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"Costs"

OPERATION GREY

JOINT TASK FORCE

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW	
SINGLE REVIEW AUTHORIZED BY: <i>DOE/H-9/UD LK 1/1/96</i>	DETERMINATION (CIRCLE NUMBER(S))
REVIEWER (ADD):	1. CLASSIFICATION RETAINED
NAME: <i>[Signature]</i>	2. CLASSIFICATION CHANGED TO:
DATE: <i>2/13/97</i>	3. CONTAINS NO DOE CLASSIFIED INFO
	4. COORDINATE WITH:
	5. CLASSIFICATION CANCELLED - <i>Var. J. e</i>
	6. CLASSIFIED INFO BRACKETED
	7. OTHER (SPECIFY):

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GREENHOUSE

FORCE THREE



This cost report of Operation GREENHOUSE is compiled and presented in an effort to portray the costs of a large scale joint operation of this specialized type. As this is the first effort to portray costs of a joint operation, the Cost System used and the results obtained may not be all inclusive, but will reflect to a marked degree a conception of the dollars involved in the operation and may be used as a base of reference in the financial planning for subsequent operations. Existing systems and procedures of the participating agencies were utilized to the fullest, which enabled the Task Force to operate with a minimum of cost manpower.

The cooperation of the Army, Navy, Air Force, Atomic Energy Commission and other participating agencies has made possible the compilation of this report.

E. R. Quesada

E. R. QUESADA
Lieutenant General, United States Air Force
Commander

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW	
SINGLE REVIEW AUTHORIZED BY:	DETERMINATION (CIRCLE NUMBER(S))
<i>D. J. H. / 100 Lt 1/1/74</i>	1. CLASSIFICATION RETAINED
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NAME: <i>[Signature]</i>	3. CONTAINS NO FOR CLASSIFIED INFO
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PURPOSE

To fulfill the requirement as stated in JCS 1998/13 that a cost summarization be made of operation "GREENHOUSE", reflecting both operating costs and capital costs, and further broken down by Experimental "Programs", Task Force, and Task Groups, including costs incurred by the military department of the Department of Defense and the Atomic Energy Commission.

PROCEDURES

Since neither the Military Departments nor the Atomic Energy Commission had a cost system that could easily be adopted in its entirety for this type of joint operation, a modified system, patterned somewhat along the lines of the cost system used by the Air Force, was established. This system is a compromise between established service cost accounting systems, the system utilized by the Atomic Energy Commission, and the ultimate cost accounting system desirable for such joint operations.

Monthly cost reports for Operation GREENHOUSE were required to be submitted direct to Headquarters, Joint Task Force THREE by each Department Headquarters, Major Command, Bureau, Technical Service, Agencies of the Atomic Energy Commission, Task Force Headquarters and each Task Group. This cost reporting requirement was considered in consonance with Title IV of the National Security Act Amendments of 1949, which directs that the Departments account for, and report, the cost of performance of readily identifiable functional programs and activities with segregation of operating and capital programs. These reports arrived on or before the 20th of the month following the month reported on. The charts of accounts developed for "GREENHOUSE" provided for segregation of operating costs and capital costs for each program and project. Allocation of GREENHOUSE funds by program and project coincided with the cost chart of accounts.

Operating costs included military and civilian payroll, expendable supplies and material, and other costs such as TDY travel, transportation, communication, administrative overhead, miscellaneous costs common to the operation, and the value of the capital items consumed in the operation.

Capital costs were broken down into two categories, buildings and equipment. Destruction of these assets were charged to and became a part of the operating costs. Capital items returned to a participating agency during or upon completion of these tests were credited to the capital cost of the operation. Ships and aircraft were costed on an operating basis and were not costed as capital items. The destruction of ships and aircraft during the operation was charged as an operational cost.

Task Group 3.1 costs included all costs incurred by the Atomic Energy Commission in the administration of the experimental programs, and the build-up and operation of the Eniwetok Proving Ground facilities. Army, Navy, and Air Force Task Group administrative and operating costs are shown under Task Groups 3.2, 3.3, and 3.4, respectively.

The establishment of appropriate controls to insure accurate reporting of costs was the responsibility of each department and participating agency.

In the cost reports under cost code number, the first digit represents the program, the second the project, and the third the sub-project. Program 3, Military Structures, deviates from this system as the second digit designates the department (1 -- Army; 2 -- Navy; 3 -- Air Force). The third and fourth digits designate the project and sub-project respectively. "Common to Program" are costs which were not identifiable to a specific project within a program. To identify this type of cost, the suffix "99" was used as the last two digits of the program number.

This report sets forth the costs of GREENHOUSE by: (a) Summary of Programs and Task Groups (b) Departmental Cost (c) Cost of each experimental program through 8 prefaced by the Program Commentary, and a listing of the program Chart of Accounts (d) General items of cost (Program 9) broken down into Task Group Costs and other undistributed cost applicable to the operation and (e) Certain charts reflecting interesting highlights of the operation.

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COMMENTARY

Operation "GREENHOUSE" was approved by the Joint Chiefs of Staff and jointly participated in by the Atomic Energy Commission and the three departments of the Department of Defense. The Air Force was given the responsibility as Executive Agent for this Operation. Plans for the operation started in July 1949, and the actual activation of Joint Task Force THREE was 1 November 1949. Although the headquarters of this operation was physically located in Washington, D. C., it was necessary for this operation to move considerable personnel to the forward area where the tests were actually performed. In all, 95% of the personnel of JTF-3 were at one time or another located in the forward area on the Eniwetok Atoll.

The movement of the test and operational material and personnel to the forward area was a tremendous undertaking. It required the movement of military and civilian personnel an average of 3000 miles within the ZI to the Port of Embarkation, and then 5000 miles more by air or ship to the forward location.

Considerable personnel were moved to the forward site approximately eight to twelve months before the actual time of the tests. These personnel were predominantly the working and/or construction men, whose prime responsibility was to activate the proving ground facilities in time for the scientific test to be accomplished. Military Police forces to patrol and secure the Atoll were moved forward in the early stages.

In December, 1949 the Army 79th Construction Battalion was moved to the forward area to construct the housing and living facilities on the Eniwetok Island. The construction of housing and facilities on the other islands was performed by the AEC contracting firm of Holmes and Narver. This construction consisted mainly of living quarters, office buildings and sanitation facilities, power plants, water distilling facilities, refrigeration plants, recreational facilities such as clubs, outdoor theaters, tennis courts, playing field and many other facilities for the health and moral of the personnel.

It was necessary to renovate existing administration facilities on Kwajalein as well as to construct new facilities which could handle the air effort and the shipping responsibilities required of the Navy. These new facilities included such construction as a new landing strip and an extension to the existing pier.



The magnitude of the cost of the GREENHOUSE effort can be summarized as follows: The accumulated cost of GREENHOUSE totaled \$114 Million; \$88 million represents operating cost, and \$26 million of capital items on hand to be used in future operations or returned to participating agencies. The total capital items furnished GREENHOUSE, however, totaled \$58.5 million; \$18.6 million of capital assets were returned to the participating agencies throughout the operation, while \$13.9 million was consumed in the operation, of which \$12.6 million is currently included in the operational cost, due to the fact that the detailed identity of these costs are not presently available. Upon proper cost itemization this amount of \$12.6 will be transferred to and reflected in detail in the consumed in operation column increasing the current figure of \$1.3 to \$13.9 million. The AEC contributed \$9.5 million; Army -- \$2.0 million; Navy -- \$.6 million; Air Force -- \$1.8 million and Civil Defense -- \$.008 million.

Significant cost areas of the GREENHOUSE operation are reflected as follows: Modification of aircraft by USAF - \$15.6 million; Transportation - \$9.5 million of which MATS contributed \$5.1 million, and MSTs \$4.1 million. The remainder of \$.3 million furnished by Commercial Transportation. Communications operating cost totaled \$1.5 million, with an additional \$10 million of capital items which included fixed station radio teletype transmitting and receiving equipment -- 30%; tactical equipment, such as boat pool, MP radios and telephone back-up equipment -- 50%; power units -- 15%, and maintenance equipment --5%.

The \$88 million of consumed effort in GREENHOUSE was contributed by departments as follows: AEC -- 37%; Army -- 9%; Navy -- 11%; and Air Force --43%

The experimental programs contributed 58% of the final GREENHOUSE Costs. Operational effort including the Task Groups furnished the remaining 42%.

The logistical support of the GREENHOUSE project totaled 275,342 tons, and 26,646 passengers. A total of 273,492 tons and 13,575 passengers were moved by the Military Sea Transport Service, and 1,850 tons and 13,071 passengers were moved by the Military Air Transport Service. The transportation of these materials caused a planned and detailed movement operation, as it required approximately 14 days from San Francisco to the Atoll by water; air lift approximately 3 days. At the peak of the operation there were 8,916 personnel located on Eniwetok Atoll.

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COSTS OPERATION GREENHOUSE JOINT TASK FORCE TH

FINAL EXPERIMENTAL PROGRAMS AND GENERAL

(A) CODE NO.	OPERATING COSTS					CAPITAL COSTS				
	(B) PAYROLL		(C) SUPPLIES & MATERIALS	(D) OTHER COSTS	(E) SUB-TOTAL OPER COST (B)+(C)+(D)	(F) BUILDINGS		MATERIAL		PA
	MIL	CIV				MIL	CIV	DR	CR	MIL
1.0		6,584,457	7,991,622	5,121,872	19,697,951			22,248		
2.0	423,347	51,286	673,526		1,148,159		789,117	1,871,643	1,827	
3.0	34,047	808,896	1,301,372		2,144,315		28,050	2,761,362	76,816	
4.0	208,799	403,340	247,937		860,076			33,880		
5.0	30,870	335,895	91,166		457,931			828	828	
6.0	167,708	358,257	93,822		619,787			7,333		
7.0	176,070	1,067,643	393,007		1,636,720		18,007	18,064		
8.0	2,244,058	4,701,044	7,576,415		14,521,517		39	133,807		
Exper. Programs	3,284,899	14,310,818	18,368,867	5,121,872	41,086,456		835,213	4,349,165	79,471	
Gen. Spt. 9.0	1,858,699	213,806	212,360	12,086,290	14,371,155			426,929	260,468	
TG 3.1	476,915	2,736,975	3,386,533	5,896,498	12,496,921		3,067,728	10,434,062		
TG 3.2	3,174,593		1,384,117	230,029	4,788,739	664,765		205,917		118,54
TG 3.3	2,339,406	288,002	878,027	159,003	3,664,438			268,500	268,500	
TG 3.4	5,782,238		2,977,404	102,723	8,862,365					
Tot. TG's	11,773,152	3,024,977	8,626,081	6,388,253	29,812,463	664,765	3,067,728	10,908,479	268,500	118,54
HQ JTF-3	1,227,013	75,534	18,632	398,522	1,719,701					
Tot. TG's & HQ	13,000,165	3,100,511	8,644,713	6,786,775	31,532,164	664,765	3,067,728	10,908,479	268,500	118,54
TOTAL	14,858,864	3,314,317	8,857,073	18,873,065	45,903,319	664,765	3,067,728	11,335,408	528,968	118,54
GRAND TOTAL	18,143,763	17,625,135	27,225,940	23,994,937	86,989,775	664,765	3,902,941	15,684,573	608,439	118,54

*Upon the receipt of additional cost detail not currently available, \$12.6 million included in operation cost will be added.

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COSTS

OPERATION GREENHOUSE TASK FORCE THREE



EXPERIMENTAL PROGRAMS AND GENERAL SUPPORT TOTALS

CAPITAL COSTS							TOTAL			
(F) BUILDINGS		(G) EQUIPMENT				(H) CONSUMED IN OPER.	(I) NETCAPITAL VALUE (F) + (G)	(J) TOTAL COST OF OPER (E) + (H)	(K) GRAND TOTAL (I) + (J)	
MATERIAL		PAYROLL		MATERIAL						
DR	CR	MIL	CIV	DR	CR					
	22,248			3,969,071		190,545	3,991,319	19,888,496	23,879,815	
7	1,371,643	1,827		122,297	120,856	133	2,160,374	1,148,292	3,308,666	
0	2,761,362	76,816		297,232		1,500	3,009,828	2,145,815	5,155,643	
	33,880			184,854	137,589	21,421	81,145	881,497	962,642	
	828	828		93,958	93,958			457,931	457,931	
	7,333			144,356	1,404		150,285	619,787	770,072	
7	18,064			263,518		30,000	299,589	1,666,720	1,966,309	
39	133,807			34,875			168,721	14,521,517	14,690,238	
13	4,349,165	79,471		5,110,161	353,807	243,599	9,861,261	41,330,055	51,191,316	
	426,929	260,468	3,943	1,561,824	1,216,411	340	515,817	14,371,495	14,887,312	
28	10,434,062			692,323			14,194,113	12,496,921	26,691,034	
	205,917		118,542	2,277,300	2,277,300	195,657	989,224	4,984,396	5,973,620	
	268,500	268,500		1,714,738	1,714,738	69,500		3,733,938	3,733,938	
				6,243,046	5,923,045	804,130	320,001	9,666,495	9,986,496	
28	10,908,479	268,500	118,542	10,927,407	9,915,083	1,069,287	15,503,338	30,881,750	46,385,088	
				34,303	10,364		23,939	1,719,701	1,743,640	
728	10,908,479	268,500	118,542	10,961,710	9,925,447	1,069,287	15,527,277	32,601,451	48,128,728	
728	11,335,408	528,968	118,542	3,943	12,523,534	11,141,858	1,069,627	16,043,094	46,972,946	
941	15,684,573	608,439	118,542	3,943	17,633,695	11,495,665	1,313,226*	25,904,355	88,303,001	

6 million included in operation cost will be transferred to this account.
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COSTS

OPERATION GREENHOUSE TASK FORCE THREE



FINAL DEPARTMENTAL TOTALS

CAPITAL COSTS							TOTAL			
F) DINGS		(G) EQUIPMENT				(H) CONSUMED IN OPER.	(I) NETCAPITAL VALUE (F) + (G)	(J) TOTAL COST OF OPER (E) + (H)	(K) GRAND TOTAL (I) + (J)	
MATERIAL		PAYROLL		MATERIAL						
DR	CR	MIL	CIV	DR	CR					
11,249,497				4,676,514		190,545	19,255,134	32,812,394	52,067,528	
1,253,251	64,031	118,542	3,943	2,597,537	2,275,754	220,657	2,306,784	7,845,383	10,152,167	
383,423	283,940			2,848,507	2,812,783	75,894	135,207	9,772,371	9,907,578	
2,798,402	260,468			7,511,137	6,407,128	826,130	4,207,230	37,872,853	42,080,083	
15,684,573	608,439	118,542	3,943	17,633,695	11,495,665	1,313,226*	25,904,355	88,303,001	114,207,356	

available, \$12.6 million included in operation cost will be transferred to this account.

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COSTS OPERATION GREENHO JOINT TASK FORCE T

FINAL DEPARTMENTAL TOTALS

(A) CODE NO.	OPERATING COSTS					CAP				
	(B) PAYROLL		(C) SUPPLIES	(D) OTHER	(E) SUB-TOTAL	(F) BUILDINGS				
	MIL	CIV	a	COSTS	OPER. COST	PAYROLL		MATERIAL		F
			MATERIALS		(B)+(C)+(D)	MIL	CIV	DR	CR	MIL
AEC	487,896	9,070,534	11,425,320	11,638,099	32,621,849		3,329,123	11,249,497		
ARMY	3,821,859	1,239,596	1,670,784	892,487	7,624,726	664,765	8,531	1,253,251	64,031	118
NAVY	2,659,510	901,321	1,490,311	4,645,335	9,696,477			383,423	283,940	
AIR FORCE	11,174,498	6,413,684	12,639,525	6,819,016	37,046,723		565,287	2,798,402	260,468	
TOTAL	18,143,763	17,625,135	27,225,940	23,994,937	86,989,775	664,765	3,902,941	15,684,573	608,439	118

*Upon the receipt of additional cost detail not currently available, \$12.6 million included in op

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HQ & TASK GROUPS

Joint Task Force THREE (JTF-3), the United States Air Force designated as Executive Agent, was activated 1 November 1949 with headquarters established in Washington, D. C. During the operational phase the command post of the Commander was located on Parry Island, Eniwetok Atoll during the period 3 March 1951 to 27 May 1951. JTF-3 was organized into four functional task groups designated as Task Groups 3.1 (Experimental), 3.2 (Army), 3.3 (Navy) and 3.4 (Air Force).

Task Group 3.3 (TG3.1) was activated 17 March 1950. The mission of this task group was to conduct all experimental programs and to design and construct all facilities with the exception of construction of facilities on Eniwetok Island. Design and construction functions were performed for the Atomic Energy Commission by the Holmes and Narver Construction Company. Of the \$14. million of capital items, expended in the effort, \$13.4 million represents the building and facilities for a permanent proving ground facility, and \$.6 million represents the capital equipment.

Task Group 3.2 (TG 3.2) was activated on 12 January 1950 and deployed on 16 March 1950. The first mission of TG 3.2 was to construct facilities on Eniwetok Island, the design and materials for which were furnished by TG 3.1 through its contractor Holmes and Narver. TG 3.2 consisted primarily of the Headquarters of the 7th Engineers Brigade and the 79th Construction Battalion, with supporting services until construction was completed. The second mission of TG 3.2 was to operate base facilities including those required for Task Group 3.4 on Eniwetok Island and JTF-3 off Atoll Communications, less Airways and Air Communications Services (AACs), and to provide land security throughout the Atoll. This Task Group personnel and construction costs of \$6. million constitutes 13% of the total Task Groups effort and included costs of such items as power facilities and water plants, ice plant, and recreational facilities such as clubs, beach facilities, playgrounds, theatres and other construction for the health and moral activity of the personnel. The items returned to the using agency, consisted primarily of the construction equipment of the 79th Construction Battalion.



Task Group 3.3 (TG 3.3) was activated on 15 July 1950. The mission of TG 3.3 was to conduct Aerial and Surface operations for security purposes within the Eniwetok danger area as directed, provide suitable water transportation and shipboard weapon assembly facilities for experimental weapons, provide auxiliary command post float for the Task Force Commander including standby facilities for communications and air control, and control harbor facilities at Eniwetok Atoll in coordination with TG 3.2. The primary costs were the operating costs of 6 capital ships and 36 light auxiliary ships. The capital assets consisted primarily of radiac equipment, gas masks and protective clothing.

Task Group 3.4 (TG 3.4) was organized by Air Proving Ground Command on 24 March 1950. The Continental Air Command, the Tactical Air Command, and the Military Air Transport Service supported the Air Proving Ground Command by organizing, manning, and equipping subordinate Task Units. The Air Materiel Command provided certain experimental aircraft and technical and logistical support of the Task Group. TG 3.4 operated all experimental aircraft, provided weather observations, reconnaissance and forecasting, provided operational air communications, operated liaison aircraft taxi service, air search and rescue, and documentary photography. Of the \$7. million reported as capital items under equipment, \$6. million was returned to the Air Force, \$.8 million was consumed in the cost of operation while \$.3 million remains available for subsequent operations.



PROGRAM ONE Los Alamos Experiments

This program constituted the majority of the AEC's experimental costs in Operation GREENHOUSE. Costs incurred by the Los Alamos Laboratories and its affiliated research laboratories were reported under this program. Here the various technical tests such as detailed weapon performance, evaluation of blast, thermal and nuclear radiations, and measurements of transit time and yield were conducted. Due to the highly technical aspects of this phase, a large proportion of the costs were incurred for research and preparation in the Zone of Interior preparatory to the actual tests to be made on the site.

In this program significant costs were found in the Gamma Ray Studies, Projects 1.1.1 and 1.1.2 and 1.2 conducted by the Naval Research Laboratories and the National Bureau of Standards. Nine million dollars was spent for the salaries of the research workers, scientific supplies, and other incidental costs, and one million dollars for the procurement of the highly technical equipment required for this particular operation. Other important costs were incurred in the Phenomenology research work (Projects 1.6.1 through 1.6.6) accounting for five million dollars for salaries, supplies and miscellaneous costs and two million dollars for specialized equipment and apparatus, and project 1.7, Cloud Sampling, and 1.8.1, X-Ray Phenomenon, which accounted for approximately three million dollars in operating costs. The remainder of the costs in this program were of smaller amounts for various scientific experimentation, collection, and tabulation of data for future studies.

CHART OF ACCOUNTS

- 1.1.1 Naval Research Laboratory - (Hale)
- 1.1.2 Naval Research Laboratory - (Krause)
- 1.2 National Bureau of Standards - AEC Test Activities
- 1.3 Naval Ordnance Laboratory - AEC Test Activities
- 1.4 Army Ballistics Research Laboratory - AEC Test Activities
- 1.5 Armed Forces Special Weapons Project - AEC Test Activities
- 1.6.1 Neutron Measurements
- 1.6.2 Shock Wave Measurements
- 1.6.3.1 Los Alamos J-2 Activities - Radiochemical Determinations

- 1.6.3.2 Air Material Command Expenditures from AEC Drone Allotment
- 1.6.4 AEC Documentary Photography
- 1.6.5 Radiological Safety Los Alamos J-9
- 1.7 Edgerton Gemeshausen & Grier Inc. - AEC Test Activities
- 1.8.1 Sandia Corp - AEC Test Activities
- 1.99.3 Common to Program - Air Force Working Fund
- 1.99.5 Common to Program - AEC Expenditures
- 1.99.6 Common to Program - J-Div. (Los Alamos Scientific Lab) Expense

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COSTS

OPERATION GREENHOUSE TASK FORCE THREE

LOS ALAMOS EXPERIMENTS



CAPITAL COSTS							TOTAL		
(F) BUILDINGS		(G) EQUIPMENT				(H) CONSUMED IN OPER.	(I) NETCAPITAL VALUE (F) + (G)	(J) TOTAL COST OF OPER (E) + (H)	(K) GRAND TOTAL (I) + (J)
MATERIAL		PAYROLL		MATERIAL					
DR	CR	MIL	CIV	DR	CR				
				714,887		51,378	714,887	2,904,661	3,619,548
				392,292		40,167	392,292	3,229,682	3,621,974
				312,676		1,500	312,676	2,499,634	2,812,310
				59,291		11,000	59,291	860,758	920,049
				59,811		7,000	59,811	450,638	510,449
				28,112		32,000	28,112	197,737	225,849
				46,587		8,500	46,587	728,382	774,969
				3,633		500	3,633	47,604	51,237
				12,293		1,500	12,293	1,559,033	1,571,326
				532,333			532,333	817,548	1,349,881
				28,853		4,000	28,853	155,217	184,070
				101,965		6,000	101,965	996,699	1,098,664
				1,369,151			1,369,151	1,098,924	2,468,075
								1,958,200	1,958,200
								1,372,143	1,372,143
								233	233
	22,248			226,579		21,000	248,827	512,113	760,940
				80,608		6,000	80,608	499,290	579,898
	22,248			3,969,071		190,545	3,991,319	19,888,496	23,879,815

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COSTS

OPERATION GREENHOLE JOINT TASK FORCE TH

LOS ALAMOS EXPERIMENTS

(A) CODE NO 1.0	OPERATING COSTS					CAPIT					
	(B) PAYROLL		(C) SUPPLIES & MATERIALS	(D) OTHER COSTS	(E) SUB-TOTAL OPER COST (B)+(C)+(D)	(F) BUILDINGS			MATERIAL		PA
	MIL	CIV				MIL	CIV	DR	CR	MIL	
1.1.1		1,017,085	1,507,971	328,227	2,853,283						
1.1.2		1,191,553	1,748,380	249,582	3,189,515						
1.2		610,161	1,185,576	702,397	2,498,134						
1.3		244,507	204,042	401,209	849,758						
1.4		154,118	141,050	148,470	443,638						
1.5		65,733	44,007	55,997	165,737						
1.6.1		246,822	370,071	102,989	719,882						
1.6.2		33,999	7,002	6,103	47,104						
1.6.3.1		704,638	755,300	97,595	1,557,533						
1.6.3.2			155	817,393	817,548						
1.6.4		91,101	50,820	9,296	151,217						
1.6.5		385,842	263,904	340,953	990,699						
1.6.6		257,019	814,976	26,929	1,098,924						
1.7		1,061,398	129,148	767,654	1,958,200						
1.8.1		223,659	308,732	839,752	1,372,143						
1.99.3			233		233						
1.99.5		49,678	395,855	45,580	491,113				22,248		
1.99.6		247,144	64,400	181,746	493,290						
TOTAL		6,584,457	7,991,622	5,121,872	19,697,951				22,248		

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PROGRAM TWO Bio - Medical

The primary purpose of this bio-medical program was to collect and tabulate information which could be used in planning effective medical care for the victims of atomic warfare. Swine, dogs and mice were exposed to the effects of the blasts in order to determine the thermal and nuclear radiation effects as related to time and distance. Here the conditions surrounding the experiments were made to represent as closely as possible, the conditions that would be present if the human body were exposed to an atomic attack.

The larger portion of the costs reported in this program were found in the Japtain Island Development where generation after generation of swine, dogs, mice were grown. Their growth and development was scientifically controlled and measured to the fullest extent, making the data before and after the blasts as accurate as possible. The cost of this island farm was approximately two million dollars, of which eight hundred thousand dollars was used for salaries of the workers and nine hundred thousand dollars was spent for various buildings, cages, etc., used in these controlled experiments and tests.

The actual cost of the animals used in this experimental program amounted to fifteen thousand dollars. They were all destroyed and were costed into supplies and materials under operating costs.

CHART OF ACCOUNTS

2.1 Japtain Island Development
2.2 Production of Animals
2.3 Exposure Equipment
2.4.1.1 Acute Radiation Mice
2.4.1.2 Histology, Swine
2.4.1.3 Histology, Dogs
2.4.1.4 Lethal Dosage, Swine
2.4.1.5 Lethal Dosage, Dogs

2.4.2 Thermal Burn Study
2.5.1.1 Survival Study, Mice
2.5.4 Distribution of Fission Products
2.5.5.3 Biological Dosimetry, Corn
2.5.5.4 Biological Dosimetry, Mouse
2.5.5.5 Biological Dosimetry, Mice Neutrons
2.99 Common to Program

SECRET



COSTS

OPERATION GREENHOUSE TASK FORCE THREE

BIO-MEDICAL

CAPITAL COSTS							TOTAL		
(F) BUILDINGS		(G) EQUIPMENT				(H) CONSUMED IN OPER.	(I) NETCAPITAL VALUE (F) + (G)	(J) TOTAL COST OF OPER (E) + (H)	(K) GRAND TOTAL (I) + (J)
MATERIAL		PAYROLL		MATERIAL					
DR	CR	MIL	CIV	DR	CR				
17	937,360						1,726,477	1,726,477	
				4,771	4,771			362,154	
				15,523	15,523			342,493	
	38,635	1,771		8,998	8,277	133	37,585	99,440	
	38,264			32,590	32,590		38,264	83,135	
	125,827			19,115	19,115		125,827	72,579	
	90,902			12,078	12,078		90,902	28,518	
				1,728	1,728				
	20,609	56		1,943	1,887		20,609	20,609	
								150	
				1,884	1,884			2,922	
	1,006						1,006	1,006	
	893						893	3,217	
	548						548	11,794	
	117,599			23,667	23,003		118,263	141,890	
117	1,371,643	1,827		122,297	120,856	133	2,160,348	1,148,292	

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COSTS

OPERATION GREENHOLE

JOINT TASK FORCE TH

BIO-MEDICAL

OPERATING COSTS						CAPIT				
(A) CODE NO.	(B) PAYROLL		(C) SUPPLIES & MATERIALS	(D) OTHER COSTS	(E) SUB-TOTAL OPER. COST (B)+(C)+(D)	(F) BUILDINGS				PA
	MIL	CIV				PAYROLL		MATERIAL		MIL
2.0						MIL	CIV	DR	CR	
2.1							789,117	937,360		
2.2	198,160		163,994		362,154					
2.3	76,719	23,813	241,961		342,493					
2.4.1.1	60,141	2,000	37,166		99,307			38,635	1,771	
2.4.1.2	16,486	3,781	62,868		83,135			38,264		
2.4.1.3	27,458	4,599	40,522		72,579			125,827		
2.4.1.4	27,861		657		28,518			90,902		
2.4.1.5										
2.4.2								20,609	56	
2.5.1.1			150		150					
2.5.4	2,922				2,922					
2.5.5.3								1,006		
2.5.5.4		2,135	1,082		3,217			893		
2.5.5.5		2,381	9,413		11,794			548		
2.99	13,600	12,577	115,713		141,890			17,599		
TOTAL	423,347	51,286	673,526		1,148,159		789,117	1,371,643	1,827	

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PROGRAM THREE

Structures

The broad objectives of this program were to test methods of analysis which had been developed before the blasts to provide predictions of damage to structures, both industrial and residential from an atomic blast. Twenty-six (26) buildings of various designs and construction were built on the site and used in the experiment. Principal designs were multi-story, industrial span, corrugated steel shelter and others as listed below in the chart of accounts.

In this program the three Military Departments, worked hand in hand building the structures, spending five million dollars for labor, administrative supplies, construction materials, and other incidental costs. The Department of the Army spent approximately two million dollars on the construction of a three story building built of brick, steel, and concrete in varying degrees of density to test the effects an atomic blast would have on structures of this type. A building was constructed and tested for the Office of Civil Defense to determine the blast damage to various types of glass and window coverings. The multi-story building used in the experiment is considered recoverable and can be utilized in subsequent operations. There is also considerable salvageable materials and instruments which are available for future tests.

CHART OF ACCOUNTS

3.1.1 Multi-story
3.1.2 Steel Mill
3.1.3 Reinforced Concrete Shelters
3.1.4 Corrugated Steel Shelter
3.2 Navy Structures
3.3 Industrial (E.E. & G. & H & N)
3.3.3 Industrial with Long Spans
3.3.4 Industrial with Short Spans

3.3.5 Load Bearing Wall
3.3.8 Scales Structures
3.4 Structures Instrumentation Holmes
& Narver Inc.
3.4.1 Structures Instrumentation (Army)
3.4.2 Structures Instrumentation (Navy)
3.4.3 Structures Instrumentation (Air Force)
3.99 Common to Program

COSTS

OPERATION GREENHOUSE
NT TASK FORCE THREE

STRUCTURES

CAPITAL COSTS							TOTAL			
(F) BUILDINGS			(G) EQUIPMENT				(H) CONSUMED IN OPER.	(I) NETCAPITAL VALUE (F) + (G)	(J) TOTAL COST OF OPER (E) + (H)	(K) GRAND TOTAL (I) + (J)
MATERIAL		PAYROLL		MATERIAL						
DR	CR	MIL	CIV	DR	CR					
441	1,949,163	64,031			32,535		1,919,108	106,166	2,025,274	
								4,528	4,528	
975							975	3,064	4,039	
								1,368	1,368	
	229,228	12,785			25,268		241,711	163,545	405,256	
	582,971				50,627		633,598		633,598	
151							21,151	331,935	353,086	
					74,616		74,616	127,059	201,675	
								34,349	34,349	
								234,042	234,042	
					8		8	143,209	143,217	
					35,860		600	35,860	270,185	
					23,123		300	23,123	262,872	
					55,195		600	55,195	328,115	
4,483							4,483	135,378	139,861	
28,050	2,761,362	76,816			297,232		1,500	3,009,828	2,145,815	

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COSTS
OPERATION GREENHOUSE
JOINT TASK FORCE TH
STRUCTURES

(A) CODE NO. 3.0	OPERATING COSTS					CAPIT			
	(B) PAYROLL		(C) SUPPLIES & MATERIALS	(D) OTHER COSTS	(E) SUB-TOTAL OPER. COST (B)+(C)+(D)	(F) BUILDINGS			PA
	MIL	CIV			PAYROLL		MATERIAL		MIL
					MIL	CIV	DR	CR	
3.1.1	3,628	14,153	88,385		106,166		1,441	1,949,163	64,031
3.1.2	354	716	3,458		4,528				
3.1.3	658	2,148	258		3,064		975		
3.1.4	233	616	519		1,368				
3.2			163,545		163,545			229,228	12,785
3.3								582,971	
3.3.3	11,244	201,546	119,145		331,935		21,151		
3.3.4	2,247	52,245	72,567		127,059				
3.3.5	2,893	24,379	7,077		34,349				
3.3.8	4,895	130,529	98,618		234,042				
3.4			143,209		143,209				
3.4.1		98,415	171,170		269,585				
3.4.2		55,612	206,960		262,572				
3.4.3		101,054	226,461		327,515				
3.99	7,895	127,483			135,378		4,483		
TOTAL	34,047	808,896	1,301,372		2,144,315		28,050	2,761,362	76,816

SECRET

Cloud Physics

This program was concerned in a broad sense with the measurement and documentation of the various highly technical properties of the Atomic clouds which included: their size, formation and appearance, electrical and radioactive characteristics, temperature, turbulence, water content, wind velocities in and around the cloud, the cloud's rate of growth, and finally its dispersion characteristics. Also included in this program were the effects the atomic blasts would have on tropical meteorology.

Compared to the other experimental programs the costs in the cloud physics program were relatively small.

The money used in this program was mainly for salaries of the research workers which was over six hundred thousand dollars and approximately three hundred and fifty thousand dollars for their airborne weather equipment instruments, such as barographs, rasondes, thermonometers, theodolites and special charts.

CHART OF ACCOUNTS

4.1 Cloud Physics Project
4.2 Wind Phenomena Project
4.5 Tropical Meteorology

4.6 Atmospheric Conductivity
4.99 Common to Program

Radiac Instrument Evaluation

The primary objective of this program was to evaluate and analyze all ground and airborne radia (Radiation Detection Indication and Computation) equipment which was currently available for use, and to improve the detection equipment now in use by both the military departments and civil defense agencies in order that new devices for the detection of atomic effects could be designed and produced.

Compared with the other experimental programs, the cost incurred for radiological instrument evaluation was the smallest reported.

Four hundred and fifty thousand dollars was spent for the pay and administration of the personnel engaged in this project, with ninety thousand dollars worth of equipment such as new type crystal dosimeters, film badge dosimeters, dropable remote transmitting type survey meters and other new design standard service survey meters being issued out and used for the various experiments of GREENHOUSE and then being returned to the participating agencies.

CHART OF ACCOUNTS

5.1 Service Test of Radiological Detection Devices

5.99 Common to Program

5.2 Evaluation of Airborne Radiac Equipment

Physical Tests & Measurements

The primary objectives of this program were to determine many physical effects and characteristics of the atomic bomb detonations. Included in these studies were: particle size and distribution studies, thermal effects on various materials, the exposure of combat vehicles to the blasts and its effects, fall out distribution interpretation of the survey meter data, the evaluation of filter materials, contamination and decontamination studies, radiation field of the atomic clouds, evaluation of the degree of protection obtained from protective and treated clothing, and collective protector equipment.

The costs cumulated for this program were relatively small, accounting for approximately six hundred thousand dollars for the pay and administration of the personnel involved in the mission of this program, and one hundred and fifty thousand dollars for the scientific materials and equipment consisting of such significant items as filter materials, various protective clothing materials, and decontaminants used for these specialized tests.

CHART OF ACCOUNTS

6.1 Cloud Particle Size and Distribution
6.2 Thermal Effects on Materials
6.3 Exposure of Combat Vehicles
6.4 Fall Out Distributions
6.5 Interpretation of Survey Meter Data
6.6 Evaluation of Filter Materials

6.7 Contamination and Decontamination
Studies (Aloft)
6.8 Cloud Radiation Field
6.9 Protective Clothing
6.10 Evaluation of Collective Protector Equipment
6.11 Common to Program

Long Range Detection

Operation GREENHOUSE provided an excellent opportunity for testing the world-wide detection net operated by the Air Office of Atomic Tests for Headquarters, United States Air Force. It also permitted the gathering of much additional data which will be employed in the evaluation of atomic explosions produced and conducted by foreign powers. By collection of bomb debris by airborne and ground level filters, measurement of atmospheric shock waves by acoustic devices, measurement of shock waves in the earth's crust by seismic instruments, and detection of bomb debris by atmospheric conductivity apparatus installed in aircraft, any suspected atomic explosion is capable of verification and, within limits, descriptive as to location and yield.

Two million dollars were used in this program for the various tests and evaluations described above, with salaries and operating costs accounting for one and a half million dollars and recording and measuring equipment making up the balance.

CHART OF ACCOUNTS

7.2 Infrasonic Wave Propagation Studies
7.3 Meteorological Observations Program
7.6 Collection of Bomb Debris from the Atmosphere at
Ground Level

7.7 Seismic Wave Propagation Studies
7.99 Common to Program

Effects on Aircraft

The primary mission of this program was concerned with pressure, gust and temperature effects of the atomic explosions on aircraft in flight and on aircraft components on the ground. In addition, several specialized projects relating to air operations in conjunction with the blasts were carried on under this program.

The major costs of this program were the operation and modification of experimental aircraft conducted by Air Material Command and accounting for over ten million dollars; labor, four million dollars; and supplies and material, six million dollars. The Air Proving Ground drone activities accounted in excess of one and a half million dollars for personnel costs and supplies and materials. Other equipment and materials made up the balance of the cost for this program. Supplies and material were installed in the test aircraft during modification and were reported as expended in operation. The installation of these materials and supplies did not necessarily destroy their value and logically should be reported as capital equipment. This included such items as special radio equipment, drone control equipment, recording meters, directional and many other experimental and testing devices. Six experimental type aircraft were lost during the operation, three T-33's totaling \$387,000 and three L-13's totaling \$78,000. The salvage of the three L-13's amounted to \$19,500, which amount was credited to the cost of the operation.

CHART OF ACCOUNTS

8.1 Test of Aircraft Airborne

8.2 Static Tests of Aircraft Panels

8.3 Radar Scope Photography

8.7 Air Proving Ground Unit Training

8.7.1 Air Proving Ground Drone Activities

8.99 Common to Program

COSTS

OPERATION GREENHOUSE JOINT TASK FORCE THREE

EFFECTS ON AIRCRAFT

(A) CODE NO. 8.0	OPERATING COSTS					(F) BUILDINGS				CAPITAL	
	(B) PAYROLL		(C) SUPPLIES & MATERIALS	(D) OTHER COSTS	(E) SUB-TOTAL OPER. COST (B)+(C)+(D)	PAYROLL		MATERIAL		PAYROLL	
	MIL	CIV				MIL	CIV	DR	CR	MIL	
1	73,489	4,076,242	5,977,241		10,126,972						
2	32,584	382,140	130,708		545,432		39	133,807			
3	8,198	52,718	7,365		68,281						
7	928,924	13,562	804,960		1,747,446						
7.1	1,034,511	2,387	648,644		1,685,542						
99	166,352	173,995	7,497		347,844						
TOTAL	2,244,058	4,701,044	7,576,415		14,521,517		39	133,807			

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General Items of Cost

This program was originally established to account for all items of cost in support of the experimental programs which could not readily be identified with a specific program or project and is composed of the following items of cost: travel amounting to two million dollars; military transportation, nine million dollars (five million dollars by MATS flying 3300 tons of personnel and cargo, and four million dollars by MSTs lifting 275,000 tons of personnel and cargo). The cost of commercial transportation was three hundred thousand dollars, and the remainder of the costs in this program were composed of communication charges, administrative overhead, and costs common to operation.

Until October 1950, the support costs of the experimental programs and the four task groups were included in this program.

Subsequent to that date the costs of the four task groups have been reported separately.

The capital items charged to this program included such items as bulldozers, cranes, lifts, tractors, and other like heavy equipment.

CHART OF ACCOUNTS

9.1 Travel (Per Diem)
9.2 Transportation (Military)
9.3 Transportation (Commercial)

9.4 Communication
9.5 Administrative Overhead
9.99 Common to Operation

1. The cost system used in this operation was unique among service systems in that it endeavored to segregate accrued costs by capital costs and operating costs, and in this respect may establish a precedent for usage in the D.O.D. The system was intentionally limited insofar as detail reporting was concerned, necessitated by the fact that it was superimposed upon existing D.O.D. and AEC systems with limited time intervals for reporting data. It will be most desirable in the future operations to expand detail reporting to provide data more susceptible to analysis for command purposes.

2. A cost accounting system for this type of joint operation is a valuable management tool for assisting in the determination of the progress and effort being expended in the build-up of operations. In using cost as a criteria for the progress being made in the accomplishment of a project, the commander will be provided another check to proof test the physical completion of the respective programs and/or projects.

3. In breaking down costs into the various categories, for example; Task Groups, Program or Individual Projects, an analysis of the individual segments of the entire operation can be extracted for analytical or statistical information. The cost reporting system employed in operation "GREENHOUSE", although by no means perfect, was a valuable contribution to the operation and will serve as an excellent reference for the planners of future tests.

4. In future operations the cost reporting system should be placed in operation immediately upon activation of the Task Force. Comprehensive instructions should be made available prior to the activation of the cost system. In this connection it is highly recommended that the present system be adopted and changes made only in those areas and procedures where improvement and greater net results will be obtained.

5. It is recommended that the cost reports be audited and submitted monthly direct from the Major Commands, Bureaus, Technical Services, and Task Groups to the Headquarters of the Joint Task Force.

6. As a final analysis it can be stated that the cost consciousness which was developed among the scientific directors and military operators will provide a greater degree of understanding and leadership in costing subsequent joint operations.

This section includes certain charts which reflect interesting cost areas of the operation; a brief description of each chart is given:

CHART 1 -- CUMULATIVE COSTS:

This chart shows in dollar cost the build-up, peak, and final stages of the project as related to time sequence.

CHART 2 -- FINAL "GREENHOUSE" COSTS:

This chart shows the percentage of operating and capital costs by participating agency.

CHART 3 -- "ON SITE" CAPITAL COSTS:

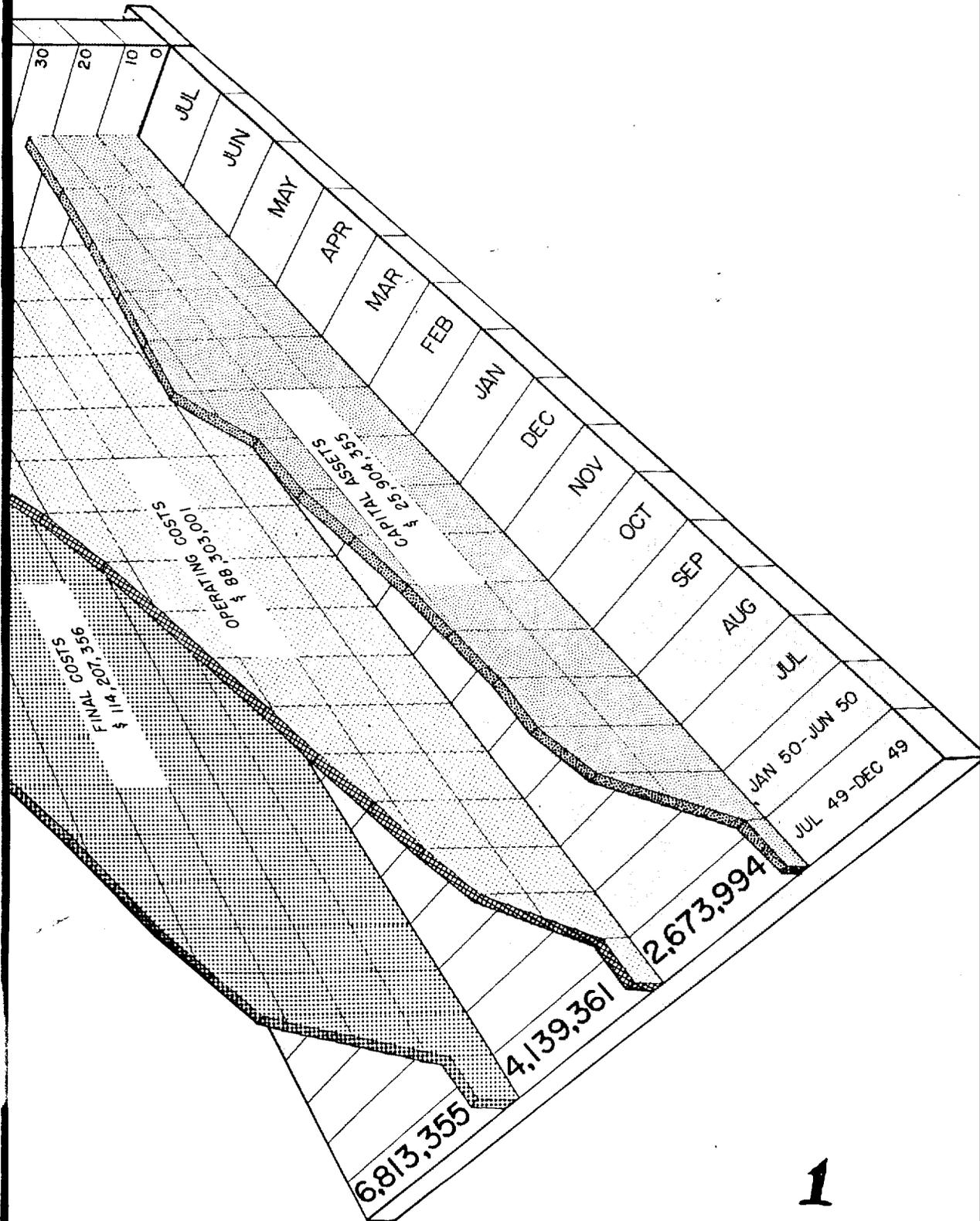
This chart is an attempt to show the cost by experimental "shots" as pertains to the individual islands. It will be noted that the chart portrays the approximate amount of recoverable capital items which may be used in subsequent tests. The costs as shown in this chart were made possible to a large degree through cost data available through the GREENHOUSE Cost system and cost accounting records of the AEC civilian contractor, Holmes and Narver, Inc.

CHART 4 -- "GREENHOUSE" FUNDING PROGRAM:

This chart shows the total out of pocket costs incurred by the participating agencies. The breakdown reflects the dollars poured into experimental program and those required to support GREENHOUSE Tests but which provided facilities and equipment of value to subsequent operations.

CHART 5 -- TRANSPORTATION COSTS:

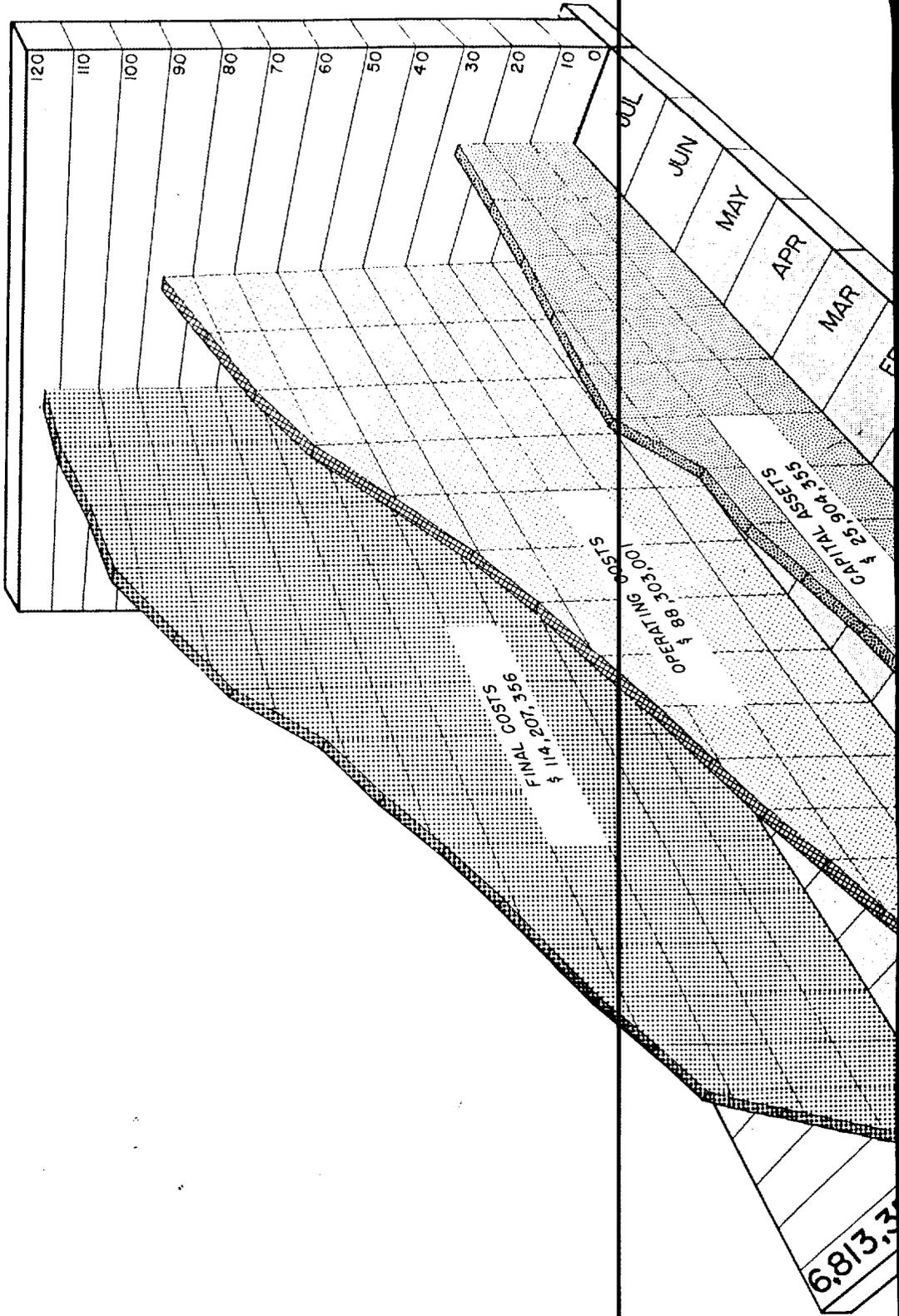
This chart is included to portray the magnitude of the air and water lift costs of GREENHOUSE, including the cost by ton and passenger mile



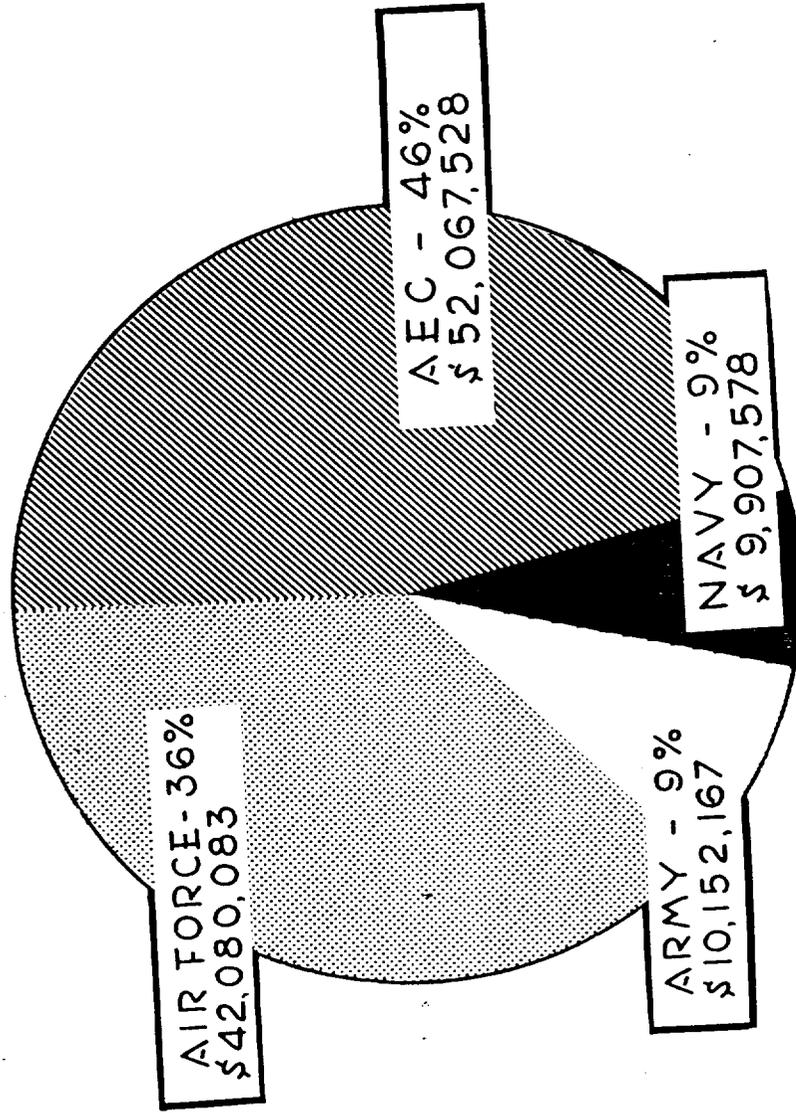
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Cumulative Costs

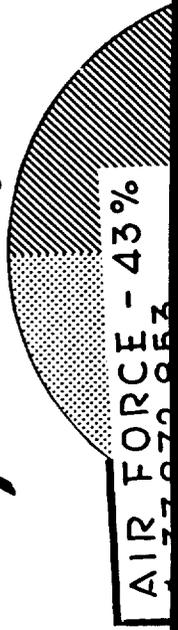


Final Greenhouse Costs

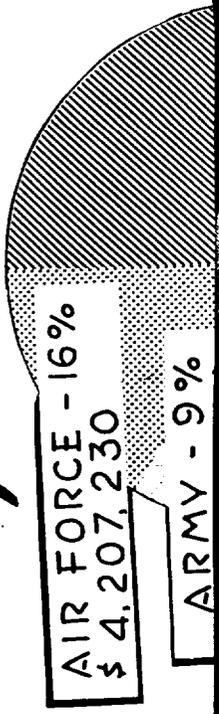


\$114 Million

Operating Costs

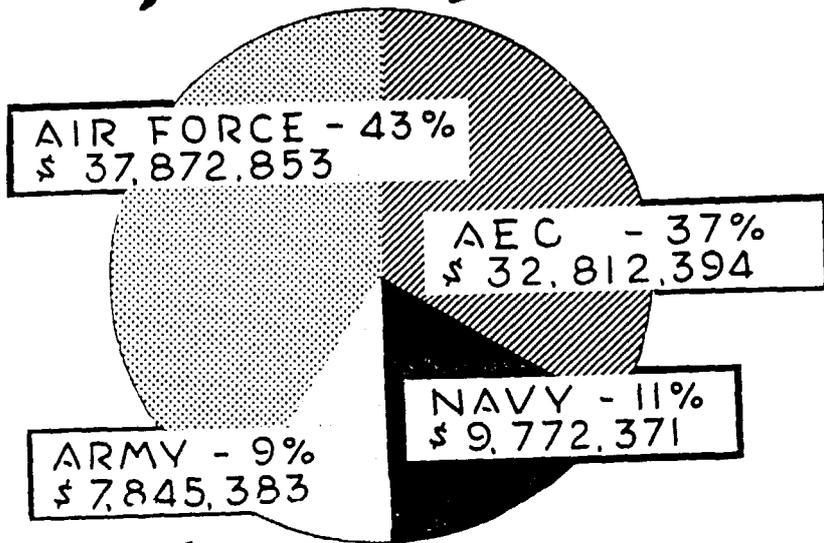


Capital Costs



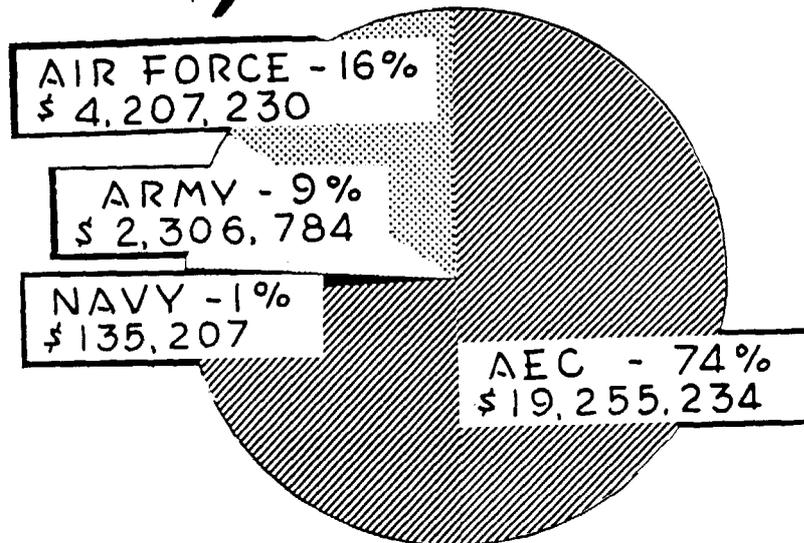
114 Million

Operating Costs



\$88 Million

Capital Costs



\$26 Million *

* Total capital items assigned to Operation Greenhouse were \$59 million. \$19 million were returned to the participating agencies; \$14 million was consumed and \$26 million represents capital assets remaining.

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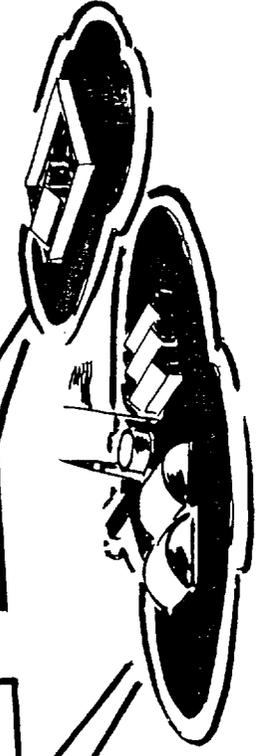
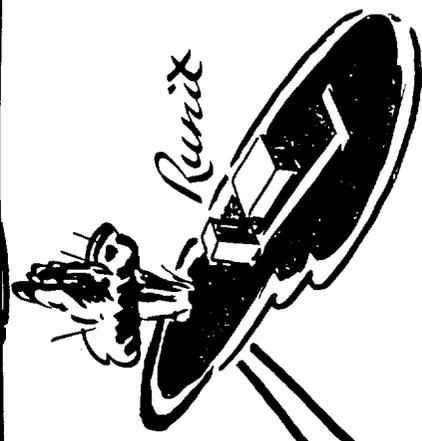
Recovered (35%) 1.98
Consumed 1.84

#1 Dog Shot
Site Facilities 2.48
Recovered (23%) .57
Consumed 1.91

Eniwetok
Site Facilities 7.04
Recovered (100%) 7.04
Consumed .00

Perry
Site Facilities 7.67
Recovered (100%) 7.67
Consumed .00

Jupiter
Site Facilities 1.25
Recovered (100%) 1.25
Consumed .00



3 Recap
Site Facilities — 31.06 (100%)
Recovered — 18.33 (59%)
Consumed — 12.73 (41%)

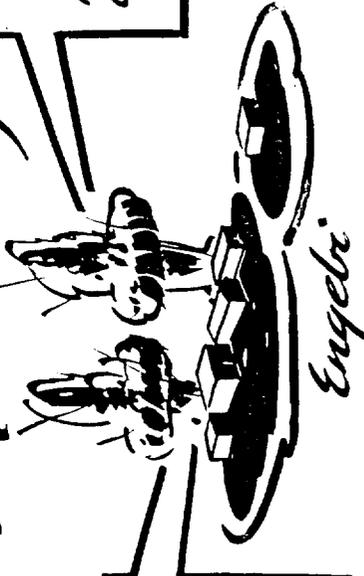
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Greenhouse "On Site" Capital Costs (in Millions)

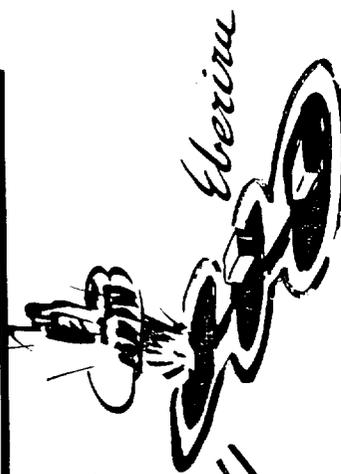
#2 Easy Shot
Site Facilities 8.59
Recovered (1%) .82
Consumed 7.77

#4 Item Shot
Site Facilities 1.21
Recovered (0%) .00
Consumed 1.21



Engebi

#3 George Shot
Site Facilities 2.82
Recovered (35%) .98
Consumed 1.84



Eberiru

#1 Dog Shot
Site Facilities 2.48
Recovered (23%) .57
Consumed 1.91



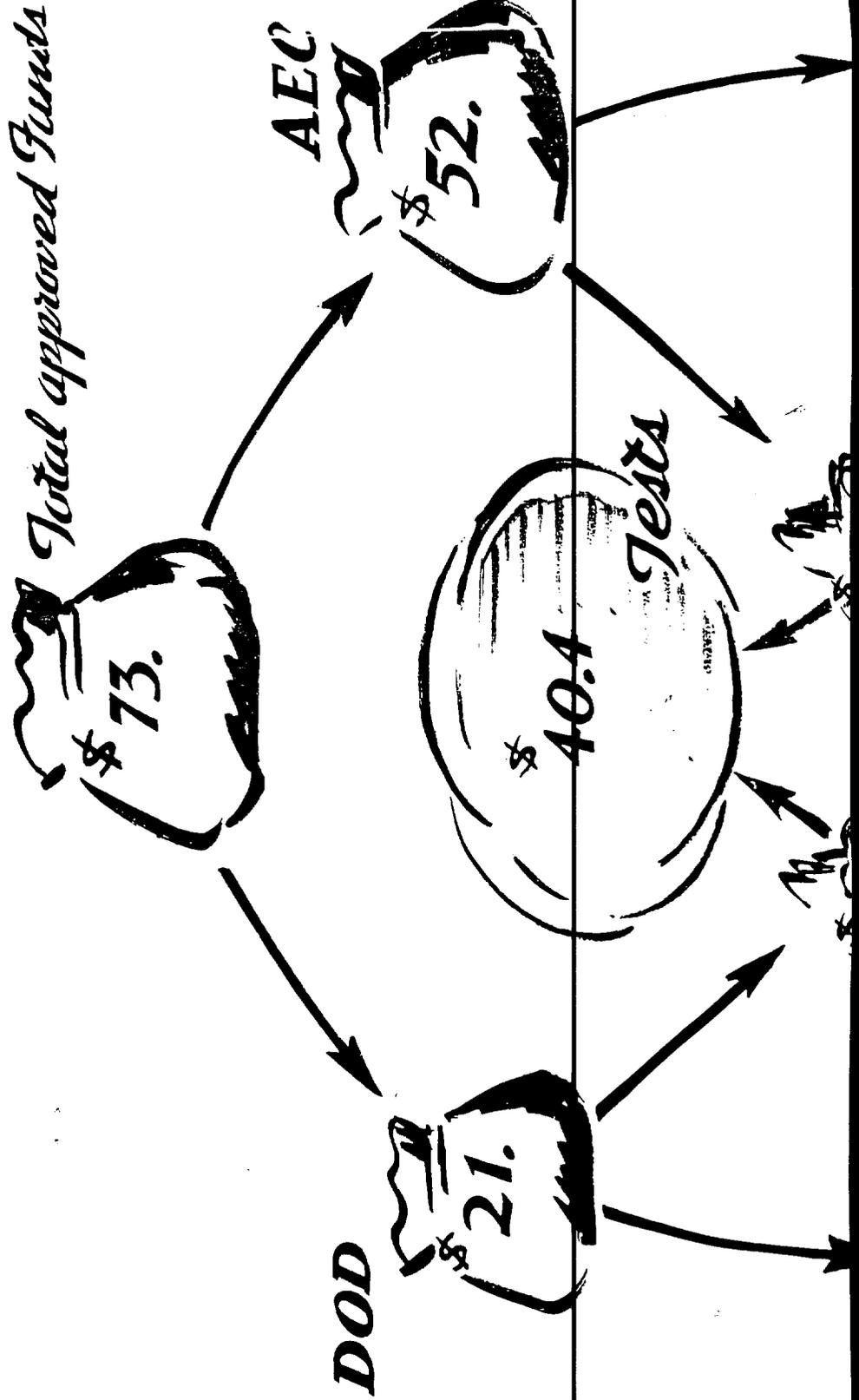
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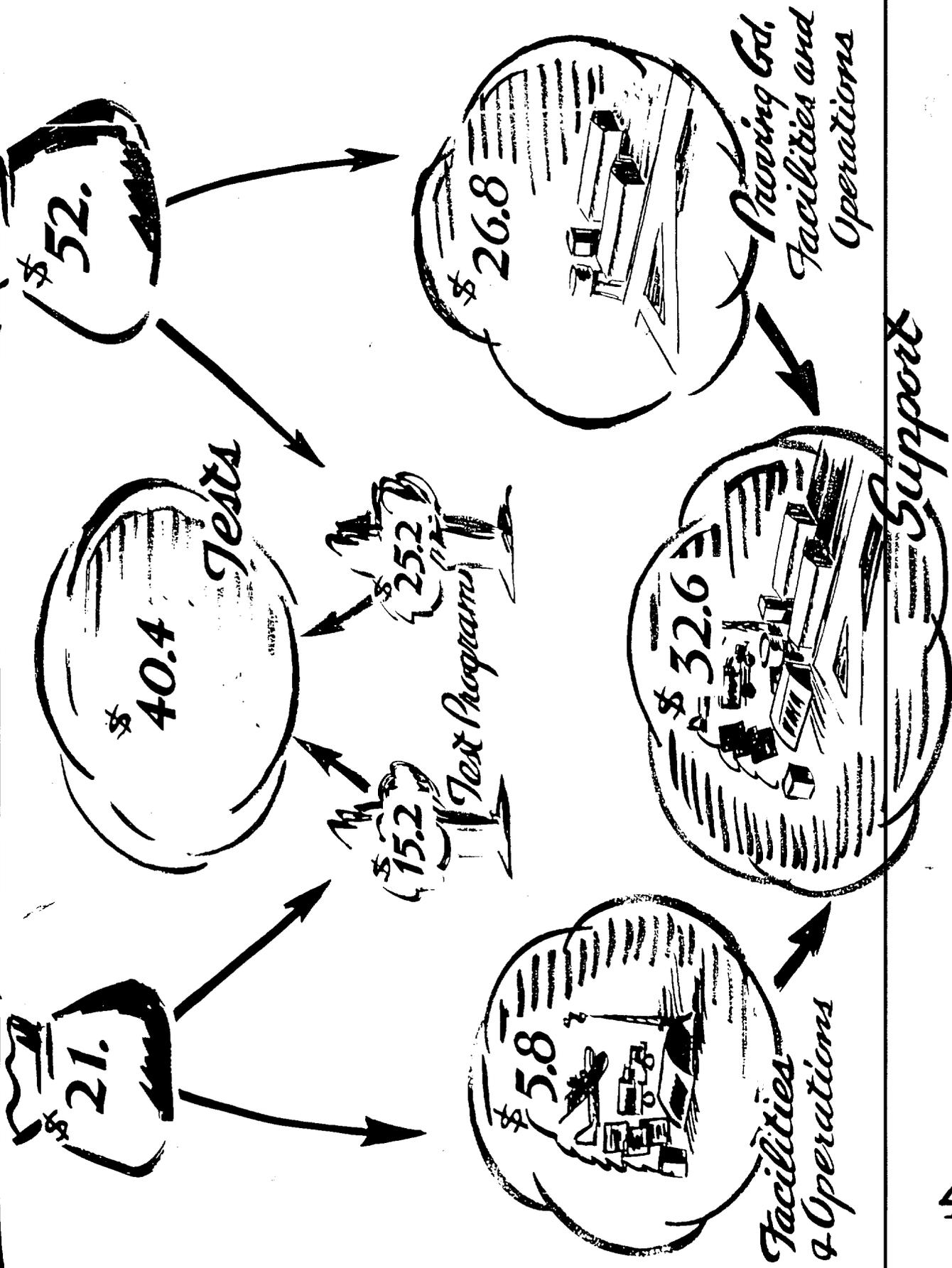
Eniwetok
Site Facilities 7.04
Recovered (100%) 7.04
Consumed .00

Jaytan

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"Greenhouse" Funding Program (in millions)





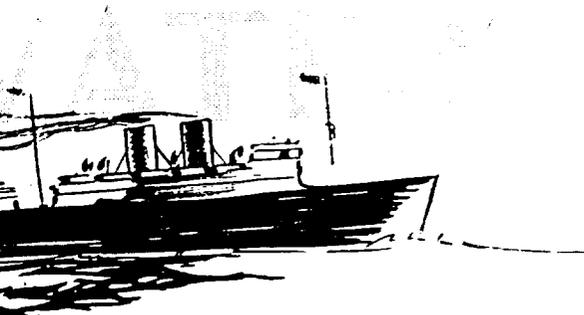
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ation Costs"

• Greenhouse

EASTBOUND

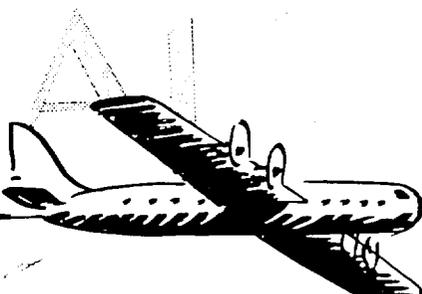


51,266 M/TONS - \$ 615,192

7,017 PASS. 432,474

TOTAL \$ 1,047,666

WATER \$ 4,081,479



642 TONS \$ 933,300

6,631 PASS. 1,193,580

TOTAL \$ 2,126,880

AL AIR \$ 5,098,080

PER M/TON \$.004; PER PASS. \$.027

PER TON \$.50; PER PASS. \$.06

5

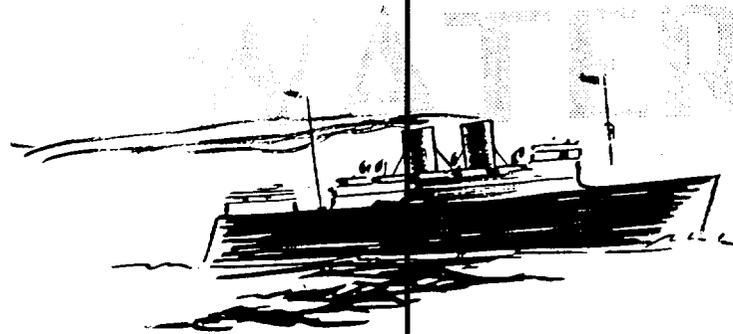
"Transportation Operation • Gr

WESTBOUND

222,226 M/TONS - \$ 2,666,712

6,558 PASS. - 367,101

TOTAL - \$ 3,033,813

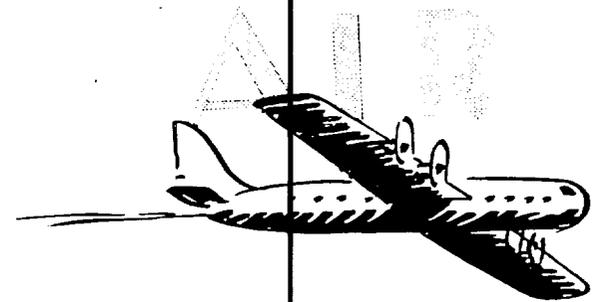


TOTAL WATER \$ 4,081,47

1,208 TONS - \$ 812,000

6,440 PASS. - 1,519,200

TOTAL - \$ 2,971,200



TOTAL AIR \$ 5,098,08

NOTE: RATE BASIS - WATER - PER M/TON \$.004;
(PER MILE) AIR - PER TON \$.50;

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