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ATLANTIC-PACIFIC INTEROCEANIC CANAL STUDY COMMISSION

GOVERNMENT

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HEARING BEFORE THE COMMITTEE ON COMMERCE UNITED STATES SENATE NINETIETH CONGRESS

FIRST SESSION

ON

S. 1566


TO AMEND PUBLIC LAW 88-609, CREATING THE ATLANTIC-PACIFIC INTEROCEANIC CANAL STUDY COMMISSION

JUNE 1, 1967

Serial No. 90-8

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ATLANTIC-PACIFIC INTEROCEANIC CANAL
STUDY COMMISSION

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CONFIDENTIAL

STATEMENT

I, the undersigned, being duly sworn, depose and say that the following is a true and correct copy of the information furnished to me by the [redacted] on [redacted] at [redacted] on [redacted] 19[redacted].

EXHIBIT

The following is a true and correct copy of the information furnished to me by the [redacted] on [redacted] at [redacted] on [redacted] 19[redacted].

I, the undersigned, being duly sworn, depose and say that the following is a true and correct copy of the information furnished to me by the [redacted] on [redacted] at [redacted] on [redacted] 19[redacted].

ATLANTIC-PACIFIC INTEROCEANIC CANAL STUDY COMMISSION

THURSDAY, JUNE 1, 1967

U.S. SENATE,
COMMITTEE ON COMMERCE,
Washington, D.C.

The committee met at 10 a.m. in room 5110, New Senate Office Building, the Honorable E. L. Bartlett presiding.

Senator BARTLETT. The committee will be in session.

It gives me pleasure to welcome Commissioner Raymond Hill of the Atlantic-Pacific Interoceanic Canal Study Commission, General Noble, General Woodbury, his assistants, and Ambassador Irwin, our special representative for Interoceanic Canal negotiations.

The committee scheduled this hearing to consider S. 1566, a bill introduced by Senator Magnuson on April 18, by request, to amend Public Law 88-609, the enabling legislation creating the commission.

(The bill follows:)

[S. 1566, 90th Cong., 1st sess.]

A BILL To amend sections 3 and 4 of the Act approved September 22, 1964 (78 Stat. 990), providing for an investigation and study to determine a site for the construction of a sea-level canal connecting the Atlantic and Pacific Oceans

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Act approved September 22, 1964 (Public Law 88-609, 78 Stat. 990), as amended, is hereby further amended (1) by striking out "June 30, 1968" in section 3 and inserting in lieu thereof "December 1, 1970," and (2) by striking out "\$17,500,000" in section 4 and inserting in lieu thereof "\$24,000,000."

Senator BARTLETT. I would like just briefly to sketch the background of this legislation before we hear from Commissioner Hill.

The crisis in 1964 in Panama focused world attention on the commercial and strategic inadequacies of the present canal. The members of this committee, after extensive inquiry, concluded that an immediate investigation should be made to determine the feasibility of, and the most suitable site for, a second canal at sea level through the American Isthmus.

We unanimously recommended the creation of a Presidential Commission to expedite the study. The committee bill became Public Law 88-609. The President appointed five civilian members to the Commission, including Mr. Hill, whom we are pleased to have with us today.

Under the law the Commission is required to report its findings and recommendations with respect to a second canal by June 30, 1968.

However, a series of circumstances, we are told, has made it apparent that the Commission cannot conclude the task within the dead-

line. I expect the witnesses today will explore these circumstances with us.

Treaties with Panama and Colombia to permit the onsite surveys could not be worked out in time for the studies to advance very far during the 1966 dry season—although I understand that the required permission has now been obtained from both of these countries and the job is now underway.

In addition, the Atomic Energy Commission's Plowshare program, which includes the cratering studies we need to decide whether nuclear excavation of the new canal is feasible, has fallen a year behind and only one test is scheduled for fiscal 1968. Mr. Kelly of the AEC is with us this morning and can advise us of the progress of this program.

As a result of these delays, the Commission has asked in this bill for more time—until December 1, 1970—in which to complete the studies and make their recommendations.

The Commission has advised us that the estimated cost of the project has increased from \$17.5 million now authorized under law to \$24 million. S. 1566 would authorize the additional expenditure, caused as I understand it by the delays the Commission has encountered as well as the fact that because of the Vietnam situation, the Department of Defense cannot provide services the Commission expected to receive free.

At this point in the record I want to include the letter of Chairman Robert B. Anderson to Vice President Humphrey, dated March 6, 1967, which explains in detail the need for the proposed legislation and following that the comments of the agencies involved.

(The letter and comments referred to follow:)

ATLANTIC-PACIFIC INTEROCEANIC
CANAL STUDY COMMISSION,
Washington, D.C., March 6, 1967.

HON. HUBERT H. HUMPHREY,
President of the Senate,
Washington, D.C.

DEAR MR. PRESIDENT: Provided herewith is a draft bill "To amend Sections 3 and 4 of the Act approved September 22, 1964 (78 Stat. 990), providing for an investigation and study to determine a site for the construction of a sea-level canal connecting the Atlantic and Pacific Oceans."

We recommend that this draft bill be referred to the appropriate committee for consideration, and we recommend its enactment.

The Atlantic-Pacific Interoceanic Canal Study Commission was established by the Act approved September 22, 1964 (Public Law 88-609, 78 Stat. 990), to make a full and complete investigation and study, including necessary on-site surveys for the purpose of determining the feasibility of, and the most suitable site for, construction of a sea-level canal connecting the Atlantic and Pacific Oceans, and the best means of construction.

When Public Law 88-609 was enacted, the expectation was that site surveys in Panama and Colombia would begin not later than January 1965. This expectation was the basis for the establishment of the June 30, 1968 reporting date and was a factor in fixing the \$17.5 million ceiling on appropriations.

On April 18, 1965, the President appointed the five present members of the Commission from private life. After the Commission was appointed, it adopted a plan of study that attempted to adjust the study program schedule to the circumstance that the favorable dry season occurring in fiscal year 1965 had already passed. At that time the Commission had no actual on-the-ground experience on which to base a more accurate time and cost estimate. The new program schedule assumed the start of a full-scale data collection beginning in January 1966, with completion of the study by June 30, 1968. Subsequent events have so altered the original program that it is now necessary for the Commission to seek modification of the completion date and the appropriation ceiling imposed by Public Law 88-609.

In September 1965, it became apparent to the Commission that the necessary treaties with Panama and Colombia could not be negotiated and ratified before the advent of the 1966 dry season. It, therefore, requested the Department of State to direct its immediate efforts towards achieving early agreements for site surveys only, with the understanding that negotiations for sea-level canal treaties would continue with the hope of agreement at a later date. The negotiations on site surveys initiated with Panama in October 1965 were successfully concluded in an exchange of notes between the United States and Panama on February 15, 1966. A similar exchange of notes with the Colombian Government was made on October 25, 1966.

Although access to the survey route in Panama was achieved prior to the close of the 1966 dry season, only limited work could be accomplished there in the remaining weeks of dry weather. During the negotiation period, every advantage was taken to expedite those functions not requiring actual route access. Supplies and equipment were purchased and stored, but full-scale data collection had to be postponed until January 1967. In spite of maximum efforts during this period, two full years for data collection have been lost.

The degree of certainty with which the Commission can reach conclusions concerning "the best means of constructing such a canal, whether by conventional or nuclear excavation," is dependent to a major degree upon the progress of and results from the Atomic Energy Commission's research and development program in this field. The Atomic Energy Commission's cratering program for fiscal year 1968 includes only one test. Thus, it now appears that the Plowshare program will fall at least one year behind the schedule previously presented to the Commission, resulting in further delay to the Canal Study. The Commission will continue to maintain close liaison with the Atomic Energy Commission concerning our correlative studies recognizing that research and development work does not lend itself to an assured timetable.

Evaluating the alternatives available to the Commission for completing their investigation and study, in the face of the delay caused by difficulties in starting actual on-site surveys and the delay in the nuclear excavation research program, the Commission has determined that it will require until December 1, 1970, to complete and submit its study.

It is also apparent to the Commission that it cannot adequately accomplish its tasks within the current appropriation limitation of \$17.5 million. The current estimate of funds required to complete the study is \$24 million, an increase of \$6.5 million. The major items contributing to the increase in estimated cost are the result of delays in beginning on-site surveys, more realistic cost estimates based upon actual field conditions, and other changed conditions. Included in the Commission's present cost estimate are funds to extend the study, to cover unprogrammed Federal pay raises, to provide services for the Commission that otherwise would have been provided by the Department of Defense at little or no cost to the Commission had it not been for the Vietnam requirements, to support program changes resulting from actual on-site conditions, to support a program stretchout which will result from the extension of the nuclear excavation research activities, and other requirements resulting from conditions which were not envisioned in the original program planning, as follows:

<i>Commission's revised fiscal program</i>		<i>Additional costs attributed to item</i>
Major item affecting cost increase:		
Delays in obtaining survey agreements.....		\$1, 303, 000
Unprogrammed Federal pay raises.....		400, 000
Vietnam situation (services originally to be furnished by DOD at little or no cost to the Commission but no longer available due to Vietnam requirements).....		477, 000
Revisions of cost estimates resulting from actual field experience..		3, 320, 000
Program stretchout resulting from extension of nuclear excavation research activities, budget limitations, and other conditions not envisioned in the original program planning.....		1, 000, 000
Total.....		6, 500, 000
Previous study estimate.....		17, 500, 000
New study cost estimate.....		24, 000, 000

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The Atlantic-Pacific Interoceanic Canal Study Commission considers that the objectives of Public Law 88-609 can best be accomplished by enactment of the proposed amendment to extend the study until December 1, 1970, and to increase the appropriation ceiling to \$24.0 million so as to provide the Commission with sufficient time and funds to complete the study in an orderly and efficient manner.

For the reasons stated above and because of the fact that the fiscal year 1968 budget for the Commission will be affected by the inclosed draft bill, its prompt and favorable consideration during this session of Congress is recommended.

The Bureau of the Budget has advised that the enactment of the draft legislation would be in accord with the President's program.

Respectfully yours,

ROBERT B. ANDERSON,
Chairman.

DEPARTMENT OF THE ARMY,
Washington, D.C., May 9, 1967.

HON. WARREN G. MAGNUSON,
*Chairman, Committee on Commerce,
U.S. Senate.*

DEAR MR. CHAIRMAN: Reference is made to your request to the Secretary of Defense for the views of the Department of Defense on S. 1566, 90th Congress, a bill "To amend sections 3 and 4 of the Act approved September 22, 1964 (78 Stat. 990), providing for an investigation and study to determine a site for the construction of a sea-level canal connecting the Atlantic and Pacific Oceans." The Department of the Army has been assigned responsibility for expressing the views of the Department of Defense on this bill.

The Act which would be amended by S. 1566 established the Atlantic-Pacific Interoceanic Canal Study Commission, to make a full and complete investigation and study, including necessary on site surveys, for the purpose of determining the feasibility of, and the most suitable site for, construction of a sea-level canal connecting the Atlantic and Pacific Oceans, and the best means to effect its construction.

S. 1566 would amend the Act so as to extend the completion date of the study from June 30, 1968 to December 1, 1970, and to increase the appropriation ceiling from \$17,500,000 to \$24,000,000.

When the Act establishing the Commission was enacted, the expectation was that site surveys in Panama and Colombia would begin not later than January 1965. The Commission members were not appointed, however, until April 18, 1965, when the favorable dry season occurring in Fiscal Year 1965 had already passed. Further delay resulted when the necessary agreements with Panama and Colombia could not be negotiated and concluded in time to enable the Commission to make full use of the 1966 dry season. As a result of these unexpected delays, two seasons of data collecting were lost. Recently, another item of delay has been encountered, the reduced activity in the Atomic Energy Commission's PLOWSHARE program. The Canal Study is in part dependent on this program, as one of its assigned tasks is to investigate the best means to effect the construction of the canal.

The need to increase the Commission's appropriation ceiling results from a variety of causes. Increased costs have stemmed from the delays in the survey negotiations and the PLOWSHARE program. In addition, cost estimates have had to be revised as a result of actual field experience. Unprogrammed Federal pay increases and the Vietnam situation also have contributed to the need to increase the appropriation ceiling.

The amendatory legislation is necessary to provide the Study Commission with sufficient time and funds to complete the study in an orderly and efficient manner. Accordingly, the Department of the Army on behalf of the Department of Defense favors enactment of S. 1566.

This report has been coordinated within the Department of Defense in accordance with procedures prescribed by the Secretary of Defense.

The Bureau of the Budget advises that, from the standpoint of the Administration's program, there is no objection to the presentation of this report for the consideration of the Committee.

Sincerely,

STANLEY R. RESOR,
Secretary of the Army.

PANAMA CANAL COMPANY,
Washington, D.C., May 1, 1967.

HON. WARREN G. MAGNUSON,
Chairman, Committee on Commerce,
U.S. Senate.

DEAR MR. CHAIRMAN: This is in response to your request for the views of the Panama Canal Company on S. 1566, a bill "To amend sections 3 and 4 of the Act approved September 22, 1964 (78 Stat. 990), providing for an investigation and study to determine a site for the construction of a sea-level canal connecting the Atlantic and Pacific Oceans".

This bill would amend section 3 of the Act to extend the life of the Commission until December 1, 1970 and would amend section 4 to increase the limit on amounts which may be appropriated under the Act from \$17,500,000 to \$24,000,000.

Although the Panama Canal Company has no direct interest in the subject matter of this legislation, the Company endorsed the purposes of the basic legislation (Public Law 89-609) and favors any amendment thereto that facilitates achievement of the objectives for which the Commission was established.

The Bureau of the Budget advises that it has no objection to submission of this report to your committee.

Sincerely yours,

W. M. WHITMAN,
Secretary.

GENERAL COUNSEL OF THE DEPARTMENT OF COMMERCE,
Washington, D.C., May 8, 1967.

HON. WARREN G. MAGNUSON,
Chairman, Committee on Commerce,
U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: This is in further reply to your request for the views of this Department concerning S. 1566, a bill "To amend sections 3 and 4 of the Act approved September 22, 1964 (78 Stat. 990), providing for an investigation and study to determine a site for the construction of a sea-level canal connecting the Atlantic and Pacific Oceans."

The bill would amend Public Law 88-609, by striking out "June 30, 1968" in section 3 and inserting in lieu thereof "December 1, 1970" and by striking out "\$17,500,000" in section 4 and inserting in lieu thereof "\$24,000,000", thereby extending the time the Atlantic-Pacific Interoceanic Canal Study Commission has to continue its investigation by 2½ years and increasing the funds available to it by \$6.5 million.

The Department of Commerce favors the enactment of S. 1566.

We have been advised by the Bureau of the Budget that there would be no objection to the submission of our report to the Congress from the standpoint of the Administration's program.

Sincerely,

ROBERT E. GILES,
General Counsel.

FEDERAL MARITIME COMMISSION,
OFFICE OF THE CHAIRMAN,
May 22, 1967.

HON. WARREN G. MAGNUSON,
Chairman, Committee on Commerce,
U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: This is in reply to your request of April 20, 1967, for the views of the Federal Maritime Commission with respect to S. 1566, a bill To amend sections 3 and 4 of the Act approved September 22, 1964 (78 Stat. 990), providing for an investigation and study to determine a site for the construction of a sea-level canal connecting the Atlantic and Pacific Oceans.

Inasmuch as the bill does not affect the responsibilities or jurisdiction of the Commission, we express no views as to its enactment.

The Bureau of the Budget has advised that there would be no objection to the submission of this letter from the standpoint of the Administration's program.

Sincerely yours,

JOHN HARLEE,
Rear Admiral, U.S. Navy (Retired) Chairman.

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OFFICE OF THE SECRETARY OF TRANSPORTATION,
Washington, D.C., May 15, 1967.

HON. WARREN G. MAGNUSON,
*Chairman, Committee on Commerce,
U.S. Senate, Washington, D.C.*

DEAR MR. CHAIRMAN: This is in reply to your request for the views of the Department of Transportation on S. 1566, a bill "To amend sections 3 and 4 of the Act approved September 22, 1964 (78 Stat. 990), providing for an investigation and study to determine a site for the construction of a sea-level canal connecting the Atlantic and Pacific Oceans."

The proposed amendments authorize (1) an extension of the date for submitting the final report from June 30, 1968 to December 1, 1970 and (2) additional funds to finance the extension of the study period.

The Department of Transportation supports the extension of the timetable for completion of the Atlantic-Pacific Interoceanic Canal Study Commission final report because the problem before the Commission is a very complex one requiring the best possible analysis of all factors involved. The extension of the deadline for the final report will permit desirable additional study without detriment to the commerce of the United States.

The Bureau of the Budget advises that from the standpoint of the Administration's program there is no objection to the submission of this report for the consideration of the Committee.

Sincerely yours,

JOHN L. SWEENEY,
Assistant Secretary for Public Affairs.

THE GENERAL COUNSEL OF THE TREASURY,
Washington, D.C., May 22, 1967.

HON. WARREN G. MAGNUSON,
*Chairman, Committee on Commerce,
U.S. Senate, Washington, D.C.*

DEAR MR. CHAIRMAN: Reference is made to your request for the views of this Department on S. 1566, "To amend sections 3 and 4 of the Act approved September 22, 1964 (78 Stat. 990), providing for an investigation and study to determine a site for the construction of a sea-level canal connecting the Atlantic and Pacific Oceans."

The proposed legislation would defer the date for completion of the sea-level canal study from June 30, 1968 to December 1, 1970, and increase the appropriation authorization for the study from \$17.4 million to \$24 million.

The Department has no objection to the proposed legislation.

The Department has been advised by the Bureau of the Budget that there is no objection from the standpoint of the Administration's program to the submission of this report to your Committee.

Sincerely yours,

FRED B. SMITH,
General Counsel.

COMPTROLLER GENERAL OF THE UNITED STATES,
Washington, D.C., April 27, 1967.

XXXXXXX

HON. WARREN G. MAGNUSON,
*Chairman, Committee on Commerce,
U.S. Senate.*

DEAR MR. CHAIRMAN: Your letter of April 20, 1967, requests our comments on S. 1566, a bill to amend sections 3 and 4 of the Act approved September 22, 1964 (78 Stat. 990), providing for an investigation and study to determine a site for the construction of a sea-level canal connecting the Atlantic and Pacific Oceans.

The bill would extend from June 30, 1968, to December 1, 1970, the time for the Atlantic-Pacific Interoceanic Canal Study Commission to complete its investigation and study to determine the feasibility of and the most suitable site for the construction of a new sea-level canal connecting the Atlantic and Pacific Oceans. The bill would also increase the appropriation authorization to conduct such studies from \$17.5 million to \$24 million.

Through fiscal year 1967, \$11.4 million has been appropriated for the Commission and if the additional \$7.5 million requested for the Commission for fiscal year 1968 is to be appropriated additional authorizing legislation is necessary. However, we have no special information or knowledge concerning the proposed legislation and, therefore, we have no recommendation to offer regarding enactment of S. 1566.

Sincerely yours,

FRANK H. WEITZEL,
Assistant Comptroller General of the United States.

MAY 17, 1967.

HON. WARREN G. MAGNUSON,
*Chairman, Committee on Commerce,
U.S. Senate, Washington, D.C.*

DEAR SENATOR: This is in response to your request for the views of the Department of Justice on S. 1566, a bill "To amend sections 3 and 4 of the Act approved September 22, 1964 (78 Stat. 990), providing for an investigation and study to determine a site for the construction of a sea-level canal connecting the Atlantic and Pacific Oceans."

This bill has been examined, but since its subject matter does not directly affect the activities of the Department of Justice we make no comment concerning it.

Sincerely,

RAMSEY CLARK,
Attorney General.

Senator BARTLETT. The committee is aware of the vital nature of the Commission's undertaking and we are concerned that the study proceed without further delay. I understand, Commissioner Hill, that the Commission is prepared to brief us in executive session in the near future with respect to the progress of our treaty negotiations with Panama. Perhaps Ambassador Irwin would want to comment on this later in the hearing.

You may proceed as you wish with your prepared statement.

STATEMENT OF RAYMOND A. HILL, COMMISSIONER, ATLANTIC-PACIFIC INTEROCEANIC CANAL STUDY COMMISSION, WASHINGTON, D.C.; ACCOMPANIED BY JOHN P. SHEFFEY, EXECUTIVE SECRETARY, ATLANTIC-PACIFIC INTEROCEANIC CANAL STUDY COMMISSION; BRIG. GEN. HARRY G. WOODBURY, JR., USA, ENGINEERING AGENT FOR ATLANTIC-PACIFIC INTEROCEANIC CANAL STUDY COMMISSION; COL. JOHN A. HUGHES, CE., DEPUTY ENGINEERING AGENT FOR ATLANTIC-PACIFIC INTEROCEANIC CANAL STUDY COMMISSION; JOHN S. KELLY, DIRECTOR, DIVISION OF PEACEFUL NUCLEAR EXPLOSIVES, U.S. ATOMIC ENERGY COMMISSION, WASHINGTON, D.C.; HON. JOHN N. IRWIN II, SPECIAL U.S. REPRESENTATIVE FOR INTEROCEANIC CANAL NEGOTIATION

Mr. HILL. Mr. Chairman, thank you for giving us the opportunity to appear before your committee.

For the record, my name is Raymond A. Hill; in private life, I am a consulting civil engineer with headquarters in San Francisco. I am appearing here for the Atlantic-Pacific Interoceanic Canal Study Commission in support of Senate bill, S. 1566, to which you have just referred in your remarks.

I believe you have the formal opening statement, a copy of it, so I will not attempt to read it, but merely summarize the two points which the Commission feels are of great importance.

Senator BARTLETT. Your statement will be printed in full.

Mr. HILL. The amendment which the Commission supports is in two parts: one, to extend the time from June 30, 1968, as set forth in Public Law 88-609, the other to increase the authorization from \$17.5 to \$24 million.

I would like to discuss these separately because they really are separate yet related matters. And with your permission, following that, I would ask Mr. Sheffey, who is the Executive Secretary of the Commission, to outline the work which has been done, except the engineering feasibility program, and ask General Woodbury, who has been intimately connected with the matter as its engineering agent, to describe the engineering work that has been done to date and what is programmed.

The extension of time requirement stems from the fact that the initiation of this study was in 1964. Action was taken by the Congress in September 1964. It was then anticipated that work would be done in the field in the dry seasons, beginning in the winter of 1965 and the four successive dry seasons.

In Panama and in Colombia, there is a rainy season and a dry season, the dry season being generally the middle of December until April. It is more pronounced in Panama than in Colombia, but within that very short period of time, it is possible to get into the field and establish work. But during the remainder of the year, the country becomes almost impassable. So the effort was to establish field camps and do all of the other things necessary for support of the people in the field in those four dry seasons.

Unfortunately, the Commission was not organized until the end of the first anticipated season. Then there was the difficulty of obtaining access agreements with Panama and with Colombia.

The agreement with Panama was not effected until February 1966, only a month or two was left of the dry weather in that season.

The agreement with Colombia did not come through until the end of 1966, in October, I believe. So that we have lost the first two dry seasons in which work was intended to be done.

In order to perform the work properly, and comply with the provisions of Public Law 88-609, at least two full dry seasons are needed, which automatically extends the required time for investigation in the field into calendar year 1969. Evaluation of the data collected and correlation of the work with the nuclear explosives research of the Atomic Energy Commission puts us into calendar year 1970.

The Commission also recognized, as time has gone on, the need for a period of perhaps 5 months to coordinate the studies among all of the agencies involved. And for that reason, the completion date was moved from June to December. So the present request is that the time, in which the Commission is authorized to carry on its work, be extended from June 30, 1968, to December 1, 1970.

With respect to the costs, the increase from \$17.5 million to \$24 million is in part tied to the extension of time during which people are in the field longer and the cost to do the work simply increases.

More important, however, it has been found that in order to determine with more assurance the feasibility of nuclear excavation, that

more fieldwork is required in geology and other aspects of the problem than was originally contemplated.

So a part of the requested increase in authorizations stems from the need developed during the studies of doing more work than had been originally anticipated. Changed conditions also account for a part of the increase.

I can refer to certain charts, if you wish, or I can come back to them later. I think it might be appropriate at this time, with your permission, if Mr. Sheffey could outline the phases of the work being carried on by the Commission other than the engineering feasibility study, and then I would ask General Woodbury to discuss that aspect, and then with your permission, have Mr. Kelly state what the Atomic Energy Commission is doing as related to the work of the Commission.

Senator BARTLETT. That will be agreeable.

Mr. SHEFFEY. Mr. Chairman, the committee is directing studies in six major fields in order to provide itself a comprehensive foundation of factual data, estimates, and expert opinions upon which to base its own ultimate findings and recommendations. As Commissioner Hill has told you, I will report on five of these and General Woodbury will follow, reporting on the most complicated and extensive one, that of engineering feasibility.

First, the study of foreign policy considerations:

This study is being accomplished by an interdepartmental group chaired by Mr. Jerome F. Fried of the Department of State. The purpose of this study is as follows:

(a) To evaluate the effect of the construction of a sea level Isthmian Canal on the U.S. relations with: (1) the canal site countries, and (2) the countries that are significant users of the canal; and

(b) To advise the Commission whether U.S. foreign policy interests are best served by the construction of a sea level canal by conventional or by nuclear methods; and

(c) To advise the Commission of the foreign aspects of sea level canal finance and operations.

The completion of this study is dependent upon the future completion of treaty arrangements with the canal site countries for the option to construct and operate a sea level canal. This study is also dependent upon the progress of the Plowshare nuclear excavation experiments and the success or failure of efforts to establish an acceptable international arrangement for the application of the nuclear excavation technology. To date, the foreign policy study group has drafted the portions of its study dealing with the background of current relations with Panama and Colombia, the U.S. policy on international limitations on the testing of nuclear explosives, and the political importance of the military bases in Panama. A contract with a private research organization has just been let to evaluate the potential economic impacts on the canal site countries.

Second, the study of national defense aspects:

This study is being accomplished by an interdepartmental group chaired by the Honorable Thaddeus Holt, the Deputy Under Secretary of the Army for International Affairs. The purpose of this study is:

To examine the potential effects of construction of an Atlantic-Pacific sea level Isthmian Canal on the national defense of the United

States and to compare alternate routes and methods of construction from the standpoint of national defense.

The initial evaluation of the contribution that a sea level canal could make to our national defense has already been completed. Of necessity this study is classified. The Department of Defense would welcome an Isthmian Canal without the vulnerable locks and dams of the present canal.

Third, the study of canal finance:

This study is being accomplished by an interdepartmental group chaired by Mr. R. Duane Saunders of the Department of the Treasury. The purpose of this study is:

To examine the methods available for financing the construction and operation of a sea level canal; and, in cooperation with other agencies and the Commission, to analyze the effects of each method.

The completion of this study must await the development of estimates of construction and operating costs for the alternative canals under consideration and the final agreement on the treaty terms under which they would be constructed and operated. The finance study group has drafted financial analyses of each canal under consideration, using preliminary estimates of construction and operating costs, several interest rates, under assumptions for future revenues and treaty terms. With this preliminary data, a computer program has been developed which enables us to make new analyses quickly as more complete data are developed. The finance study group is now analyzing a range of finance plans in preparation for the time when treaty agreements are reached and firm cost and revenue estimates are available.

Fourth, the study of interoceanic and intercoastal shipping:

This study is being accomplished by an interdepartmental group chaired by the Honorable M. Cecil Mackey, Assistant Secretary of Transportation for Transportation Policy. The purpose of this study is:

To analyze the long-range trends in intercoastal and interoceanic shipping related to the canal; to examine the interrelationships between the sea level canal, shipping, and finance; and, in cooperation with other agencies, to analyze the effects of various toll collection and distribution plans upon interoceanic and intercoastal shipping.

This study group has drafted the chapters dealing with population growth, economic growth, and trade expansion, innovation in transportation systems and equipment, and a preliminary traffic forecast. It is now developing a forecast of future ship sizes and characteristics and analyzing various toll levels and possible toll structures to determine their effects on revenues, traffic growth, and world trade.

Fifth, the study of public information aspects of sea level canal construction:

This study is actually a special subdivision of the foreign policy study. However, it is being treated separately in the initial phases of our investigation because of the unique problems presented by the possibility of nuclear excavation. If it is determined that a nuclear excavated canal is technically feasible, it is likely that an extensive program of public education throughout the Isthmian area would be needed to overcome the fears that could be played upon by local

elements hostile to the United States. This study is being accomplished by an interdepartmental group which I chair as the Executive Secretary of the Commission. Its purpose is:

To anticipate public reaction to the alternatives which could be recommended by the Commission and to advise the Commission of the public information requirements associated with its study and recommendations.

Working entirely through U.S. Government agencies, the study group has accumulated evaluations of the local attitudes toward the significant aspects of sea level canal construction and operation in all the foreign countries having important interests in an Isthmian Canal. With this information, which will be updated as the Commission's investigation proceeds, we will develop a public information plan to accompany the recommendations that the Commission will make to the President for transmittal to the Congress.

The Commission's public information activity is limited to response to inquiry for unclassified information. Its policy during the course of its investigation is to make no statements that favor any route or method of construction over any other. Its completed studies, findings, and recommendations will not be publicly released until proper authorization has been given.

I will be followed by General Woodbury, who will report on the engineering study.

Senator BARTLETT. Thank you.

General WOODBURY. Mr. Chairman, the purpose of the engineering feasibility study is to make a comparative analysis of the feasibility of constructing a sea level, interoceanic canal across the American Isthmus, along alternate alignments, using either conventional or nuclear excavation methods.

The study is a cooperative effort involving the U.S. Army, Air Force, and Navy, the U.S. Atomic Energy Commission, the Panama Canal Company, the Environmental Science Services Administration, and other agencies. The organization for conducting these studies is shown on chart B. A Canal Studies Coordinating Committee, composed of expert members of applicable disciplines from the major participating agencies, is assisting me in coordinating this complex effort.

ORGANIZATION FOR STUDY OF ENGINEERING FEASIBILITY

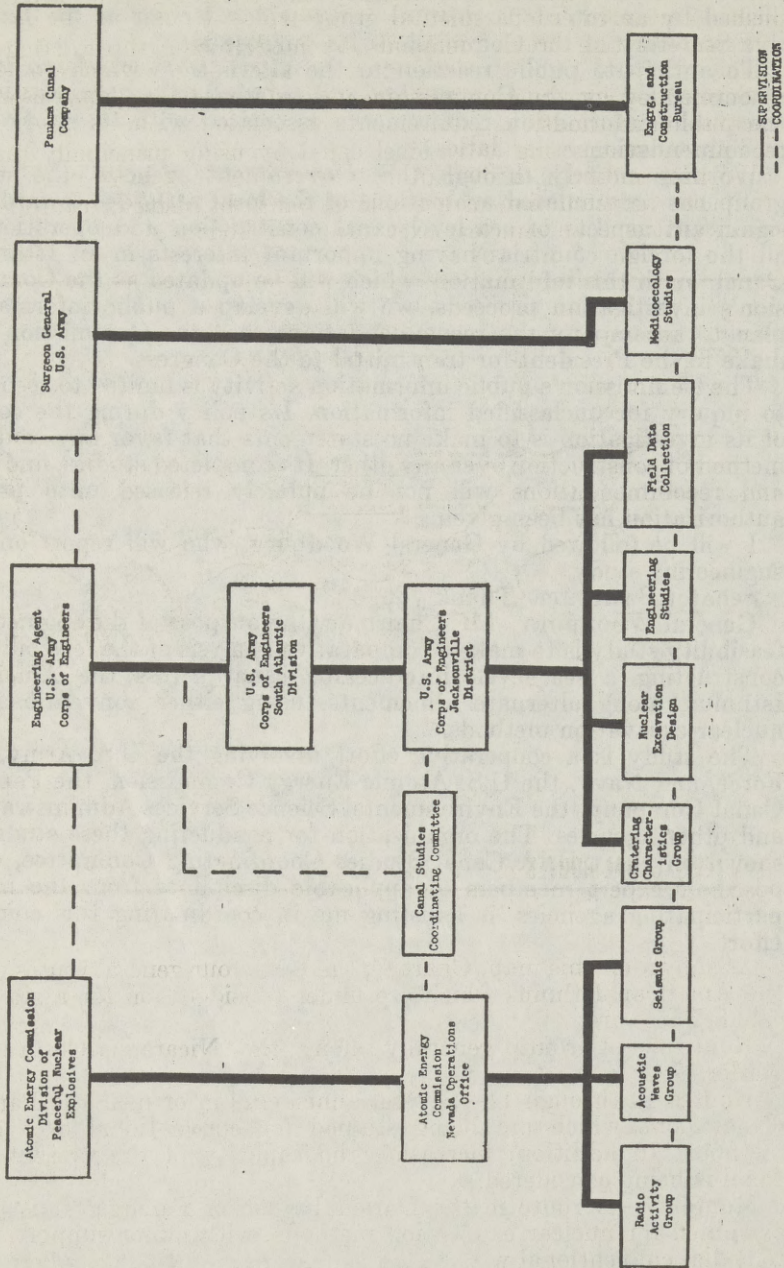


CHART B

In studying engineering feasibility the following alternatives are being considered:

First, meeting traffic demands by modernizing the existing lock canal,

Second, by constructing a sea level canal by using only conventional excavation methods,

Third, constructing a sea level canal by using principally nuclear excavation methods, and finally,

Fourth, construction of a sea level canal by using a combination of conventional and nuclear excavation methods.



CHART C

As shown on this map, Chart C, there are four general routes along the American Isthmus which are under consideration for a sea level canal. These are:

Route 8—A route generally along the Nicaragua-Costa Rica border.

Routes 10 through 14—Several alignments in or near the Panama Canal Zone which are being studied for conventional excavation methods. In addition, increasing the capacity of the present lock canal is being considered.

Route 17—A route in the Darien Region of Panama. It is being examined for nuclear excavation methods, with minor supporting or remedial conventional work.

Route 25—A route in the extreme northwestern portion of Colombia, near the Colombia-Panama border. It is being studied for a combination of nuclear and conventional excavation.

The engineering studies have been divided into two broad programs—data collection, and data evaluation and engineering studies.

The data collection program is designed as an intensive 2-year effort on the proposed routes to collect data necessary to evaluate the

engineering, and nuclear operational and safety aspects of construction. A token start of the program was started in February 1966 in Panama, but the full-scale effort along both Routes 17 and 25 couldn't begin until January of this year. Our work on Route 8 has awaited the production of topographic maps under the inter-American mapping program. This is now completed and map studies are in progress.

The Commission presently has survey forces deployed along the Panamanian and Colombian Routes 17 and 25, respectively. Considerable progress has been made since January 1967.

To illustrate our onsite data collection programs I have prepared a series of slides supplemented with a short filmstrip.

Our general plan is to examine in detail a zone about 4 miles on each side of selected alignments. Facilities for support to include base and line camps are, of course, necessary. Thus, on Route 17 [slide] we have two weather stations, one at each end of the route, and the support facilities indicated on the slide.

Will you point to the two weather stations, Mr. Black [pointed out] and the logistics support facilities?

On Route 25 a similar pattern has been established. We have support facilities at each end of the route, but because of the length of this route we also have to have support facilities in the middle of the route and then we have a floating facility which we use on the Atrato River.

Data is being collected in the technical disciplines as shown on chart D.

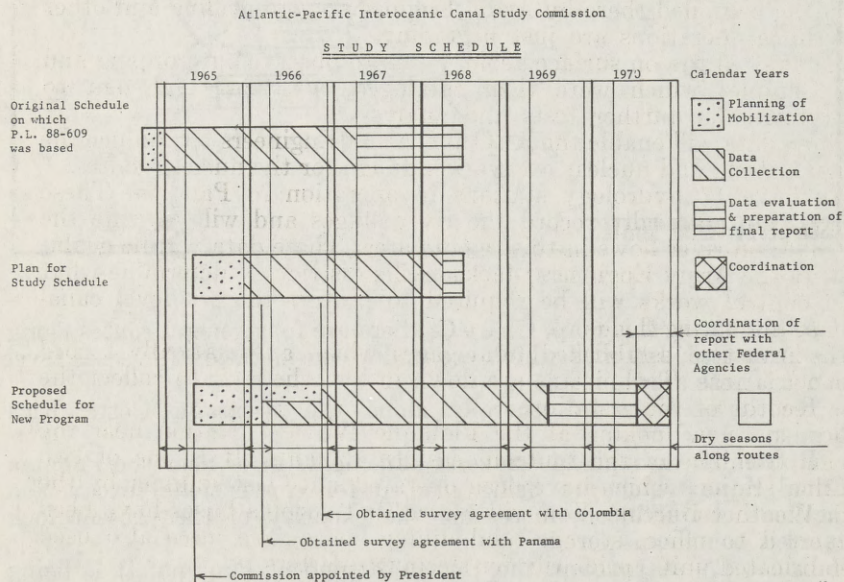


CHART D

All of those listed except acoustic wave which is being done in the Canal Zone, are being undertaken in the remote routes. This slide shows, sir, in the Canal Zone, our radar station for tracking rockets for acoustic waves; this [indicating] is the rocket launcher.

Now, sir, with your permission I have a short film which was taken down on Route 17, that I think would be of interest to the committee.

(Whereupon, while a film was being shown, Colonel Hughes gave the following commentary:)

Colonel HUGHES. Mr. Chairman, this is an aerial view of the base camp at Santa Fe. Here we have sleeping quarters, messhalls, aid stations and maintenance facilities. An airstrip was opened nearby to provide access and the camp is also accessible by water using the Sabana River.

Access roads and trails were cleared so that the men, materials and supplies which were shipped from the Canal Zone could be moved from the beaches and river banks to the interior of the jungle.

We have cleared a trail across the rain forest of eastern Panama which links the Sabana and Chucunaque Rivers. This trail is passable only during the dry season and even then generally only with four-wheel drive or track vehicles.

Because of the excessive costs of clearing trails across the isthmus we are now using a more economical plan of line camps spotted at intervals along the canal route. You are looking now at a typical line camp which includes thatched huts and a clearing where a helicopter can land to transport scientists and engineers and food and supplies. All line camps in Panama, a total of 10, are now complete.

Besides a dispensary at Santa Fe we also maintain first aid stations at our line camps on an as-needed basis. The U.S. Forces, Southern Command, are assisting us in providing medical support.

This scene shows a geologists' camp in Darien. Surface geology field work is completed along Route 17 in Panama and geologic maps are being compiled there by Army Engineers. Core drilling and other subsurface operations are just beginning.

Our first efforts on surface geology was to observe outcropping and take samples which were then cataloged, identified and sent to laboratories for further tests and analysis.

These data will enable the AEC and Army Engineers to produce the design criteria and nuclear excavation design for the nuclear routes.

We have 17 hydrology stations in operation in Panama. These stations automatically record the river stages and will provide the first data on river flows in this remote area. These data will be evaluated by the Army Engineers, Jacksonville district, to determine what flood control works will be required to protect the sea level canal against disrupting floods.

We have also established tidal gages which automatically record tidal variations. Technicians are flown in by helicopter to collect the tape records of these stations.

You are now looking at the Pidiaque Weather Station near the Pacific terminus of the route in eastern Panama. It is one of two weather stations which have been operated since last summer by the U.S. Weather Bureau. You will notice that surplus buses have been converted to office, storage, and dining space. We have also used prefabricated units, primarily for sleeping quarters.

The weather stations collect data around the clock, 7 days a week. The data are essential to the determination by the AEC of the time intervals when nuclear operations can be scheduled without posing a threat to inhabited areas or creating a long-term hazard.

This is a radarscope, mapping rain intensity weather patterns out to 100 miles.

This scene shows a weather station on the island of Soskatupu near the Caribbean terminus on Route 17 in Panama. The island also contains an airstrip and is used as a base camp for personnel entering the route from the Atlantic side. You are now viewing the radar portion of the station.

The operational facilities here are the same as those which you saw at Pidiaque.

This scene shows our medical laboratory at Santa Fe. More than 3,000 specimens of animals and insects have been collected and cataloged in the jungle of Panama by personnel of the Army Medical Service. These specimens are inspected for parasites and diseases.

The medicocology and biology studies will provide data regarding medical and health problems which may be encountered during the construction of a sea level canal.

Captured animals are kept under observation at various locations and levels in the jungle. Virus-bearing mosquitoes, for example, breed in the treetops. These animals are checked daily to determine what vector or host parasites exist. A monkey is kept under observation on a platform 64 feet off the ground. As seen here, he is receiving his daily visit for medical inspection and food.

The Howler monkeys, which live in the treetops, complete the cycle for yellow fever and possibly other diseases. The Gorgas Memorial Laboratory is assisting in the analysis of medical problems.

Considerable attention is being given to the food chains leading to man. This is necessary to ascertain the likelihood of unacceptable concentration of radionuclei entering these food chains. Since the Indians in the area eat wild game, ecologists of the Battelle Memorial Institute must determine what these animals eat and must trace the food chain back to the basic forms of life. This requires a thorough knowledge of the indigenous people, their migratory habits, diets, and customs.

Mr. Chairman, the film depicted the activities on Route 17.

We have a similar effort now underway in Colombia.

Going now to Route 25, our first effort involved landing of supplies and equipment on the Pacific coast.

This shows an LST unloading supplies. It was provided by the U.S. Navy in conjunction with a training exercise.

An airstrip was opened on the beach and a base camp was constructed.

The work also included constructing an access road from the base camp to a weather station in the foothills of the Continental Divide and grading the site for construction of the station.

Going now across the Continental Divide, we landed at Teresita on the Truando River, using the Atlantic Ocean and the Atrato River for access and began construction of a second base camp to include opening an airstrip.

Some military aircraft are being provided in connection with training exercises and for air rescue by the U.S. Army and Air Forces, Southern Command.

Construction of hydrology stations and tidal stations are also underway along this route.

On the northern end of the route we are preparing this hill for construction of a second weather station. The small canal you see there was dug by a lumber company which has been logging in the area.

This next scene shows the same hill after we had leveled off the top and had constructed an access road to the top.

Data collection on this route will parallel that taken on Route 17 and is now in progress. Topography in particular is well advanced. This fieldwork is being done by a Colombian contractor, using primarily native personnel.

The Army's Inter-American Geodetic Survey is providing basic map coverage and ground control for this work.

Geology explorations have also begun. Our data collection in other areas will follow construction of the necessary facilities.

Sir, this completes our pictorial summary of the work on the routes.

General WOODBURY. A preliminary design for each of the alternate routes is being made and a study of the modernization of the present lock canal and conversion of the present canal to sea level is in progress. For the latter, we are using, for the most part, existing data. Data being collected on the proposed nuclear routes will provide the basis for their design. These designs and associated cost estimates will include initial construction costs and annual operating costs projected throughout the economic life of the project. The study of the conversion of the existing lock canal to sea level is proceeding on schedule. Alinement studies have been prepared for Routes 17 and 25 and are updated periodically to incorporate new data as collected.

Technical groups are providing guidance to the data collection effort and the data evaluation studies in the fields of seismic effects, acoustic waves, radiological hazards, nuclear cratering characteristics, slope stability, and excavation systems.

With your permission, sir, I would like now to call upon Mr. John Kelly of the Atomic Energy Commission to discuss with you a related AEC program.

Senator BARTLETT. Go ahead.

Mr. KELLY. Mr. Chairman, I am very happy to appear before your committee today.

The AEC does cooperate closely with the Canal Study Commission and its engineering agent, the Corps of Engineers, in these studies.

Our nuclear excavation research and development program is divided into two major activities or parts: one of these is the development and testing of nuclear explosives; and the other, techniques that will minimize the release of radioactivity.

The second is the further development of explosive crater mechanisms and to develop the capability of more accurately predicting crater size, shape, and other characteristics.

Reduction of the amount of radioactivity released from nuclear cratering explosions has always been recognized as crucial to the ultimate success of the nuclear excavation program. To minimize the amount of radioactivity released, development is underway on two fronts: (1) special thermonuclear explosives which would produce a minimum of fission products, and (2) on special emplacement techniques.

During the past year, three experiments were conducted to advance the design of low-fission explosives. Those tests were very successful. Experiments will be conducted to further develop the family of explosives most useful for excavation applications. We plan to continue the explosive developmental program concurrently with cratering experiments and verify through testing that radioactivity should pose no real health obstacle to large-scale nuclear excavation.

Our present knowledge of cratering mechanism is based on extensive laboratory studies and on several hundred chemical explosive tests and nine nuclear explosive cratering experiments. These were conducted in different types of rocks and at varying depths of burial. It is very important to our program that the relationship that exists between the size and depths of explosive craters and the depth at which the explosion takes place be fully understood.

There is a depth of burial of an explosive of a given yield at which optimum crater dimensions are produced. If the explosive is buried shallower or deeper than the optimum, the depth and/or diameter of the crater will be smaller. In the case of nuclear explosives, with a deeper burial a minimum of radioactivity is released since most of it is trapped in the rubble of the crater and in the debris deposited close to the crater.

To demonstrate the feasibility of nuclear excavation, we must have the capability to more accurately predict the characteristics of craters produced by nuclear explosives. Experience to date indicates that an empirically based predictive capability does not suffice for higher yield detonations or for detonations in different media. One of the most significant recent results of our studies on the development of the theory of nuclear explosion effects is a very promising approach to predicting crater characteristics for any new condition by use of computer calculations; further studies are needed to better understand the theory on which this method is based. In addition to the minimum number of cratering experiments needed to provide a nuclear excavation feasibility determination to the Canal Study Commission, we are planning a series of low-yield experiments to test and refine this predictive capability.

Also included in our studies and experiments is the development of a better understanding of the phenomena associated with the simultaneous detonation of rows of explosives and the connection of such row charges to produce continuous, ditchlike craters. This is very important to demonstrating the feasibility of nuclear excavation of canals.

Because of their importance to the Canal Study Commission, primary attention will be given to performing those cratering experiments which will provide the data required for determining the feasibility, costs, and other factors involved in excavating a sea level canal by nuclear means. In this cratering work the AEC will continue to benefit from its close association with the U.S. Army Corps of Engineers in a joint research program. As in the past, the civil works research of the corps will contribute valuable information, especially in the important area of engineering properties of explosion-produced craters.

We believe that successful execution of about six major cratering experiments with associated explosive and safety development activities will provide timely information for a determination of the technical feasibility of using nuclear explosives to excavate a sea level canal. These can be conducted at a rate of about two per year.

The first of these is known as Project Cabriole. It is planned to be a 2.5-kiloton-nuclear-cratering explosion at a depth of 170 feet at the Nevada Test Site. This experiment will be an important step in providing essential data on basic cratering effects from a nuclear explosion occurring at the apparent optimum depth in hard, dry rock. Cabriole

was prepared for execution in February; however, it has been postponed until after this year's grazing season.

The next experiment is called the Buggy I nuclear row-charge experiment. As now planned it involves the simultaneous underground detonation of five low-yield nuclear explosives in even terrain at the Nevada test site and is designed to investigate the production of a smooth ditch-like crater. This experiment will be this country's first nuclear row-charge experiment and is very important in determining the feasibility of nuclear excavation of canals.

With high explosives, it has been demonstrated that the simultaneous detonation of explosives appropriately spaced in a line and buried at the proper depth will produce a smooth-sided, ditch-like crater. If this effect can be duplicated with nuclear explosives such as in Buggy I, we will have taken a big step toward demonstrating that nuclear explosives could be used for canal excavation.

After Buggy I, a second nuclear row charge, Buggy II, is planned. This experiment is planned to be performed adjacent to the Buggy I crater and will be designed to investigate the joining of a second ditch-like crater to the one that already exists. This experiment is also very important because the current concept of nuclear excavation of canals and mountain passes calls for such interconnecting of a series of nuclear row-charge craters. For this method to be proved feasible, it must be demonstrated that such craters can be reliably joined without the need for extensive cleanup operations.

Our plans include a higher yield single charge experiment such as Schooner, which is presently conceived to be about a 100 kiloton nuclear point charge in hard rock, possibly in the Bruneau River area of southwestern Idaho. Schooner would provide the basis on which to extrapolate to the higher yields needed for practical large-scale, nuclear excavation.

The nuclear excavation experimental program each year depends on the results obtained from the experiments previously conducted. It is expected that at least one higher yield nuclear row charge in varying terrain and a major experiment or demonstration project combining several experimental objectives would be required for purposes of the canal studies.

Due to delays in AEC's nuclear excavation program, only a highly conditional determination on the technical feasibility of using nuclear explosives to excavate a sea-level canal could be provided by June 30, 1968, to the Canal Study Commission for consideration in its final report to the President. Extension of the final reporting date, in accordance with the amending legislation proposed by the Canal Study Commission, would provide the AEC with much needed time to conduct the minimum excavation program in an orderly manner and to report the data and evaluation to the Canal Study Commission for consideration in its final report.

Mr. HILL. Mr. Chairman, I think it is clear from the testimony of Mr. Sheffey, and that of General Woodbury, that the Commission has been proceeding vigorously to obtain its objectives. Further, from the statement of Mr. Kelly, that the Commission is dependent in large degree upon the AEC being able to carry forward the experiments which are essential to a determination of the feasibility for using nuclear explosives.

In my opening statement, I described briefly the effect of the dry seasons and I don't think there is any need to repeat that.

I think there has been sufficient said as to why the costs necessarily increased. If you are going to get a sound study, an increase is unavoidable.

In my opening statement, I did not refer to the treaty negotiations with Panama. Present today is Ambassador Irwin who has been involved in these treaty negotiations.

Mr. IRWIN. Mr. Chairman, as we spoke earlier, the negotiations are proceeding on an almost daily basis, either meeting with the Panamanians or working in connection with the negotiations.

Ambassador Anderson or I would be happy to come back whenever it is convenient for you, to discuss them in whatever detail you would like, either in executive hearing or with you or members of your committee individually.

Senator BARTLETT. Yes, I think it would be well to have an executive meeting at a later date when we can hope to assemble more members of the committee.

Mr. IRWIN. Fine, sir.

Senator BARTLETT. Do you have an appointment elsewhere, Mr. Ambassador?

Mr. IRWIN. Thank you very much. I may leave if we go on.

Mr. HILL. I think we have very little more to submit at this time, Mr. Chairman. Just to recap for the moment, there are two requests in this legislation: One for extension of time, one for increased ceiling on the appropriations.

Both, we feel, are necessary to accomplish the objectives of the public law under which we are working and the Commission urges your prompt and favorable consideration of these amendments. Our full appropriation request this year will depend upon passage of this requested amendment.

If there are any questions, I would attempt to answer them, or if I feel that somebody can answer them better, I will direct the questions to them.

Senator BARTLETT. Could you give the committee the distances of the canal on each projected site, approximately?

Mr. HILL. The distances from Panama?

Senator BARTLETT. No, the distances of each canal route that you are studying?

Mr. HILL. The present canal is 42 miles in land length. The Route 17 would be slightly longer, 44 land miles.

The Colombia route, the Atrato Route 25 would be roughly double that length, or about 100 miles, of which little more than half would be presumably conventional construction in the delta alluvial plain of the Atrato River.

The Nicaraguan Costa Rican route is much longer, it is approximately 140 miles in length.

Senator BARTLETT. And I assume that the cost would increase with the distance?

Mr. HILL. Both with distance and with the elevation. The Nicaraguan route is not only longer, but it also has equally high elevations and its cost, if feasible from other aspects, would be very much more than the other routes.

We are speaking now of the sea level canal. On the Colombian route, its great length is offset in part by the fact that roughly one-half of it is susceptible of being dredged, so that its length is not quite as much of an obstacle as might be presumed.

Nevertheless, it does have a high ridge to cross and the elevation of high ground, although somewhat less than Route 17, is still substantial.

Senator BARTLETT. Has the Commission as yet made any preliminary cost estimates?

Mr. HILL. Just in a very vague way, Mr. Chairman. An implication that we have gotten from the study to date is that costs of conventional excavation would be little more if any above estimates made 20 years ago, due to improvements in methods.

The cost of the nuclear excavation is still indeterminate, because we don't know all of the relative matters, but the indications are that the costs would be materially less than conventional construction if it in fact is found feasible to use this method.

Senator BARTLETT. If it were determined to use nuclear explosives, would there also be required some conventional dredging?

Mr. HILL. There would be some conventional dredging necessary at each entrance. There would be perhaps conventional excavation required in lower portions if it turned out it was more economical to do it conventionally than by nuclear means.

Route 17 would have the minimum of conventional work involved. Route 25 would have a very large amount of conventional excavation.

Senator BARTLETT. Has any sentiment been expressed in any of the countries with whom we are dealing as to the manner in which they would receive use of the nuclear explosives?

Mr. HILL. There has been an effort to ascertain this sentiment. With your permission, Mr. Sheffey has accumulated that data and is the public relations chairman. I would ask him to be more explicit in the answer.

Mr. SHEFFEY. I will answer that in two parts, generally and specifically.

In general, our survey through the embassies, all within U.S. Government channels, found that if the United States would establish before the world by experiments and demonstrations in its own territory, that nuclear excavation is feasible and safe; these countries would accept nuclear excavation on their own territory.

But they very clearly indicated that they don't want to be the guinea pig for this.

Specifically, some very high members of the Government of Panama have expressed considerable enthusiasm for nuclear excavation on economic grounds. Their hope is that a very low-cost canal will pay them more money in the long run. Should it be that they get control of it at some future date, it will be far more profitable because of the lower investment.

So I would say that at this time, it appears that nuclear excavation would be acceptable if we can prove elsewhere that it is feasible and safe.

Senator BARTLETT. Out in Nevada?

Mr. SHEFFEY. Yes, sir.

Senator BARTLETT. How much is the Commission appropriation for the current fiscal year?

Mr. HILL. General Woodbury, would you have that at your fingertip?

General WOODBURY. Yes, sir.

May I supply that for the record, sir?

Senator BARTLETT. Certainly. And at the same time, will you inform the committee how much of the authorized \$17.5 million has been appropriated?

General WOODBURY. A little over \$11.3 million, sir.

Senator BARTLETT. Now, from what the committee has been told, it is quite obvious that if you can't conclude your work by June 30, 1968, and if the law isn't amended, it will mean a waste of all the work and money up to this time, would it not?

Mr. HILL. That is correct. We could answer part of the question but those portions of your instructions as set forth in the original act, which pertain to nuclear excavation cannot be answered by June 30, 1968.

I wouldn't say that all of the work would be wasted, because the fieldwork is not something that is lost. It would be valuable in the long run, but as far as this Commission's own activity is concerned, we simply cannot give a substantive answer by June 30, 1968.

General WOODBURY. Mr. Chairman, in response to your earlier question, the appropriation for 1967 was \$4 million. There was something on the order of \$2.9 million carryover from the preceding year, thus giving a total of \$6.9 million available for obligation in fiscal year 1967. The appropriations to date total \$11.4 million.

Senator BARTLETT. Did you receive all of the money you asked for last year?

General WOODBURY. Yes, sir, there was a budget amendment to reduce the request last year, because of the savings we had accrued due to our inability to proceed in fiscal year 1966, so there was money carried over from 1966 which we were able to use in 1967, the authorization having been granted by amendment last year to permit funds that were appropriated to remain available until expended.

Senator BARTLETT. And you are asking for \$7.5 million for the coming fiscal year?

General WOODBURY. Yes, sir.

Senator BARTLETT. Will the Commission's requirements in fiscal 1968 exceed the amounts authorized to be appropriated?

General WOODBURY. Yes, sir.

Senator BARTLETT. Are there any U.S. Navy ships at sea or under construction that can't use the present canal?

General WOODBURY. Yes, sir, 24.

Senator BARTLETT. They have to take the long voyage around?

General WOODBURY. Yes, sir.

Mr. SHEFFEY. These are all our major aircraft carriers, none can go through the canal.

Senator BARTLETT. And how about merchant vessels, any of them?

General WOODBURY. There are some 500 merchant vessels, sir, on the high seas, which cannot transit the canal when fully laden. There are some 300 which can't transit it at all.

Of course, all of these ships are not necessarily on trade routes that use the canal. There is a tendency, however, as you have noted in the newspapers, to build larger and larger ships to effect economies that can be realized from these larger ships.

Senator BARTLETT. Over in Yokohama last November I saw a ship of 205,000 deadweight tons, 1,005 feet long, and I assume it could not use the canal.

General WOODBURY. It could not use the present lock canal. It, of course, would be able to use the sea level canal, constructed by nuclear methods, because such a canal would be about 1,000 feet wide, and up to 250 feet deep in the center.

Senator BARTLETT. Do you have any plans to conduct an onsite survey in Nicaragua?

Mr. HILL. I can answer it generally. The answer is "No," so far as we can now see. The site has been examined by various members of the Commission from the air. Maps are available and the old surveys made some 30 years ago, very detailed surveys, all indicate that from excavation by conventional methods, we are dealing with quantities which are completely unreasonable.

Excavation by nuclear methods is very doubtful from a safety aspect because of the concentration of population in Costa Rica particularly but also in Nicaragua. It therefore seems that little would be gained by onsite surveys as information is sufficient now to provide a comparative analysis unless something develops in an area in which we now have incomplete knowledge. General Woodbury is familiar also with Route 8.

General WOODBURY. The requests to increase the appropriation authorization from \$17.5 million to \$24 million, sir, does not include any funds for an onsite survey of Route 8.

Senator BARTLETT. I will ask this question, and leave it up to you, Mr. Ambassador; as to whether you care to answer it or not.

What caused the delays in obtaining survey rights from host countries?

Mr. IRWIN. Sir, that phase of the negotiations was handled separately from the actual canal negotiations. The rights for surveys were handled separately and I would like to refer the question back to General Woodbury.

General WOODBURY. Mr. Chairman, I participated with the State Department in the negotiation of these survey agreements with both Panama and Colombia. Mr. Hill has indicated to you that the Commission didn't come into existence until April of 1965. At that time negotiations were just being started with Panama for a modification to the 1903 treaty, a base rights agreement and a sea level canal agreement. It was thought initially that the survey rights would be a part of the overall treaty negotiations.

However, it was subsequently concluded that this would not be practicable and so in the early fall of 1965 it was decided to separate the survey access agreement from the treaty negotiations that were in progress. The agreement negotiations then for the survey access in Panama were initiated in October 1965 and successfully concluded in February 1966, with no unconscionable delay once we got started.

The negotiations in Colombia were not started until after the negotiations in Panama had progressed almost to the point of conclusion. Following the opening of discussions with Colombia, Colombia underwent a presidential election, a change in government, and there was a delay occasioned by this. But there was no unreasonable delay and we ran into no difficulty with the Colombians, after the new government had been formed and new ministers were appointed. We were able to proceed expeditiously.

Senator BARTLETT. What are some of the basic plans proposed for financing the new canal?

General WOODBURY. There is, as Mr. Sheffey pointed out, a Finance Study Group which is considering this problem. They are examining the possibility of private financing, multinational financing, and single nation financing by the United States. This study group has not reached any conclusions as of this time but the indications are that it would be most difficult to obtain private financing for an undertaking of this magnitude without some sort of a guarantee; and if the United States, for example, were to furnish that guarantee, it might find it less costly to the United States to do the financing in the first place.

Mr. HILL. Mr. Sheffey, you are on that committee as a member for the Commission. Do you have any comment to add to that?

Mr. SHEFFEY. I would add that the finance group must await the completion of treaties, because the treaties will establish the range of financial possibilities. And I believe the U.S. objectives are to leave itself some freedom of action. It remains to be determined whether the other countries will agree.

Senator BARTLETT. Can you give us a figure, even if it isn't based on accurate knowledge at this time, as to what a canal might cost?

Mr. HILL. In round numbers, and these are very preliminary figures, we are thinking in terms of about \$2.5 billion for the conventional canal at the most suitable location. Also, using the assumption that a nuclear-excavated canal is feasible, the cost of such a canal might be as much as a billion and a half dollars less than that for a conventional canal.

These are the general range of figures in the mind of the Commission at the moment.

Senator BARTLETT. Mr. Kelly, why is only one excavation test scheduled by the AEC for the next fiscal year?

Mr. KELLY. Actually, in fiscal year 1968, the forthcoming year, we hope to do two. We had scheduled one and now we hope to pick up the one that we had planned to do this year, but deferred.

Senator BARTLETT. Why does the Plowshare delay cause an additional cost to the Commission?

Mr. HILL. Generally two things: One, because of the uncertainties of the Plowshare experiments, we have had to upgrade the detail of some field investigations. Not that we shouldn't have done that in the long run anyway, but there is a certain realm of doubt and we wish to remove it insofar as is possible to do it. The other is merely the matter of extension of time, that like all investigations, or all business, overhead runs on, and it takes a substantial sum of money to keep the work going.

General Woodbury, do you have something to add to that?

General WOODBURY. No, I think not, sir.

Senator BARTLETT. Please explain the revision of the cost estimate based on your field experience?

Mr. HILL. General Woodbury, you have that detail. Will you answer for me, please?

General WOODBURY. Yes, sir. The original cost estimate was made up with limited reconnaissance of the routes in Panama and Colombia. They were made up from what little information that was available in 1964. We made the best estimates that we could. Since that time, however, we found that the business of constructing the facilities on the remote routes in the jungle has cost us more than we anticipated.

We found that particularly labor costs in the route were higher than originally programed. Our initial program estimates were on the basis of labor costs at 30 cents an hour; we were unable to get the kind of labor that we needed for that price.

We also found that some of the rules and regulations in the Canal Zone, which we had not anticipated, were to apply to the remote routes, did in fact apply, and this affected the wage scales.

We found too that the construction of access roads, one of which you saw in the movie, cost us considerably more than we originally anticipated. And so in order to keep this cost increase to the minimum, we have changed our operating procedure from one of constructing land access to the use of helicopters. But the helicopter contracts have been expensive too. The Army was unable to furnish the helicopter service for the first 2 years of the study. Their earlier aircraft that had been available there were deployed to Vietnam. The Air Force is now beginning to deploy helicopter aircraft to Panama.

Senator BARTLETT. Please give us a breakdown of the additional estimated cost of \$1,303,000 which you expect because of the delays in obtaining survey agreements?

General WOODBURY. Would you like me to furnish that, sir, for the record?

Senator BARTLETT. Yes, that will be agreeable.

General WOODBURY. All right, sir.

(The information follows.)

Breakdown of estimated cost of \$1,303,000 due to delays in obtaining survey agreements

<i>Activity</i>	<i>Estimated costs for salaries and expenses</i>
Commission administration, advisers, and consultants, special studies and agent for engineering feasibility studies.....	\$350, 000
Data collection.....	503, 000
Data evaluation and engineering studies.....	450, 000
Total.....	1, 303, 000

Senator BARTLETT. How many people are employed by the Commission in the field, either directly or by contract or by loan from other Government departments?

General WOODBURY. We currently have about 900 people deployed in the field, sir. Of these 600-odd are contract and local hire personnel. There are a total of 35 military personnel including some U.S. Army Medical Corps people that are doing some of this medical fieldwork that you saw, 162 U.S. civilians, plus 97 employees of the Panama Canal Company, for a total of some 900.

Senator BARTLETT. Now does the Commission have to reimburse the Army for the medical help, the Air Force for the helicopters, and the Canal Zone for their people?

General WOODBURY. The Canal Commission is reimbursing the Army for those additional identifiable costs that are associated with the work of their personnel in support of the Commission. They are not paying my salary, for example, but they are paying my transportation, when I have to go to Panama on their business. We are not paying the Air Force for the use of their helicopters. Of course their helicopters are not providing all of the service that we require. They have deployed only one medium helicopter down there at this time. And we are having to supplement this by two helicopter contracts.

The Navy LST, which you saw landing supplies across the beach was done in connection with a Navy training program, and there was no cost to us as a result of that. The Panama Canal Company is being reimbursed for all identifiable costs incurred in support of the Commission.

The Army Medical Service is not reimbursed for military salaries but is reimbursed for all additional identifiable costs such as the work of the civilian personnel you saw dissecting bats.

Senator BARTLETT. You said that you expected to get native labor for 30 cents an hour and couldn't. What did you wind up paying?

General WOODBURY. Our scales vary, sir, depending on whether we have an Indian, a non-Indian, who is indigenous to the area, or Panamanian, or Colombian, whom we hire and then bring into the area.

The base wage for common labor hired onsite in Panama is 30 cents an hour. The rate is higher for semiskilled labor hired onsite. The Panamanians, which we bring in from the Canal Zone, are hired by the Canal Company and come under the canal pay scales.

In Colombia, we are paying the going wage for Colombian labor.

Senator BARTLETT. Is the Commission required to pay rent for the use of land you occupy?

General WOODBURY. The survey agreement that we have with Colombia, sir, provides that the Colombians will make available to the United States all lands necessary for the conduct of the survey without cost to the United States. In the agreement that we have with Panama, Panama agrees to furnish to the United States all lands necessary free of cost that are in the public domain. But the United States will reimburse Panama for any costs incurred in the use of privately owned real estate. To date, however, we have made maximum utilization of lands in the public domain and the only real estate costs which we have incurred is a small claim for about \$500 for some destruction that was wrought to the Indian gardens on Soskatupu Island when we put up the weather station on that island.

Senator BARTLETT. Are you confident that all of your work can be completed by December 1, 1970?

Mr. HILL. We are confident that the work required in Panama and in Colombia can be completed by that time. The other aspect of the problem, that is the AEC's Plowshare problem, that of course is not in the hands of this Commission.

Senator BARTLETT. This date satisfies you then?

Mr. HILL. This date satisfies the Commission; yes, sir.

Senator BARTLETT. Now, when these Plowshare experiments are conducted in Nevada, does the AEC pay for them or is AEC reimbursed by the Commission?

Mr. KELLY. The AEC pays for those.

Senator BARTLETT. Senator Griffin?

Senator GRIFFIN. Mr. Chairman, I regret that I was here late and I understand from counsel that you have covered the subject very well with your questions. I have none to ask at this time.

Senator BARTLETT. As a matter of fact, we didn't need very many questions, although I asked quite a few, because the gentlemen were so informative and gave us information in detail.

I want to thank all of you and each of you for appearing here today.

The committee will stand in recess with the understanding that at a later date Ambassador Irwin will brief us in executive session.

Thank you, gentlemen.
 (Thereupon, at 11:22 a.m., the committee was adjourned.)
 (The prepared comments of Commissioner Raymond A. Hill follow:)

STATEMENT OF RAYMOND A. HILL, COMMISSIONER OF THE ATLANTIC-PACIFIC
 INTEROCEANIC CANAL STUDY COMMISSION

COMMISSION ACTIVITIES

Following the Commission's appointment in 1965, it developed an organization and made plans for the accomplishment of its studies. Our organization for conduct of these studies is shown in Chart A. All study elements are now in progress.

During the past year the Commission met quarterly. In addition, individual members have had numerous meetings with representatives of agencies and organizations supporting the Commission, have made visits to activities of special interest and have conducted Commission business from their home offices.

The activities of the Commission during fiscal year 1966 were recounted in our Second Annual Report, dated 31 July 1966, which the President transmitted to the Congress.

SITE SURVEY AGREEMENTS

On 15 February 1966, Notes were exchanged with the Government of Panama authorizing site surveys. A similar exchange took place with Colombia on 25 October 1966.

Since then detailed arrangements have been developed to include use of real estate; the movement of personnel, supplies and equipment; local participation of host country personnel; exchange of data; and processing of claims. We are enjoying excellent cooperation with both host countries.

STUDY SCHEDULE

I would like to illustrate the schedule of the Commission's investigation with Chart D. This chart covers the period beginning with 1964 when Congress authorized the establishment of the Commission and extends through calendar year 1970.

The upper bar represents the schedule upon which the Authorizing Legislation was based. It contemplated data collection to start in late calendar year 1964 with completion of the study scheduled for 30 June 1968. This schedule was overly optimistic in that it did not allow for delays in formation of the Commission, delays in securing survey rights from host countries, and stretch-out of related programs.

Following the appointment of the Commission in April 1965, a new schedule was adopted which attempted to adjust the study program to the loss of the favorable dry season in fiscal year 1965. The development of this schedule contemplated survey agreements in late 1965, which would allow full-scale data collection to begin in December 1965 with completion of the study still on 30 June 1968. Delays in obtaining survey agreements have so altered the schedule that completion of the study within the assigned scope by 30 June 1968 is no longer possible. During the period of negotiation between the United States and the host countries, every advantage was taken to expedite those functions not requiring on-site access to survey areas. Supplies and equipment were purchased and stored, key personnel were mobilized, but full-scale data collection and full mobilization was necessarily postponed until January 1967.

The proposed new study schedule, shown on the lower bar on the chart, will provide the Commission with sufficient time to complete the study in an orderly manner. The schedule has been adjusted to compensate for the delays encountered in obtaining access to survey areas; it provides for a stretch-out of the Data Evaluation and Engineering Program to match the delay in PLOWSHARE, and it will provide time for coordination of the Commission's report with other Federal agencies prior to its submission to the President, something which earlier schedules did not provide.

FISCAL

The present estimate of funds required to complete the study is \$24 million. This represents an increase of \$6.5 million. I have prepared a chart showing the comparisons between the original estimate and the requirements estimate (Chart

E). The major items contributing to the increase in estimated cost are shown on Chart F:

- Delays in obtaining survey agreements.
- Unprogrammed Federal pay raises,
- Viet Nam Situation,
- Revisions of cost estimates resulting from actual field experience,
- Program stretch-out.

In preparing the Commission's fiscal year 1968 budget, it was necessary to assume that an amendment to the authorizing legislation will be passed by the Congress. This amendment proposes to extend the study from 30 June 1968 until 1 December 1970 and to raise the appropriation ceiling from \$17,500,000 to \$24,000,000.

I have prepared Chart G to show the relationship between appropriations, obligations, and requirements. You will note from the chart that the appropriations through fiscal year 1967 amounted to \$11,385,000. This leaves an unappropriated balance of \$6,115,000 remaining under the original appropriation ceiling of \$17,500,000. Since the Commission's requirements in fiscal year 1968 exceed the unappropriated balance by \$1,385,000, it will be necessary that the authorizing legislation be amended if the study is to continue as scheduled. Total funding requirements for the studies are shown on the lower bar of this chart.

TREATY NEGOTIATIONS WITH PANAMA

Quite apart from the Canal Commission's activities, negotiations are being conducted with the Republic of Panama for three new treaties: one for the continued operation of the existing lock canal, a second covering a base rights and status of forces, and a third for the construction and operation of a sea-level canal. In Chairman Anderson's capacity as Special Representative of the United States for United States and Panama Relations and for canal treaty negotiations, he has been able to keep the Canal Commission informed of treaty matters affecting the sea-level study. Formal negotiations with nations other than Panama for sea-level canal treaty rights have not yet been undertaken. Ultimately, these treaties will have a bearing in the evaluation of the alternate canal routes under investigation.

SUMMARY

In reviewing the status of the Commission's investigation and study, it is apparent that the delay caused by difficulties in starting actual on-site surveys and the stretch-out of the nuclear excavation research program will prevent the Commission from completing its work by 30 June 1968. It also is apparent that the Commission will be unable to accomplish adequately its tasks within the present appropriation limitation of \$17.5 million. These facts remain in spite of maximum effort by the Commission and its agents to accelerate the progress of the study and minimize its costs.

The Commission now expects to complete its study by 1 December 1970 at an estimated cost of \$24 million. This represents an increase of \$6.5 million over the present authorized limit of \$17.5 million.

If the study is to continue as presently scheduled an early amendment to the authorizing legislation is essential.

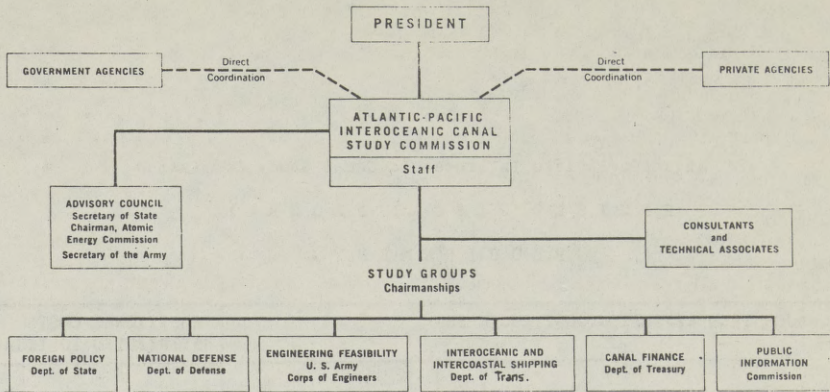


CHART A

ATLANTIC-PACIFIC INTEROCEANIC CANAL STUDY COMMISSION

COMPARISON OF ORIGINAL ESTIMATE WITH REVISED REQUIREMENTS ESTIMATE

Activity	Estimated Cost in Plan for Study	Revised Cost based on Requirements
Commission Administration, Advisors and Consultants, Special Studies and Agent for Engineering Feasibility Studies	\$ 1,513,000	\$ 1,823,000
Data Collection	12,670,000	16,981,000
Data Evaluation	3,317,000	5,196,000
Total	\$17,500,000	\$24,000,000

CHART E

Atlantic-Pacific Interoceanic Canal Study Commission

REVISED FISCAL PROGRAM

REQUIREMENTS

MAJOR ITEM AFFECTING COST INCREASE	ADDITIONAL COSTS ATTRIBUTED TO ITEM
Delays in obtaining survey agreements	\$1,303,000
Unprogrammed federal pay raises	400,000
Vietnam situation	477,000
Revisions of cost estimates resulting from actual field experience	3,320,000
Program stretch-out due to PLOWSHARE delay	1,000,000
TOTAL	\$6,500,000
PREVIOUS STUDY ESTIMATE	<u>17,500,000</u>
NEW STUDY COST ESTIMATE	24,000,000

CHART F

Atlantic-Pacific Interoceanic Canal Study Commission

FISCAL PROGRAM

