipment.

### CONCLUSIONS

Although GSA has Government-wide responsibility for silver recovery programs from fixer, it does not require sufficient data from the agencies to evaluate their programs. It does receive data on silver recovered but does not receive data on each agencies' maximum recoverable silver. Without such data, GSA cannot be sure that agencies are recovering the silver or that recovery is maximum.

Most agencies need to improve their recovery results. They have not established program goals against which to compare results. Such comparison is needed to identify program inefficiencies.

## RECOMMENDATIONS

We recommend that the Administrator of General Services require all agencies to immediately, and annually thereafter, survey their components to identify those using fixer and its estimated silver content. Further, the Administrator should initially require these agencies to report semiannually to GSA. These reports should show the following data, as well as any other information which GSA believes is necessary for better management of the program.

- Gallons of fixer used.
- Types and amounts of film processed.
- Estimated maximum recoverable silver.
- Method of estimation.
- Silver recovered.
- Explanations of significant differences between estimated recoverable silver and silver actually recovered.
- Actions planned to maximize recovery.
- Type of recovery equipment.

We also recommend that the Administrator follow up with these organizations to determine reasons why the agencies are not recovering the maximum amount of silver and the actions planned for doing so.

## AGENCY COMMENTS AND OUR EVALUATION

The Administrator of General Services commented on our findings and proposed recommendations, and his letter is included as appendix II.

In response to our proposal that GSA require each agency to survey its components and identify those using fixer and the estimated silver content, GSA replied that it has encouraged this but could make the survey mandatory. The reply stated, however, that an annual survey would be unnecessary because our proposal for more frequent and detailed reporting by agencies would, in itself, require such surveys. We believe that the intent of the surveys is to



search for and identify potential recovery locations. The intent of the reporting is to monitor the progress made by these locations. We believe that the surveys should be made mandatory. Most agencies currently do not perform such surveys and, as a result, have not accumulated the basic data they need to identify potential locations for recovery of silver. We also believe that GSA should establish controls to insure that the surveys are made.

The Administrator suggested that the agencies report to GSA semiannually rather than quarterly, as suggested in our earlier draft report. We concur and are recommending that reporting be semiannual. We further agree that when GSA is able to show that its silver recovery program is being carried out efficiently by the Federal agencies, the reporting could be made an annual requirement.

GSA also suggested that our recommendations be directed to all Federal agencies rather than to the Administrator of General Services. We are making our recommendations to GSA because GSA, by statutory authority, is responsible for Government-wide management of precious metal recovery programs.

On our proposal that followup by GSA would be needed to determine why agencies are not recovering the maximum amount of silver and to ascertain agency plans for improving recovery, GSA responded that it would follow up to the extent of present resources. The Administrator has given responsibility for the Government-wide precious metals recovery program to his Property Rehabilitation Division. This Division has not established a followup procedure to insure that the program is being carried out as directed in the Federal Property Management Regulations. We believe positive-action followup to be an essential ingredient of any program. By adopting the recommendations in this report, GSA should be in a position to evaluate agency recovery actions, compare results with goals, identify successful and less than successful results. In cases where results are less than successful, followup by the Government-wide manager of silver recovery is, in our opinion, the key element needed to insure agency compliance with the program.

GSA has commented on three additional areas. It states that we advocate centralized batch processing with electrolytic silver recovery equipment, while other methods can be as efficient. We recognize that metallic replacement cartridges or online electrolytic equipment can be effective if properly managed. We believe that the system installed

should be compatible with the facility, the quantities of fixer to be processed, and other factors peculiar to each installation. We have found, however, that at the facilities we visited, those with central batch processing were generally most efficient in recovering silver. Central batch processing facilities also offer the advantage of being able to service any number of photographic development laboratories. For example, a large processor of film who has central batch processing with electrolytic recovery equipment is in a position to accept fixer solution from nearby smaller units.

GSA also questions why we do not discuss the limited incentives to most Government agencies to recover gold and silver. Most agencies we reviewed also voiced the opinion that recovery yields would be greater if incentives were incorporated in the recovery programs.

VA does have direct incentive to recover, since legislation allows it to directly receive proceeds from the sale of silver. Those proceeds are deposited in their revolving supply fund. VA is also among the most efficient agencies in the recovery of silver from film and photographic material. In most other agencies, the proceeds from sale of silver are deposited in the Treasury.

We believe that incentives would probably increase recovery. Also we recognize that although the law now requires agencies to recover precious metals, it has assigned Government-wide responsibility for precious metal recovery to GSA. Therefore, if GSA believes an incentive, such as receipt of proceeds from recoveries, is needed to motivate agencies to improve their programs, it should request the necessary legislation. In fact, GSA should be the agency that would initiate any legislative action or policy changes necessary to improve the program. However, before GSA can effectively implement any plans to improve silver recovery, it needs the information and the basic data which is not now accumulated but would be if the recommendations in this report are adopted.

Finally, GSA notes that we criticize the effectiveness of a GSA contract to recover silver in the Washington, D.C., area but do not make conclusive judgments nor recommend alternatives. This was only one of several examples we are presenting where we found agencies either not recovering silver or losing silver even though recovery attempts were being made. We believe that GSA and the agencies need to

establish management controls which will enable them to identify losses of precious metals, as cited in the examples, so that corrective actions can be initiated.

Although the Administrator does not dispute our findings and conclusions and agrees that our proposals can be adopted, he set forth no positive plans to implement our proposals to improve the silver recovery program. We believe that this is an excellent opportunity for GSA to take a leadership role and thereby not only increase the Government's recovery of silver but also demonstrate to all agencies the commitment of GSA to promotion of economy and efficiency throughout the Government.

The DOD comments (see app. I) to a draft of this report questioned our estimate that 2 million gallons of fixer solution are processed annually within DOD. They state that only 446,744 gallons were issued to DOD activities by DLA and that it would be unlikely that DOD could use four times the amount of fixer that had been supplied by DLA.

We found that DOD users of fixer solution obtain the solutions through (1) DLA, (2) GSA contractors, and (3) local purchasers. We also found survey data available at the Defense Precious Metal Recovery Office, Colts Neck, New Jersey, which identifies over 1.1 million gallons of fixer being used annually by 228 activities which were included in the surveys. We have identified an additional 192 activities not included in the surveys, which ship silver flake from fixer solution and recovery cartridges to the recovery office.

DLA is not the most frequently used source of fixer solution, particularly photographic fixer. Of the 446,744 gallons identified by DOD, only 1,940 gallons were of fixer solution used in photographic processing; the remainder was fixer used in X-ray processing. One DOD photo lab alone in the Washington, D.C., area uses over 10,000 gallons of photographic fixer solution.

We realize that the 2-million-gallon estimate is an estimate and that development of exact figures would require considerable effort. However, DLA officials of the precious metal recovery program have agreed that 2 million gallons is a reasonable estimate. If our recommendations in this report are adopted, using activities will be required to accumulate and report on the amounts of fixer used and DOD will be in a position to establish goals, monitor recovery, and better evaluate its program.



SR  
MANPOWER,  
RESERVE AFFAIRS  
AND LOGISTICS

ASSISTANT SECRETARY OF DEFENSE  
WASHINGTON, D C 20301

11 October 1977

Mr. Fred J. Shafer  
Director  
Logistics and Communications Division  
General Accounting Office  
Washington, D.C. 20548

Dear Mr. Shafer:

This is in reply to your letter to the Secretary of Defense dated July 12, 1977 which forwarded your Draft Report entitled "Gold and Silver--Recover Them," LCD-77-228, for our review and comment (OSD Case #4666).

The Draft Report implies that the Department of Defense (DoD) has not acted effectively in the recovery of precious metals, noting a lack of management direction in the segregation and recovery of gold and silver from electronic scrap and stating that much of this scrap is being sold at nominal prices in lieu of recovery. It also notes that DoD has a large potential for recovering silver from photographic solutions but that the recovery rate is low. The Report contains a recommendation that the Secretary of Defense direct the Defense Logistics Agency (DLA) to take necessary actions to segregate electronic scrap containing precious metals and, at appropriately selected locations, accumulate it and extract the available gold and silver.

We require the costs of segregating scrap and recovering precious metals to be compared to alternative methods of disposition, considering the market value of the precious metals and the full costs of the program. We attempt to reduce the degree of subjectivity in judging whether or not to recover the precious metals by requiring DLA, as the Program Manager, to establish standards to measure the efficiency and cost effectiveness of recovery efforts based on the quantity and value of the precious metals contained in the items.

A complete statement of DoD policies and responsibilities is contained in the enclosed DoD Directive 4160.22, "Recovery and Utilization of Precious Metals," dated December 1, 1976. (Enclosure 1.) We believe the

Directive adequately covers the area addressed by the above recommendation. You may wish to revise the Draft Report to make it clear that such direction is presently in effect. Defense Audit Service is currently completing an audit of the management of the precious metals program. We will consider the results of that audit, as well as your findings, in determining what changes are required to enhance the effectiveness of the DoD recovery program.

In addressing the recovery of silver from photographic solutions by all Federal Agencies the Draft Report states "DoD had the largest recovery potential, but had one of the lowest rates of recovery--21 percent." This conclusion appears to be based on DoD usage of 2,000,000 gallons of solution in FY 1976. Information provided to your staff in November 1976 indicated that DLA issues of photographic (hypo) solution totaled 446,744 gallons, or less than one fourth the quantity cited in the Report. It is recognized that all the solution requisitioned in FY 1976 was not necessarily used in FY 1976, and that other acquisition sources may have been utilized by some DoD units. However, it appears unlikely that the amount used could have been four times the issues made by DLA. It will be mutually beneficial if the figure of 2,000,000 gallons is verified for accuracy.

At Enclosure 2 you will find comments not previously discussed which are intended to clarify specific portions of the Report. We appreciate the opportunity to offer comment on this Report in draft form.

Sincerely,



ROBERT B. PIRIE, JR.  
Principal Deputy Assistant Secretary  
of Defense (MRA&L)

Enclosures  
As Stated

GAO note: The two enclosures to this letter have not been included. Enclosure 1 was DOD Directive 4160.22 establishing responsibilities for the precious metals program. Enclosure 2 comprised specific comments relating to material in the draft report which has been revised or changed in the final report.

UNITED STATES OF AMERICA  
 GENERAL SERVICES ADMINISTRATION  
 WASHINGTON, D.C. 20405



August 22, 1977

Honorable Elmer B. Staats  
 Comptroller General of  
 the United States  
 General Accounting Office  
 Washington, DC 20548

77 AUG 24 P 2: 51

Dear Mr. Staats:

Thank you for the opportunity to comment on the General Accounting Office (GAO) report to the Congress entitled "Gold and Silver--Recover Them" (LCD-77-228).

Since there is a variance in the recommendations to the General Services Administration (GSA) as cited in the digest, page "v," and page 30 of the text, we are responding primarily to the latter.

---"...that the Administrator of GSA require all agencies to immediately and annually thereafter, survey their components to identify those using fixer and its estimated silver content."

We have endeavored to encourage agencies to survey their components in the past by prescribing a survey format in Federal Property Management Regulations (FPMR) 101-42.4901, "Intra-agency survey format for evaluating the recovery potential of activities not now recovering precious metals." The survey format requests information from each activity on the estimated generation of used fixer solution and the average silver content per gallon. We can revise our FPMR to make this a mandatory survey. However, the reporting requirement recommended in your second recommendation requires the same type of information (i.e., gallons of fixer used, estimated maximum recoverable silver, and method of estimation) on a more frequent basis, and, in effect, requires that an agency survey its components every time it prepares a report to GSA (see comment on next recommendation).

---"...(that) the Administrator should require quarterly reports by all agencies and components showing at least, but not necessarily limited to, the following data: Gallons of fixer used; Types and amounts of film processed; Estimated maximum recoverable silver; Method of estimation; Silver recovered; Explanations of significant differences between estimated recoverable silver and silver actually recovered; Actions planned to maximize recovery; and Type of recovery equipment."

FPMR 101-42.4902, "Format for annual consolidated report on activities generating precious metals," section (1), requires that agencies report annually on some of the data described above. While our present report does not require all of the information recommended, if properly filled out, we can determine whether all appropriate agency activities are recovering silver, how many gallons of solution are being processed, and the amount of silver recovered. We agree, however, that the data you suggest we require in such a report would enable us and the agencies to better examine the efficiency of their components and, therefore, the agency as a whole.

In light of efforts to reduce the number of reports required in the Federal Government, we feel that a semi-annual (which we required up until 2 years ago), rather than a quarterly report, would be sufficient for GSA and the agencies to monitor their progress. We propose that a semi-annual report would satisfy the "more stringent reporting" recommendation noted on page "v," and that your first two recommendations on page 30 be modified accordingly. We also feel that if and when Federal agencies' silver recovery programs are operating efficiently, it would be sufficient to require an annual report as we do now.

--"...that the Administrator follow-up with these organizations to determine reasons why the agencies are not recovering the maximum amount of silver and the actions these agencies plan to take to do so."

We plan to follow-up with agencies, to the extent that our present resources will allow, to urge them to recover the maximum amount of silver possible. We have attempted to encourage agencies to recover silver in the past by revising FPMR 101-42.3, "Recovery of Precious Metals and Critical Materials," which requires the report described above; by updating (to reflect new technology and program experience) our publication, a "Guide for the Recovery of Silver from Used Fixing Solution and Scrap Film," which was designed to be of use to activities trying to determine the most effective methods of silver recovery for their situation; and by developing a service contract covering the eastern half of the United States which provides technical surveys of photographic processing facilities to determine silver recovery potential and recommend methods for increasing the efficiency of silver recovery programs. We hope to offer this service nationwide following experience with the initial contract.

We further suggest that the second recommendation on page "v," that the Administrator of GSA "require each agency to (1) survey its components, (2) set goals, and (3) monitor recovery in relation to goals," be reworded so that the recommendation is directed to all Federal agencies which generate silver scrap; and that (1) will read "survey its components semi-annually, preparatory to reporting to GSA." The GAO report could then be sent directly to heads of Federal agencies recommending corrective action.

With regard to the body of the report, there were several points made for which no conclusions or recommendations were drawn, and on which we would like to comment.

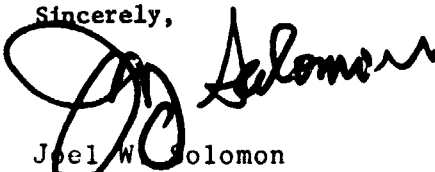
Concerning the methods for extracting silver from fixer, the report appears to advocate centralized batch processing with electrolytic silver recovery equipment as the most efficient method for extracting silver from fixer. However, it is not always the most feasible due to the limitations of a facility or the lack of economical quantities. Since there will continue to be situations where metallic replacement cartridges or electrolytic recovery equipment on-line with processors will be the most effective methods that can be used in a particular situation, we suggest that the report be modified accordingly. We feel that the report should also include mention of recovery systems in which the fixer solution, a source of potential pollutants, is repeatedly reused rather than discarded.

Mention is made of limited incentives to recover gold and silver, and that many agencies do not receive the sales revenue from reclaimed silver, but the issue is not discussed any further.

Criticism of the effectiveness of GSA contractor recovery services in the Washington, D.C., area is made, but a conclusive judgment or recommended alternative is not suggested.

We would be happy to have representatives of our Property Rehabilitation Division (FWR) meet with GAO representatives to discuss the issues mentioned above and any other aspects of the report. If this is agreeable, Mr. William S. Eckert, Director, Property Rehabilitation Division, may be contacted (557-1743) to arrange such a meeting.

Sincerely,



Joel W. Solomon  
Administrator

GAO note: Page references in this appendix may not correspond to pages of final report.



LOCATIONS VISITED TO OBSERVE  
OPERATION OF RECOVERY PROGRAMS

Components visited  
Disposal office Photo or X-ray labs Other

DEPARTMENT OF DEFENSE

Davis-Monthan Air Force Base, Tucson, Arizona	X	X		
U.S. Air Force Academy, Colorado Springs, Colorado	X	X		
Pueblo Army Depot, Pueblo, Colorado	X	X		X
Fort Carson, Colorado Springs, Colorado	X	X		
Lowry Air Force Base, Denver, Colorado	X	X		
Naval facilities, Great Lakes, Illinois	X	X		
Navy Recruiting District, Hyattsville, Maryland	X	X		
Fort Monmouth, New Jersey	X	X		
U.S. Navy Ammunition Depot, Earle, Colts Neck, New Jersey	X	X		
Clark Air Force Base, The Philippines	X	X		
Subic Naval Base, The Philippines	X	X		
Defense Property Disposal Region, Ogden, Utah	X	X		
Hill Air Force Base, Ogden, Utah	X	X		
Naval facilities, Norfolk, Virginia	X	X		
Naval facilities, Portsmouth, Virginia	X	X		
Navy Publications and Printing Service, Washington, D.C.	X	X		

VETERANS ADMINISTRATION

VA Hospital, Allen Park, Michigan	X	X		
VA Hospital, Ann Arbor, Michigan	X	X		
VA Supply Depot, Somerville, New Jersey	X	X		
VA Hospital, Lyons, New Jersey	X	X		
VA Hospital, East Orange, New Jersey	X	X		
VA Outpatient Clinic, Manila, The Philippines	X	X		X

	Components visited			
	Disposal office	Photo	labs	Other
OTHER GOVERNMENT AGENCIES				
Soil Conservation Service, Hyattsville, Maryland	X			
National Institutes of Health, Bethesda, Maryland	X			
Radiological Health Facility, Rockville, Maryland	X			
Saint Elizabeth's Hospital, Department of Health, Education, and Welfare, Washington, D.C.	X			
Social Security Administration, Baltimore, Maryland	X			
U.S. Public Health Service Outpatient Clinic, Washington, D.C.	X			
U.S. Geological Survey, Reston, Virginia	X			
Bureau of Mines, College Park, Maryland			X	X
Bureau of Mines, Salt Lake City, Utah			X	X
Federal Bureau of Investigation, Washington, D.C.	X			
Printing and Graphics Division, Department of Transportation, Washington, D.C.	X			
Assay Office, Bureau of the Mint, New York, New York				X
Bureau of Engraving and Printing, Washington, D.C.	X			
U.S. Secret Service, Washington, D.C.	X			
Central Intelligence Agency, McLean, Virginia	X			
U.S. Information Agency, Washington, D.C.	X			
U.S. Information Service, Manila, The Philippines	X			
Government Printing Office, Washington, D.C.	X			
Library of Congress, Washington, D.C.	X			
National Archives and Records Service, Washington, D.C.	X			
Smithsonian Institution, Washington, D.C.	X			
U.S. Embassy Dispensary, Manila, The Philippines	X			

GAO COMPUTATION OF MARKET VALUE OF METALSRECOVERED DURING OGDEN REGION PROJECTAND ESTIMATED COSTS OF RECOVERY (See p. 10.)

	<u>Amounts</u>
Market value of metals:	
Gold - 327.912 oz. @ \$130 (note a)	\$42,628.56
Silver - 634.085 oz. @ \$4.40 (note a)	2,789.97
Copper - 1,630.8 lbs. @ \$.45 (note a)	<u>733.86</u>
Total market value	<u>\$46,152.39</u>
Estimated costs of recovery:	
Sorting (27,168 lbs. @ \$.15) (notes b and c)	\$ 4,075.20
Smelting sorted scrap (note d) \$4,616.75	
Smelting slag (3,943 lbs. @ \$.75) (note e) <u>\$2,957.25</u>	<u>7,574.00</u>
Total estimated costs	<u>\$11,649.20</u>
Market value over costs	<u>\$34,503.19</u>

a/Data from Ogden Region, Defense Property Disposal Service, DLA.

b/The estimated pounds of electronic scrap sorted was based on the weight of sorted items smelted and the sorting project at Hill Air Force Base.

c/Sorting costs a pound taken from sorting project at Hill Air Force Base.

d/Costs obtained from smelting contract for this project.

e/Cost was determined based on slag resulting from this project and estimated cost to process slag furnished by Precious Metals Manager, Ogden Region of the Disposal Service.

GAO COMPUTATION OF ESTIMATED NET ADDITIONAL REVENUE  
HAD PRECIOUS METALS BEEN RECLAIMED FROM ELECTRONIC SCRAP  
SOLD BY THE DISPOSAL SERVICE IN FISCAL YEAR 1976

	<u>Amounts</u>
Revenues from estimated recoverable metals:	
Gold - 107,382 oz. @ \$138.59 (notes a and b)	\$14,882,071
Silver - 207,646 oz. @ \$ 4.39 (notes a and b)	911,566
Copper - 533,718 lbs. @ \$ .45 (notes a and b)	<u>240,173</u>
Total additional revenue	<u>16,033,810</u>
Estimated costs of recovery:	
Sorting - 12,192,121 lbs. @ \$.15 (notes a and c)	1,828,818
Smelting sorted scrap - 2,682,066 lbs. @ \$.50 (notes a and d)	\$1,341,133
Smelting slag - 1,291,222 lbs. @ \$.75 (note e)	<u>968,417</u>
Reduction in sales revenue (note f)	<u>268,227</u>
Total estimated costs	<u>4,406,525</u>
Net additional revenue	<u>\$11,627,215</u>

a/The Disposal Service sold 12,192,121 pounds of electronic scrap in fiscal year 1976. Using the sorting project at Hill Air Force Base as a basis for determining weight of items containing precious metals, it is estimated that 2,682,266 pounds of the electronic scrap, or 1,341 tons, contained gold and silver. The average yields of 80.076 ounces gold, 154.844 ounces silver, and 398 pounds of copper a ton from the smelting project in Utah were applied to the 1,341 tons.

b/Market values for gold and silver are the average of those used by the Disposal Service in fiscal year 1976 to prepare management reports, specifically, Precious Metals Recovery Expense/Cost. Value of copper is the same as that used by the Ogden Region of the Disposal Service as shown in app. IV.

c/Sorting costs taken from sorting project at Hill Air Force Base.

d/Cost to smelt was based on informal quotes obtained by the Disposal Service.

e/Cost based on percentage of slag under the smelting project in Utah and estimated cost to process slag furnished by the Precious Metals Manager, Ogden Region of the Disposal Service.

f/Based on actual sales of electronic scrap in fiscal year 1976.

PRINCIPAL OFFICIALS RESPONSIBLE FOR  
ADMINISTERING ACTIVITIES DISCUSSED IN THIS REPORT

	<u>Tenure of office</u>	
	<u>From</u>	<u>To</u>
<u>DEPARTMENT OF DEFENSE</u>		
<b>SECRETARY OF DEFENSE:</b>		
Harold Brown	Jan. 1977	Present
Donald H. Rumsfeld	Nov. 1975	Jan. 1977
<u>GENERAL SERVICES ADMINISTRATION</u>		
<b>ADMINISTRATOR:</b>		
Joel W. Solomon	Apr. 1977	Present
Robert T. Griffin (acting)	Feb. 1977	Apr. 1977
Jack Eckerd	Nov. 1975	Feb. 1977

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