

The Panama Canal

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Panama Canal Office of Public Affa
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PANAMA CANAL TRAFFIC - FISCAL YEARS 1987 THROUGH 1996

TABLE NO. 1

Fiscal Year	Total Traffic			Traffic Assessed Tolls on Net Tonnage Basis		Traffic Assessed Tolls on Displacement Tonnage Basis	
	Number of Transits	Tolls	Long Tons of Cargo	Number of Transits	Panama Canal/UMS Net Tonnage*	Number of Transits	Displacement Tonnage
OCEANGOING COMMERCIAL TRAFFIC (1)							
1987	12,230	\$ 328,372,714	148,890,380	12,208	188,416,485	24	130,129
1988	12,234	337,868,211	156,482,641	12,209	191,506,903	25	106,599
1989	11,989	327,850,613	151,836,113	11,864	185,769,083	25	101,710
1990	11,941	353,725,982	157,072,979	11,904	181,604,268	37	153,514
1991	12,572	372,279,573	162,895,886	12,544	191,786,855	28	120,375
1992	12,454	365,716,456	159,272,818	12,425	188,511,014	29	117,403
1993	12,086	398,232,479	157,703,910	12,048	186,405,741	38	142,599
1994	12,337	416,803,062	170,538,437	12,280	194,289,433	57	195,198
1995	13,459	460,043,676	190,303,085	13,426	215,355,914	33	116,191
1996	13,536	483,114,903	198,067,990	13,502	226,884,859	34	104,670
OCEANGOING U.S. GOVERNMENT TRAFFIC (1)							
1987	78	\$ 1,384,125	205,701	48	662,286	32	239,023
1988	69	1,361,393	296,140	46	714,055	23	129,545
1989	74	1,806,539	224,121	62	994,711	12	103,020
1990	91	1,707,864	248,442	63	821,340	28	193,160
1991	173	2,214,170	516,130	69	902,085	104	458,899
1992	167	2,790,452	341,256	96	1,295,153	71	405,886
1993	151	2,496,881	275,896	59	887,830	92	574,415
1994	131	2,252,725	296,767	55	860,430	76	374,453
1995	152	2,537,820	98,520	44	893,034	108	590,398
1996	173	3,422,597	419,508	64	1,313,393	109	541,963
FREE OCEANGOING TRAFFIC (1)(2)							
1987	5		5	4	2,224	1	1,300
1988	15		-	6	3,312	9	16,765
1989	12		-	6	3,312	6	9,709
1990	20		6	4	2,218	16	30,530
1991	18		-	4	2,218	14	24,702
1992	16		-	4	2,206	11	18,508
1993	20		12	6	3,330	14	23,271
1994	10		-	1	550	9	12,630
1995	20		-	3	1,674	17	26,308
1996	12		-	7	3,892	5	7,172
TOTAL OCEANGOING TRAFFIC (1)							
1987	12,313	\$ 329,756,840	148,896,086	12,256	187,080,995	57	370,452
1988	12,318	339,227,604	156,778,781	12,261	192,224,270	57	252,909
1989	12,075	329,657,153	151,860,234	12,032	186,767,106	43	214,439
1990	12,052	355,433,848	157,321,427	11,971	182,427,826	81	377,204
1991	12,763	374,493,743	163,212,016	12,617	192,691,158	146	603,976
1992	12,636	368,506,908	159,613,874	12,525	189,808,373	111	541,897
1993	12,257	400,729,360	157,979,818	12,113	187,296,901	144	740,285
1994	12,478	419,055,786	170,835,204	12,338	195,150,413	142	582,281
1995	13,631	462,581,296	190,401,585	13,473	216,250,822	158	732,897
1996	13,721	486,537,500	198,487,498	13,573	228,202,144	148	653,805
SMALL COMMERCIAL TRAFFIC (3)							
1987	852	\$ 90,829	3,282	852	55,827	-	-
1988	844	79,805	1,422	842	49,245	2	64
1989	997	96,158	8,311	996	60,156	1	430
1990	1,017	115,180	1,497	1,016	66,999	1	98
1991	1,079	118,675	537	1,077	67,982	2	64
1992	1,260	137,318	1,250	1,258	77,747	2	304
1993	1,232	140,848	483	1,223	73,608	9	555
1994	1,322	139,423	791	1,319	72,997	3	437
1995	1,272	149,388	1,620	1,268	78,138	4	449
1996	1,292	133,933	992	1,287	69,621	5	2,010
SMALL U.S. GOVERNMENT TRAFFIC (3)							
1987	236	\$ 11,106	-	25	987	211	9,572
1988	246	11,917	-	21	901	225	10,375
1989	287	12,316	-	13	738	274	11,018
1990	240	8,931	-	23	903	217	6,684
1991	248	12,319	-	12	654	236	10,065
1992	231	18,278	81	28	3,027	203	11,753
1993	202	13,825	-	11	762	191	10,112
1994	200	23,547	-	15	868	185	17,902
1995	215	23,370	-	13	1,383	202	17,021
1996	157	16,832	4	5	497	152	12,900
SMALL FREE TRAFFIC (2)(3)							
1987	43		57	28	1,451	17	1,012
1988	33		-	15	1,081	18	1,189
1989	30		3	14	878	16	1,141
1990	16		-	5	249	11	800
1991	18		-	13	568	5	545
1992	21		19	11	932	10	792
1993	29		-	9	572	20	1,437
1994	29		17	6	318	23	1,470
1995	18		11	9	1,024	9	367
1996	17		8	7	566	10	897
TOTAL PANAMA CANAL TRAFFIC							
1987	13,444	\$ 329,858,775	148,899,425	13,159	187,139,260	285	381,036
1988	13,441	339,319,326	156,780,203	13,139	192,275,497	302	264,537
1989	13,389	329,765,627	151,868,548	13,055	186,828,878	334	227,028
1990	13,325	355,557,957	157,322,924	13,015	182,495,977	310	384,786
1991	14,108	374,624,737	163,212,553	13,719	192,760,362	389	614,650
1992	14,148	368,662,504	159,615,224	13,822	189,890,079	326	554,746
1993	13,720	400,884,033	157,980,301	13,358	187,371,843	364	752,389
1994	14,029	419,218,757	170,836,012	13,676	195,224,598	353	602,090
1995	15,136	462,754,053	190,403,216	14,763	216,331,167	373	750,734
1996	15,187	486,688,265	198,488,502	14,872	228,272,828	315	669,612

* The new tonnage measurement system for Panama Canal tolls assessment, the Panama Canal/Universal Measurement System (PC/UMS), became effective October 1, 1994 (the start of Fiscal Year 1995).

(1) Oceangoing traffic includes ships of 300 PC/UMS net tons and over, or of 500 displacement tons and over on vessels paying tolls on displacement basis (dredges, warships, etc.).

(2) Free traffic includes ships of the Colombian and Panamanian Governments and ships transiting for repairs by the Commission.

(3) Includes vessels under 300 PC/UMS net tons (or under 500 displacement tons for vessels assessed on displacement tonnage).

GAILLARD CUT AND THE GAILLARD CUT WIDENING PROGRAM

Background

Because of its history, its unusual geology and the fact that it slices through the Continental Divide, the Panama Canal's Gaillard Cut holds special interest for nearly everyone, including crew members and passengers aboard transiting vessels, as well as the public in general. Called Culebra Cut during the Panama Canal construction period, it was later renamed for Col. David du Bose Gaillard, the engineer in charge of this section of the Canal construction work.

This portion of the channel is about 12.6 kilometers (8 miles) long and was carved through rock and shale for most of the distance. It was here that the principal Canal excavation was required and here that devastating slides occurred during construction, soon after the Canal was opened and several times since.

On August 15, 1914, the world hailed the opening of the Panama Canal, the monumental engineering achievement of the century. This event marked fulfillment of the centuries-old dream of uniting the world's two great oceans and established a new link in the world transportation chain. The building of the Panama Canal was an unprecedented triumph and the product of almost superhuman endeavor, with at least 75,000 men and women contributing to the work during its 10-year construction period. These Canal builders created Gatun Dam, the largest earth dam that had ever been built; Gatun Locks, the largest concrete structure that had ever been

erected; and Gatun Lake, the largest artificial lake that had ever been created. It also created the healthiest strip of tropical terrain anywhere in the world and a water link across eighty kilometers (50 miles) that were, in the words of author David McCullough, "among the hardest ever won by human effort and ingenuity." And the hardest-won stretch of Canal was the 12.6 kilometer-long (8-mile) Gaillard Cut.

The Panama Canal is a lock-type canal approximately 80 kilometers (50 miles) long from deep water to deep water. Vessels transiting the Canal are raised in three steps to the 26 meter (85 foot) level of Gatun Lake, the principal reservoir for Canal water, then lowered to sea level again in three steps. The three sets of locks are paired so as to permit simultaneous lockage of two vessels in the same or opposite direction. The minimum width of the navigable channel is 152 meters (500 feet) and the normal permissible draft for transiting ships is about 12 meters (39.5 feet) tropical fresh water.

A ship traveling from the Atlantic to the Pacific enters the Cut where the Chagres River flows into the Canal channel at Gamboa. More than any other section of the Canal, Gaillard Cut gives the impression of the waterway as an enormous ditch. A short distance before the ship reaches Pedro Miguel Locks, it passes Gold Hill on the left, the highest promontory along the channel. It currently rises 164 meters (539 feet) above sea level, after being lowered some 50 feet for slide control.

Contractor's Hill, on the west bank of the Canal opposite Gold Hill, originally had an altitude of 123 meters (410 feet) , but this was reduced to 111 meters (370 feet) in 1954 to stabilize the hill. During the 1930s and 1940s, the straight section immediately north of Gold Hill was widened from its original 91.5 meters (300 feet) to 152 meters (500 feet) to provide a passing section for large ships, and during the period from 1957 to 1971, the remaining portions of the Cut were also widened to 152 meters (500 feet).

Trend Toward Larger Vessels

Over the last few decades, average ship size began a moderate upward trend. It is now expected that the number of Panamax vessels (the largest size that will fit in the Canal locks) transiting the Canal will increase from a level of about one-fourth of total oceangoing transits to over one-third of those transits by the year 2010. For example, transits by Panamax vessels with beams of 30.5 and over increased to more than 3,600, or almost 27 percent of total oceangoing transits in FY 1995.

Because of Gaillard Cut's narrow width and sharp turns, large vessels cannot meet safely in this section of the Canal. As more large ships transit the waterway, traffic congestion and delays could occur, thus affecting the Canal's ability to provide expeditious transit service in the next century.

Although the Canal now has adequate capacity to handle current and projected levels of traffic, the Panama Canal Commission is intent on ensuring that the Canal will continue to have sufficient

capacity and reserve margin to provide high quality transit service and to efficiently handle unforeseen traffic surges well into the next century. The PCC has always had high service standards and it measures its performance against an internally-developed, self-imposed benchmark standard of average Canal waters time (CWT) of 24 hours for transiting vessels. In order to uphold this standard and thus continue to meet the challenge of global changes in shipping, Canal management closely monitors trends in ship size and other key parameters in order to assure a margin of sufficient reserve capacity to allow an average CWT of 24 hours.

Feasibility Studies

In 1982, the Canal Commission initiated feasibility studies that included hydrodynamic modeling in Sweden and the design of a new channel layout using computer simulation, which was primarily carried out by the Computer Aided Operations Research Facility (CAORF) of the U.S. Dept. of Transportation at King's Point, New York. Following further analysis of construction methodologies, operational conditions, cost estimates, financing alternatives and environmental assessments, the studies concluded with the recommendation to widen Gaillard Cut over a 20-year period by contracting all of the dry excavation above water level and using in-house resources to perform all of the drilling and blasting operations and the dredging necessary to complete the \$200 million (out-of-pocket expenses in 1991 dollars) project.

Cut Widening Program Approved

In July 1991, a long-range program to widen the Cut was approved, the word "program" denoting its long-term (20-year) scope. The work is described as a major effort to take the Panama Canal, as it was originally conceived by its builders, to its maximum capacity. The proposal was to carry out the task, as much as possible, with internal resources and mostly within the Canal's operating budget.

The first dry excavation contract was awarded in December 1991, with work beginning in January 1992. Engineers estimate that 21.5 million cubic meters (28 million cubic yards) of material will be removed under 18 separate contracts.

The Commission's Dredging Division was placed in charge of the wet excavation phase, which was initiated in January 1994. With the help of a new, land-based rotary drill rig, the drillboat Thor, and the 11.5 cubic meter (15 cubic yard) dipper dredge *Rialto M. Christensen*, dredging personnel began to remove an estimated 10.5 million cubic meters (13.6 million cubic yards) of material before the project's end. The overall estimated total is 32 million cubic meters (41.6 million cubic yards).

Program Reevaluation

Because of recent increases in Canal traffic, especially in wide-beam vessel transits, the PCC has reevaluated the timetable for program completion. The new construction scenario will accelerate the effort significantly to have the Gaillard Cut

widening completed some eight to ten years ahead of the original plan. The plan involves purchasing additional dredging support equipment in fiscal year 1996 and 1997; augmenting further the Commission's drilling and blasting capabilities; increasing the present inhouse, single-dredge operation with a two-dredge operation in fiscal year 1997; and bringing aboard contract support to supplement the in-house dredging in fiscal year 1998. This will bring the target completion date for the Gaillard Cut Widening Program to 2002.

Benefits to Shipping

In line with its mission to provide uninterrupted and efficient transit service to world shipping, the Panama Canal Commission continues to invest heavily in the maintenance and modernization of the waterway, creating the conditions that will guarantee a smooth transition into the 21st century and Panamanian stewardship. The widening of Gaillard Cut is a well planned and executed program that, in conjunction with other important improvement projects, will provide significant benefits to international shipping, including greater flexibility in the scheduling of vessel transits and improved quality transit service during periods following locks outages by providing additional reserve capacity to more quickly work off vessel backlogs.

By actively working to provide for two-way safe passage of virtually all vessels 24 hours a day, the Commission aims to ensure that the Canal will remain an essential part of the Panamanian

economy and a viable artery for world trade well into the next century.

Review of Gaillard Cut Widening Program Pertinent Facts

- What is Gaillard Cut ?

Gaillard Cut is a narrow, approximately 12.6 kilometer-long (eight mile) stretch of the Panama Canal where certain vessels, because of their size or other operational concerns, are restricted to one-way passage during daylight hours.

- Why is Gaillard Cut going to be widened?

The Panama Canal Commission has always had a program of accomplishing all necessary Canal improvements with sufficient lead time to ensure the waterway has the capability to meet transit demand safely and efficiently. This particular major improvement will ensure that the Canal will continue to have sufficient capacity and a reserve margin for providing high quality transit service well into the next century.

- How will the Gaillard Cut widening program be accomplished?

This improvement program will utilize existing Commission resources and outside contractors to accomplish the dredging, or wet work and exclusively outside contractors to do the dry land work. Many, if not the majority, of the earthmoving contracts will likely be awarded to local companies.

- When did the Gaillard Cut work start and what is the construction timetable?

Dry excavation work began in January 1992, and wet excavation work

in January 1994. The Commission's new capital investment program, approved in July 1996, calls for a targeted completion date by the end of fiscal year 2002.

- How much will the Gaillard Cut widening program cost?

The Commission Board of Directors has approved the expenditure of \$92.8 million during fiscal years 1996 through 1998. The total estimated cost of this major canal improvement program is approximately \$200 million in 1991 dollars.

- How does this Gaillard Cut widening approach differ from those previously studied?

Current plans are based on the assumption that the work would have to be accomplished using outside contractors for much of the work and a significant augmentation of Commission resources and equipment. The wet, or dredging work, is being accomplished by the Commission primarily with available resources and the dry-land excavation being done by local contractors.

- How will it be funded?

The Gaillard Cut widening program, like all other Canal maintenance and improvement work, will be funded as a part of the Commission's regular and continuing capital and operations programs to modernize and improve the efficiency of the waterway.

- How much wider will Gaillard Cut be?

The navigational channel throughout Gaillard Cut at present has a width of 152 meters (500 feet). The objective of the widening effort is to increase this channel width to a minimum of 192 meters (630 feet) in the straight sections and a maximum of 222 meters (730 feet) at the curves.

- Who designed the Cut Widening program?

The Geotechnical Branch, part of the Commission's Engineering and Construction Bureau, is in charge of the excavation design. They receive in-house support from the Surveys Branch, for surveys and maps; Drilling and Blasting Branch, for geologic samples; and Exterior Maintenance Branch, for access roads. Geotechnical Branch also receives contracted support in collecting and analyzing geological information and preparing the design.

- What effect will the Cut Widening have on Canal operations?

When completed, the widening will increase the waterway's operating capacity from 38 to 43 vessels per day.

- Will widening Gaillard Cut generate other benefits besides capacity enhancement to international shipping? To Panama?

In addition to capacity enhancement, there are a number of other benefits. The widened cut will allow greater flexibility in the scheduling of vessel transits improve the quality of transit service during periods subsequent to locks outages, and reduce the risk of landslides that could disrupt transit operations. Most importantly, the widening of Gaillard Cut will allow the waterway to continue providing high quality transit service to world commerce well into the 21st century, and, by so doing, the Panama Canal will remain an essential and valuable part of the Panamanian economy.

OFFICE OF EXECUTIVE PLANNING
Panama Canal Commission
Historical Reports

REPORT: Panama Canal Traffic - Oceangoing Commercial
FY 1915 - FY 1996

DATE: 11/18/96
RPT NO: TRA 1-3

<u>Fiscal Year</u>	<u>Transits</u>	<u>Long Tons of Cargo</u>	<u>Tolls Revenue</u>
1915	1,058	4,888,400	\$4,366,747
1916	724	3,093,335	\$2,403,089
1917	1,738	7,054,720	\$5,620,800
1918	1,989	7,525,768	\$6,428,780
1919	1,948	6,910,097	\$6,164,291
1920	2,393	9,372,374	\$8,507,939
1921	2,791	11,595,971	\$11,268,681
1922	2,665	10,882,607	\$11,191,829
1923	3,908	19,566,429	\$17,504,027
1924	5,158	26,993,167	\$24,284,660
1925	4,592	23,956,549	\$21,393,718
1926	5,087	26,030,016	\$22,919,932
1927	5,293	27,733,555	\$24,212,251
1928	6,253	29,615,651	\$26,922,201
1929	6,289	30,647,768	\$27,111,125
1930	6,027	30,018,429	\$27,059,999
1931	5,370	25,065,283	\$24,624,600
1932	4,362	19,798,986	\$20,694,705
1933	4,162	18,161,165	\$19,601,077
1934	5,234	24,704,009	\$24,047,183
1935	5,180	25,309,527	\$23,307,063
1936	5,382	26,505,943	\$23,479,114
1937	5,387	28,108,375	\$23,102,137
1938	5,524	27,385,924	\$23,169,889
1939	5,903	27,866,627	\$23,661,021
1940	5,370	27,299,016	\$21,144,675
1941	4,727	24,950,791	\$18,157,740
1942	2,688	13,607,444	\$9,752,207
1943	1,822	10,599,966	\$7,356,685
1944	1,562	7,003,487	\$5,456,163
1945	1,939	8,603,607	\$7,243,602
1946	3,747	14,977,940	\$14,773,693
1947	4,260	21,670,518	\$17,596,602
1948	4,678	24,117,788	\$19,956,593
1949	4,793	25,305,158	\$20,541,230
1950	5,448	28,872,293	\$24,430,206
1951	5,593	30,073,022	\$23,906,082

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1952	6,524	33,610,509	\$26,922,532
1953	7,410	36,095,349	\$31,917,515
1954	7,784	39,095,067	\$33,247,864
1955	7,997	40,646,301	\$33,849,477
1956	8,209	45,119,042	\$36,153,649
1957	8,579	49,702,200	\$38,444,128
1958	9,187	48,124,809	\$41,795,905
1959	9,718	51,153,096	\$45,528,728
1960	10,795	59,258,219	\$50,939,428
1961	10,866	63,669,738	\$54,127,877
1962	11,149	67,524,552	\$57,289,705
1963	11,017	62,247,094	\$56,368,073
1964	11,808	70,550,090	\$61,098,312
1965	11,834	76,573,071	\$65,442,633
1966	11,925	81,703,514	\$69,095,129
1967	12,412	86,193,430	\$76,768,605
1968	13,199	96,550,165	\$83,907,062
1969	13,146	101,372,744	\$87,423,430
1970	13,658	114,257,260	\$94,654,468
1971	14,020	118,626,906	\$97,380,036
1972	13,766	109,233,725	\$98,764,959
1973	13,841	126,104,029	\$111,032,088
1974	14,033	147,906,914	\$119,422,568 ^{1/}
1975	13,609	140,101,459	\$141,898,218
1976	12,157	117,212,266	\$134,204,402 ^{2/}
TQ	3,037	30,888,300	\$35,272,300
1977	11,896	122,978,785	\$163,826,571
1978	12,677	142,518,288	\$194,773,111
1979	12,935	154,110,866	\$208,376,741 ^{3/}
1980	13,507	167,214,935	\$291,838,590
1981	13,884	171,221,762	\$301,762,600
1982	14,009	185,452,332	\$323,958,366
1983	11,707	145,590,759	\$285,983,805 ^{4/}
1984	11,230	140,470,818	\$286,677,844
1985	11,515	138,643,243	\$298,497,802
1986	11,925	139,945,181	\$321,073,748

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<u>Fiscal Year</u>	<u>Transits</u>	<u>Long Tons of Cargo</u>	<u>Tolls Revenue</u>
1987	12,230	148,690,380	\$328,372,714
1988	12,234	156,482,641	\$337,866,211
1989	11,989	151,636,113	\$327,850,613 ^{1/}
1990	11,941	157,072,979	\$353,725,982
1991	12,572	162,695,886	\$372,279,573
1992	12,454	159,272,618	\$365,716,456 ^{2/}
1993	12,086	157,703,910	\$398,232,479
1994	12,337	170,538,437	\$416,803,062
1995	13,459	190,303,065	\$460,043,676
1996	13,536	198,067,990	\$483,114,903
TOTAL	<u>682,847</u>	<u>5,910,002,542</u>	<u>\$8,947,086,274</u>

^{1/} Tolls increase effective 7/8/74.

^{2/} Tolls increase effective 11/18/76.

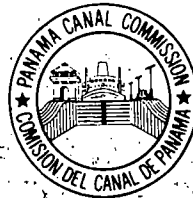
^{3/} Tolls increase effective 10/1/79.

^{4/} Tolls increase effective 3/12/83.

^{5/} Tolls increase effective 10/1/89.

^{6/} Tolls increase effective 10/1/92.

PANAMA CANAL



Panama Canal Commission

UPDATE

February 1997

Traffic & Tolls Remaining Strong in Fiscal Year 1997

Panamax transits expected to rise

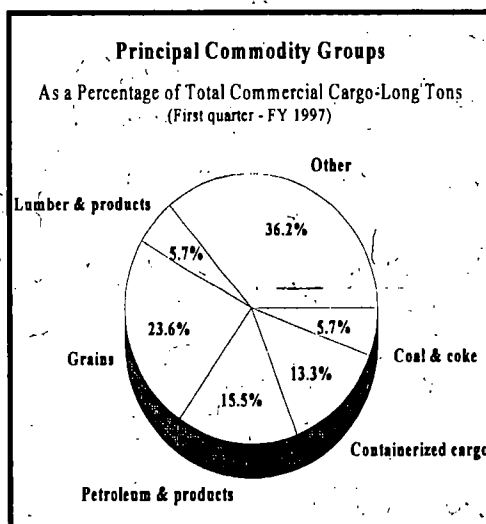
Most major elements of Canal traffic and tolls revenue continued at near record levels during the first quarter of fiscal year 1997 (Oct.-Dec. 1996). Compared to the same period in the prior year, oceangoing transits decreased 6.1 percent to 3,150 or 34.2 daily; however, the number of Panamax vessel transits was virtually identical to the previous year's first quarter at 1,017, a record 32.3 percent of all oceangoing transits. Accordingly, ship tonnage, as measured in PC/UMS net tons, was down just 2.3 percent to 55.6 million tons and tolls revenue at \$119.0 million compared favorably to the \$121.3 million collected during October/December of the prior year. Fewer transits by dry-bulk carriers and tankers during the quarter resulted in the decline from the prior year. An upturn in traffic levels was evident by December and is continuing in January and February, thus PCC forecasts indicate year-end results should be near or above previous records, including more transits by Panamax vessels.

Commercial cargo tonnage to improve after the first quarter

Available cargo statistics for the first three months of fiscal year 1997 showed commercial cargo tonnage decreasing 0.8 percent to 48.7 million long tons, relative to the same period last year. A decline in cargo tonnage was evident in a number of bulk-type and specialized commodities, such as petroleum and petroleum products, corn, wheat, coal and coke, refrigerated products, phosphates and manufactures of iron and steel, particularly during October and November. Although cargo passing through the Canal in fiscal year 1997 is forecast to decline slightly from record levels established in the prior year, tonnage movements should remain substantially above the historical trend during the remainder of the year.

Oceangoing Transits First Quarter			Panamax Transits First Quarter	
Month	FY '97	FY '96	FY '97	FY '96
Oct	1,046	1,134	344	361
Nov	999	1,110	335	351
Dec	1,105	1,110	338	309
Total	3,150	3,354	1,017	1,021

Tolls Revenues	
First Quarter FY'97	First Quarter FY'96
\$119.0 million	\$121.3 million



Vessel Transit Reservation System under Review

Agency Plan to Improve System

At its second quarterly meeting of fiscal year 1997, the PCC Board of Directors reviewed an agency plan to test proposed improvements to the Canal's Transit Reservation System. Canal management also held a meeting with the Panama Maritime Chamber to obtain their views on the

proposed revisions to the Reservation System. The PCC will soon publish a notice in the Federal Register proposing a test of the changes and inviting comment from all interested parties. A test of the revised system will begin following analysis of customer feedback that is received during the 30-day comment period.

News in Brief

Proposed bill to regulate successor Canal agency presented to Panama's Legislative Assembly

During the month of December, the final draft of the Canal Organic Law was approved by President Perez-Balladares's Cabinet Council. The bill is now at the Legislative Assembly for review and is expected to be passed during the legislative sessions that will begin in March. Soon after, it will be sent to the President for formal signature into law.

Board of Directors approves Canal toll rates increase

After approval by the Board of Directors on November 22, 1996, the first of a two-step increase in Canal toll rates went into effect on January 1, 1997 with a 8.2 percent toll hike. The new toll rates in effect at the Panama Canal are as follows:

- On merchant vessels, yachts, army and navy transports, colliers, hospital ships and supply ships, when carrying passengers or cargo, \$2.39 per PC/UMS Net Ton, based on the net tonnage determined in accordance with the rules of measurement of vessels for the Panama Canal.
- On vessels in ballast without passengers or cargo, \$1.90 per PC/UMS Net Ton,
- On other floating craft, including warships or other than transports, colliers, hospital ships and supply ships, \$1.33 per ton of displacement.

An additional 7.5 percent increase will become effective January 1, 1998, while a measurement rule change to cover on-deck container capacity has been deferred until July 1, 1997, to accommodate customer requests for longer lead time.

Programs Integration Plan

The significant increase in Canal traffic during fiscal years 1995 and 1996 has motivated efforts within the PCC to accelerate the execution of all major Canal capacity-related maintenance and modernization projects. In an attempt to coordinate these efforts and ensure that all undertakings are completed concurrent with the Cut Widening Program, the PCC Administrator requested the development of a master plan, designated as the Programs Integration Plan (PIP). The PIP will serve as a tool to monitor and guide some 23 major projects totaling \$907 million. A current objective is to accelerate those projects that will enhance capacity to coincide with completion of the Cut Widening Program in 2002.

Tentative schedule of locks outages

The tentative schedule below outlines the lane outages and planned overhaul work for fiscal year 1997. Please refer to the Marine Director's Advisory to Shipping for updates on traffic conditions and new dates for locks outages.

Locks	Dates	Lane	Planned Overhaul Work
Miraflores	April 21-22	EAST	Removal of miter gates 112 & 113
	June 2-11	EAST	Dry chamber work on miter gates 112 & 113 and replacement of removable tow track section over miter gates 105, 108, 109 & 116 Track repairs to be determined
	June 16-17	EAST	Rehanging of miter gates 35 & 36 in miter gates' 112 & 113 location
	July 7-19	WEST	Dry chamber miter gates 122 & 123 Rehanging of miter gates 120 & 121 and delivery of miter gates 122 & 123 to Industrial Division's Synchrolift Replacement of track section over miter gates 114, 115, 118 & 119 Track repairs to be determined
	Sept. 18-19	WEST	Removal of miter gates 118 & 119
	Sept. 22-Oct. 1	WEST	Replacement of removable tow track section over miter gates 110 & 111 Track repairs to be determined
Pedro Miguel	Aug. 11-Sept. 1	CENTER WALL	Conversion of 4 rising stem valves and replacement of 18 cylindrical valves
Gatun	June 2-11	EAST	Tentative simultaneous lane outage for track repairs to be determined (10 days)
	July 7-19	WEST	Tentative simultaneous lane outage for track repairs to be determined (10 days)
	Sept. 22-Oct. 1	WEST	Dry chamber work on miter gates 35 & 36 Rehanging of miter gates 112 & 113 in miter gates' 35 & 36 location Track repairs to be determined

Maintenance & Modernization

Two medium-size drills procured for Gaillard Cut Widening Program

The Panama Canal Commission's Logistical Support Division has contracted to procure two new, medium-size crawler drills. The diesel, hydraulically-driven machines are being purchased for \$1.56 million from Tamrock-Drill Tech, Inc., a Florida subsidiary of Tamrock, which is a Finnish-based company specializing in providing rock drills and tunneling machinery worldwide.

The drills weigh 65 tons each and can perforate-blast holes up to 62 feet deep without the requirement for adding drill rod extensions. Scheduled to arrive in March 1997, the drills will be used along the banks of Gaillard Cut as part of the accelerated program to widen the Cut to permit virtually two-way traffic for all vessels.

Contracts awarded for locks locomotive parts

During the latter half of fiscal year 1996, the Marine Bureau's Locks Division awarded a \$1.4 million contract to the Mitsubishi Corporation of Japan for 10 new gear cases for the Canal's locks towing locomotives. The contract complies with the locks maintenance and locomotive rehabilitation programs and follows a Locks Division decision to increase the number of spares on hand.

The first gear case units should arrive in about a year and will be sent to the Locomotive Component Repair Facility at Pedro Miguel Locks where locks personnel will assemble and introduce them into the system as spares.

FOR MORE INFORMATION

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PANAMA CANAL UPDATE

Mr. Alberto Aleman Z.,
Administrator,
Panama Canal Commission

Mr. Joseph W. Cornelison,
Deputy Administrator,
Panama Canal Commission

An official publication of
the Panama Canal
Commission prepared by
the Office of Executive
Planning

Van Ingen identified completely with the Canal work. In discussing the murals at that time, he said that he had become so caught up in the construction effort that he felt that he, too, was a Canal worker. He said, "I forgot I was an artist and had genuine regret at not being entitled to a number and a brass identification badge."

According to Van Ingen, his challenge in producing the murals had been how to portray the magnitude of Canal construction. In explaining his approach to the task, he said, "I tried to compose into one picture the views to be seen from different standpoints, but united in the mind. It enabled me to combine different periods of time in the construction work." Commenting on his perspective in composing the paintings, he added, "Any success the paintings may have had, came, I believe, from an endeavor to see with the eyes of the man in the ditch."

The murals were restored in 1993 by art conservator Anton Rajer, of Madison, Wisconsin, and rededicated in a special ceremony on September 29, 1993.



Excavation through the Continental Divide, shown here, required digging down some 270 feet through the lowest of this mountainous area to form the bottom of the Canal in Gaillard Cut. The Canal's original width in the Cut was 300 feet, and trains were used to haul away some 262 million cubic yards of earth and rock from this area.

Restorer's Remarks

The Panama Canal murals in the Administration Building rotunda are the masterpiece of their creator, artist William B. Van Ingen. The light, impressionist colors reflect the atmospheric quality of Panama and the bold compositions commemorate in pictorial form, the actual building of the Panama Canal.

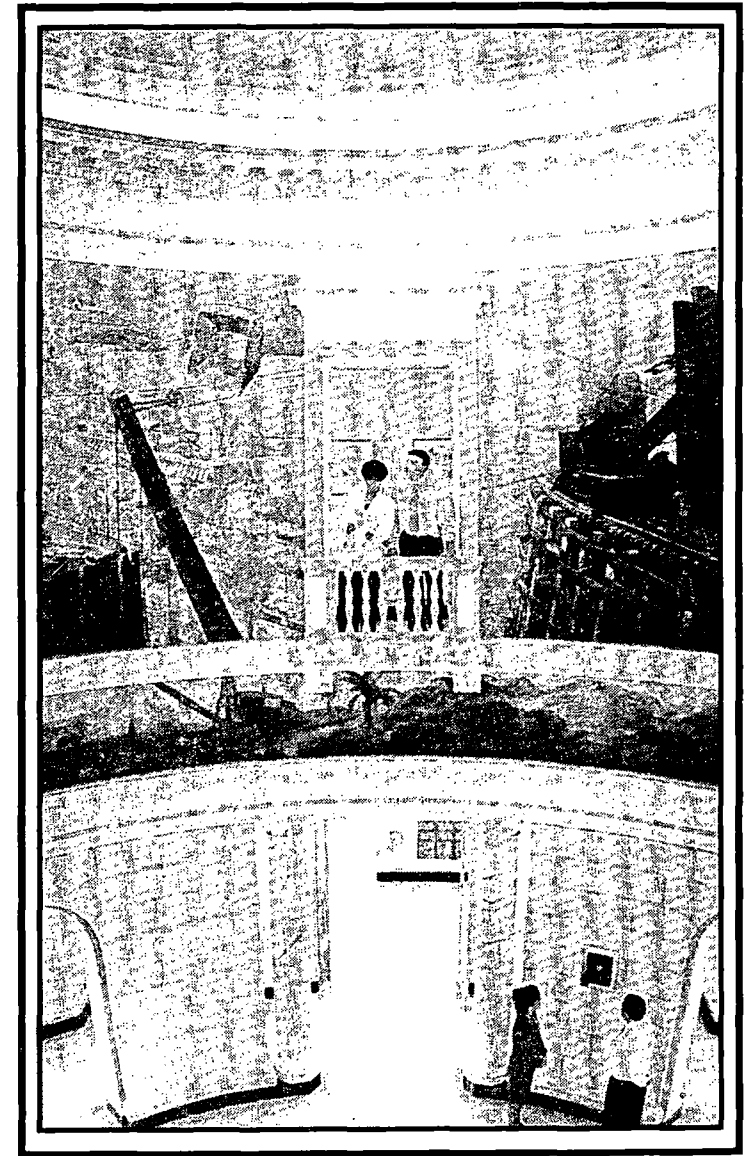
Over the years, mold and dirt settled on the murals necessitating cleanings in 1929, 1932, 1939, 1960 and 1993. During the 1993 conservation project, over 22,000 cotton swabs were used to clean the murals of dirt and grime, as well as old overpaint that was covering many areas of the mural, particularly the sky of the frieze. The cleaning was accomplished with a combination of cleaners that removed the grime and old varnish, but did not harm the murals. A few areas of touch-up were needed, though not many, as the murals were in good condition despite previous cleanings.

The entire project was documented with video and hundreds of photos, both black and white and color, and an extensive written report was prepared in English and Spanish to serve as a guide for any future restorations.



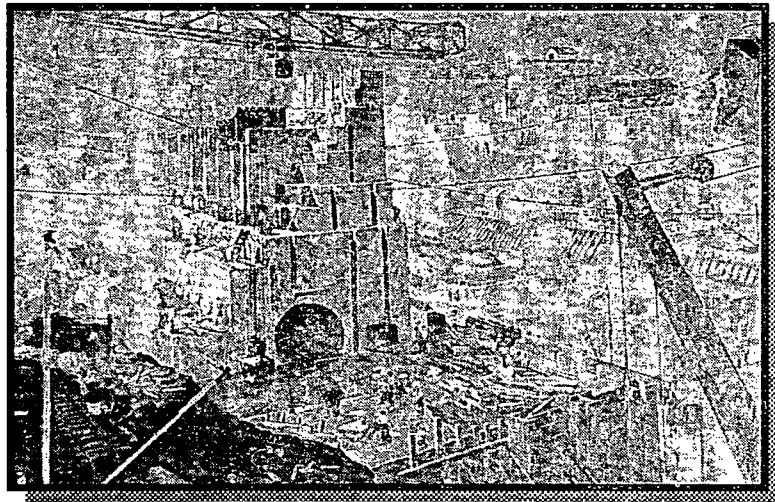
An official publication of the Panama Canal Commission
October 1996

STORY OF THE MURALS



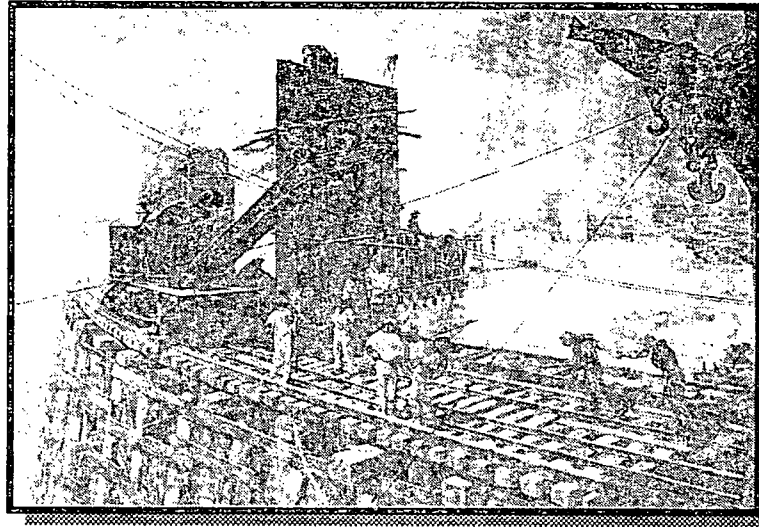
Panama Canal Commission
Administration Building

The story of the heroic effort that produced one of the supreme achievements of all time -- the construction of a water passage between the world's two greatest oceans across the isthmus of Panama -- is powerfully depicted in graphic detail in the Panama Canal murals. Mounted in the rotunda of the Panama Canal Administration Building at Balboa Heights, Republic of Panama, the murals have been a major Canal area attraction throughout the years.

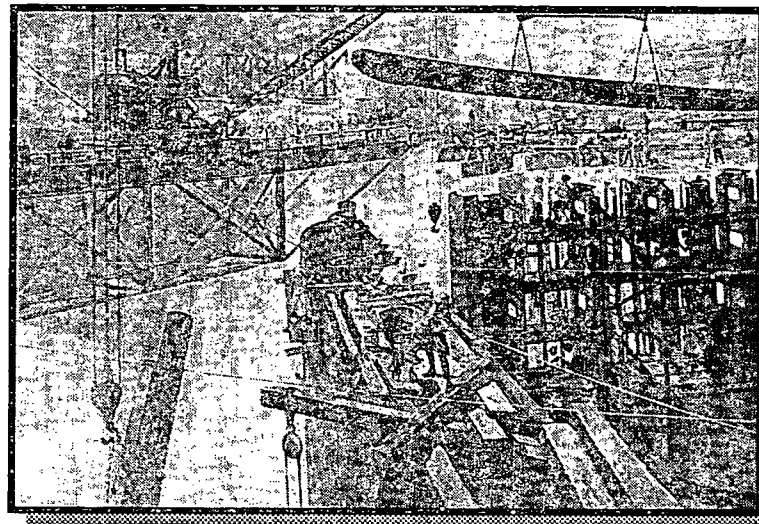


The panel pictured here shows construction of a side wall culvert at Miraflores Locks. The huge locks culverts, that direct the flow of water, are large enough to drive a train through.

The murals tell the overall story of the building of the Panama Canal in four main scenes, which show Gaillard Cut at Gold Hill, where the Canal passes through the Continental Divide; the building of the spillway of Gatun Dam, which dams the Chagres River to create Gatun Lake; construction of a lock miter gate; and the construction of Miraflores Locks near the Pacific entrance to the Canal. The frieze below presents a panorama of the excavation of Gaillard Cut. The power of these vividly portrayed scenes has the effect of linking all who view them in an unbroken chain with those engineering masters and the heroic work force that created the Canal.



Construction of the Gatun Dam spillway is shown here. Gatun Lake was formed by damming the Chagres River, and the dam's fourteen spillway gates maintain the lake at 85 feet above sea level. At the time of its formation, Gatun Lake was the largest manmade lake in the world.



This panel shows a partially completed lock gate. Steel structures 65 feet wide and 7 feet thick, lock gates vary in height from 47 to 82 feet and weigh from 390 to 730 tons. The Canal uses some 80 of these gate leaves at the various locks.

Canal Chief Engineer George W. Goethals is credited with having the foresight to ensure that a record of the monumental labor involved in the building of the Canal was preserved in this art form, so that all who come after might not only marvel at what was accomplished and appreciate its grandeur, but might share in the sense of pride and commitment that this magnificent achievement has always evoked, not only in those who built the waterway, but also in all who have been involved, throughout the years, in its operation and administration. Goethals chose carefully the person who would be entrusted with this special project, selecting William B. Van Ingen of New York, an outstanding artist who had achieved considerable fame for his murals in the Library of Congress in Washington, D.C. and the U.S. Mint in Philadelphia.

Van Ingen agreed to produce the murals at \$25 per square foot, which was the way such work was contracted for in those days, and the finished murals cover about 1,000 square feet. Van Ingen and two assistants, C. T. Berry and Ira Remsen, made charcoal sketches of Canal construction activities for the mural during two visits to Panama in 1914, while on the latter part of the construction work. Van Ingen then painted the murals on separate panels in his New York studio. The panels were shipped to Panama and installed over a 3-day period in January 1915 under the artist's personal supervision. The paintings have the distinction of being the largest group of murals by an American artist on display outside the United States.

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Pennell lithographs capture essence of Panama Canal construction effort

The true wonder, adventure and magnitude of the effort that went into building the Panama Canal are captured forever in the 1912 drawings by artist Joseph Pennell. Copies of sixteen of these lithographs are permanently displayed in the second floor rotunda of the Canal Administration Building in Balboa Heights.

Pennell worried that he might have gotten to the Canal too late to observe construction at its most impressive. As it turned out, he arrived at exactly the right moment to capture the power and vitality of the project. The work was still going on at full steam when he disembarked at Cristobal that January.

Pennell was an important (perhaps the most important) American illustrator during the golden age of illustration.

At the Canal, gigantic structures, nearly complete, but still empty of water, showed their enormity and naked strength. Raw building materials, the tropic environment and the earth itself had grudgingly ceded to man, whose power lay not just in numbers (for, man was, indeed, present in great numbers), but in knowing how to combat and harness the forces of nature and how to design, make and use machines to accomplish this great construction and operational feat. And all this Pennell drew.

Of the work he wrote, "... it is the most wonderful thing in the world; and I have tried to express this in my drawings at the moment before it was opened, for when it is opened, and the water turned in, half the amazing masses of masonry will be beneath the waters on one side and filled in with earth on the other, and the picturesqueness will have vanished."

Well, certainly not completely vanished by any means, for those who see the Canal today only in its water-filled state believe it to be still quite magnificent.

Pennell's work can take one's breath away, for the scenes show vividly not only the huge size of a locks chamber and gate, for example, but also the contrasting fragility of the human figures at work upon this colossal mass of concrete and steel or deep in the mighty gorge that is Culebra (Gaillard) Cut. One powerful

drawing depicts the tenacity and spirit of adventure of workers, who, instead of using the stairway provided, cling chillingly suspended from a crane for a lift from the bottom of a lock chamber at quitting time.

And then there are the landscapes...

Although printed in black on off-white, so well do the Pennell drawings depict Panama's special atmosphere that they seem to take on living color, emitting an almost tangible sense of light and warmth, and the pungent scents of fresh-dug earth and steamy jungle.

Pennell, born in 1857 of Quaker parents, grew up in Philadelphia, the only child of physically and emotionally undemonstrative parents. He was a solitary, quiet, sensitive, thin child called "Skinny Pennell" by the other boys. Apparently not an unhappy child, he devised his own entertainment, making drawings on any piece or scrap of available paper to illustrate made-up stories. Oddly enough, soldiers were more often than not the heroes of these tales. In a biography by his wife, Elizabeth Robbins Pennell, she says that he learned his appreciation for good English from the reading of the Scriptures, both at meeting and at home.

He graduated from the Germantown Friends' School in 1876 and went to work as a clerk in a

coal company, attending the Industrial Art School at night. Art, and especially art as a career, was frowned upon by the Friends, who considered it perhaps just short of sinful. Notwithstanding, Pennell studied and drew and read. He also tried to sell cartoons and once raced to a fire in hopes of making a drawing and selling it to a newspaper. He quit his office job to devote more time to art. He drew anything and everything and, with a group of students, went out on Sundays to draw and sketch.

Pennell was interested in sports activities. In the winter he skated, and at other times of the year he bicycled. He was an active member of the League of American Wheelmen and of the Germantown Bicycle Club.

But mostly, Pennell was dedi-

cated to his artistic work and towards becoming an illustrator. This was his true recreation. And it wasn't long before the world realized his talent. Lithography became his chosen medium, and he mastered both its artistic and technical aspects so well that his later book on the subject, "Lithography and Lithographers," became a professional standard.

Pennell was an important (perhaps the most important) American illustrator during the golden age of illustration. He was a devoted friend of American artist James Abbott McNeill Whistler, and he was thrilled in 1900 when he was commissioned to write the "Life of Whistler," a project about which he was exceedingly enthusiastic, both because of his fondness of Whistler and his admiration and respect for Whistler's work. He asked his wife, a frequent collaborator, to write the book with him.

Pennell was a traveler and an adventurer. Living in London, he traveled throughout Europe — England, Spain, Italy, Greece, France and other countries — as well as in the United States and, of course, he came to Panama. Being an avid cyclist, he pedaled everywhere, carrying with him pen and ink, etching plate and needle, to make the drawings that would illustrate dozens of publications. His wife was his frequent traveling companion, as well as co-author of many books they wrote together.

It was love at first sight when Pennell first became acquainted with a new invention, the motor bicycle. He rode one over the Alps in the summer of 1900, from which came a later (1904) article, "In the Alps on a Motor Bicycle."

And so, it is no wonder that Pennell had so much feeling for the great adventure that was (and is) the Panama Canal. It was his own idea to come to Panama, and he knew not whether he would be welcomed or chased off by Canal authorities. He was, of course,

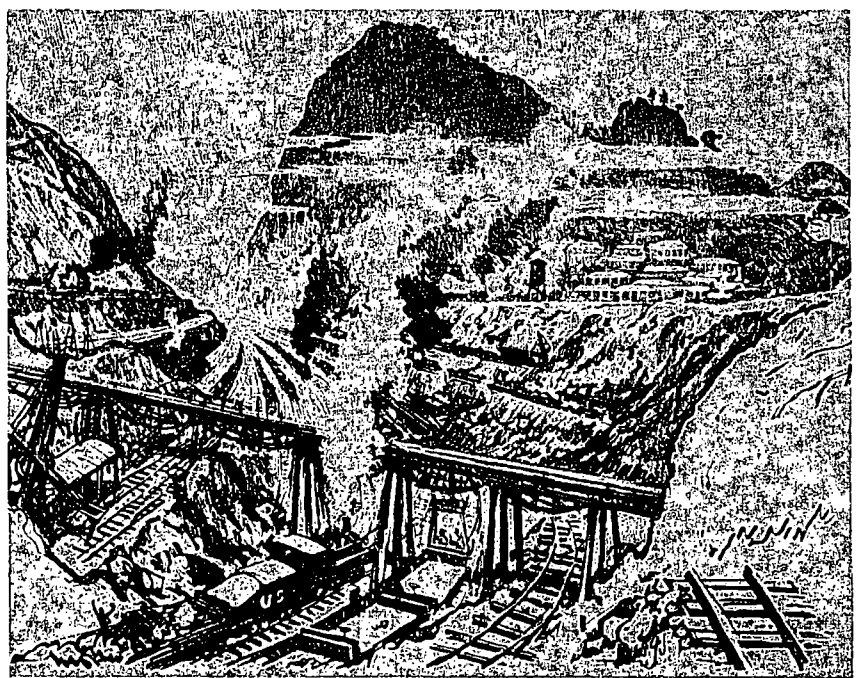
welcomed, and provided every courtesy and assistance, particularly by Isthmian Canal Commission Secretary Joseph Bucklin Bishop, in carrying out his work.

Letters to Pennell from Panama Canal Chief Engineer George W. Goethals and Bishop are published in the "Catalogue of an Exhibition (September 19 to October 12, 1912) of Lithographs and Etchings of the Panama Canal" by Joseph Pennell.

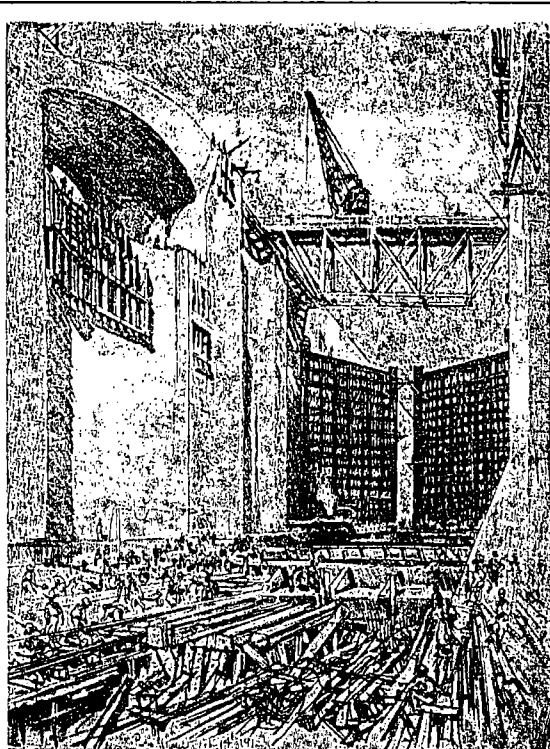
"I cannot express in words the pleasure that these pictures give me," Goethals wrote, "as they illustrate so clearly, forcibly and vividly the work, and portray actual conditions with a force which I did not think could be developed in a picture."

Bishop wrote, "I have your letter telling me that the Government at Washington has bought a complete set of your Panama lithographs. This is glorious news and is a worthy recognition of a great artist and a great work, for I am sure that these prints will rank amongst the best things you have ever done. You saw the work as no one else has had the eyes and the brains to see it, save, of course, those of us who are actually engaged in it. I am delighted that this is the outcome."

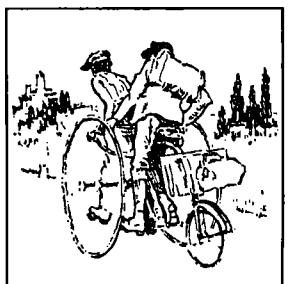
Several of the Pennell lithographs illustrate this article, but a better appreciation for the artist's work can be had from viewing the works displayed in the Administration Building, and all can be seen in a book titled "Joseph Pennell's Pictures of the Panama Canal."



An early morning scene of Culebra (now Gaillard) Cut at Paraiso, shows wisps of mist stretching across the Canal at the point where the old railroad once crossed the Canal bed.



Workers lay the floor of Pedro Miguel Locks. The Pennell sketch at right is of himself and his wife on one of their bicycle tours.



Chief engineer directed Canal project to its conclusion

Goethals major figure in waterway's construction

By Susan Harp

Most people are familiar with the tall, white, marble structure standing at the bottom of the Panama Canal Administration Building steps. But current generations may be less familiar with the life and personality of Col. George Washington Goethals -- the man it honors.

The Panama Canal's chief engineer, Goethals presided over the Canal construction effort for more than seven of the ten years of work, from April 1907 until August 1914, and after bringing this unprecedented undertaking to a successful conclusion, was named governor of the Canal Zone. He served in that capacity until 1916, when he resigned from the U.S. military to go into private engineering practice.

Goethals was born of Dutch parents on June 29, 1858, in Brooklyn, N.Y. Already accustomed to hard work and holding down

an after-school job by age 11, he worked his way through the College of the City of New York, where he enrolled at age 14. Appointed to West Point, he was captain of the cadet corps and graduated second in his class in 1880. In succeeding years, he worked on Army Corps of Engineers dam, canal and locks construction projects on the Tennessee River and on harbor projects in Newport, R.I. His 1884 marriage to Effie Rodman of New Bedford, Mass., produced two sons, George R. and Thomas R. Goethals.

By 1903, Goethals was serving in Washington, D.C., as a member of the General Staff, and was one of the first engineering officers to be so appointed.

After the United States took over the Panama Canal construction work from the French in 1904, management problems under John F. Wallace, the first chief engineer, and the fear of continued deaths from disease seemed to doom progress on the endeavor. With Wallace's resignation, President Theodore Roosevelt appointed John F. Stevens as a replacement in June 1905. Dr. William C. Gorgas, a recognized au-



George W. Goethals

thority on tropical disease, was already on the Isthmus. Under Stevens, the doctor got the support he had not received from Wallace to control the yellow fever and malaria that had been taking such a heavy toll on the workers.

Despite having set up the infrastructure and rail system that would see the Canal through to completion, making excavation progress and gaining the admiration of his workers, Stevens unexpectedly and inexplicably resigned in February 1907, effective March 31. Roosevelt chose Goethals as Stevens' replacement, stating that the Canal would now be built by "men who will stay on the job until I get tired of having them there, or 'till I say they may abandon it. I shall turn it over to the army."

Goethals was not enthusiastically received when he arrived in Panama on March 14. Stevens was still living in the chief engineer's residence in Culebra, and Goethals and Col. David D. Gaillard, another new engineer and member of the Isthmian Canal Commission, were greeted

unceremoniously at the dock. Accommodations had not been prepared, so both ended up rooming with Gorgas in Ancon. The new chief engineer's first letters home were written without benefit of a desk. There had been speculation among Canal workers that, now that the military was in charge, they would have to salute the officers. A subtle resistance had begun. Two days after his arrival, at a St. Patrick's Day "smoker" that Stevens did not attend, Goethals silently endured the toastmaster's praises of the outgoing chief engineer and derogatory remarks about the military. The crowd cheered at the mention of Stevens' name but was silent at references to Goethals. In turn, Goethals addressed the group, assuring them that the operation would remain a civilian one. Thereafter, he never appeared in uniform while on the Isthmus, and soon became recognized by the white suit he almost invariably wore. Once in charge, Goethals established himself as a demanding boss, but one who was fair with those who followed his hardworking example. In an interview with writer Ray Stannard Baker, Goethals said, "My chief interest at Panama is not in engineering, but in the men. The canal will build itself if we can handle the men."

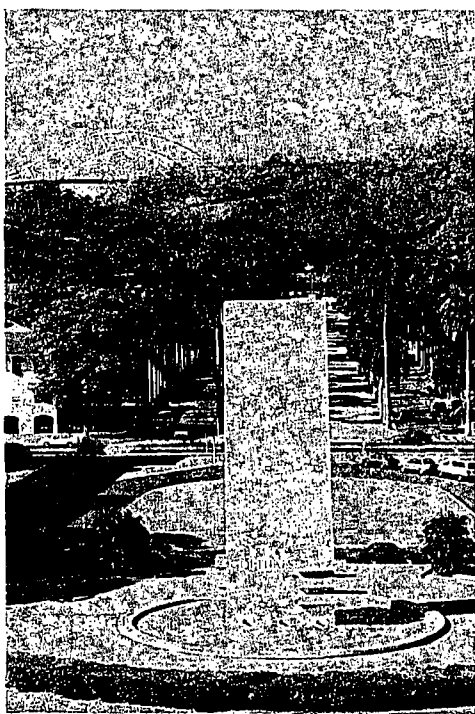
Accordingly, Goethals set about making organizational changes to boost worker morale. Roosevelt had already made him the supreme authority (at \$15,000 a year -- half the salary of Stevens) over the seven-member Isthmian Canal Commission. Goethals divided the project into three districts, each with its own chief -- Col. William L. Sibert on the Atlantic side, Gaillard in charge of the central area and a civilian, Sydney B. Williamson, at the Pacific end.

Continued on other side . . .

Goethals Memorial marks 40th anniversary

The most visible of the monuments dedicated to the builders of the Panama Canal, the Goethals Memorial stands at the foot of the 113 steps leading up to the Administration Building in Balboa Heights. Officially inaugurated 40 years ago on March 31, 1954, it honors Maj. Gen. George W. Goethals, chief engineer during the U.S. construction of the Panama Canal and the first Canal Zone governor to preside over the actual operation of the newly completed waterway.

Symbolic in concept, the white Vermont marble shaft rising from a reflecting pool 65 feet in diameter represents the Continental Divide. The basins on each side represent the Panama Canal locks, with their cascades emulating the waters



Goethals Memorial

A central feature of the Prado in Balboa, the Goethals Memorial pays homage to the chief engineer of the Panama Canal construction project. Inscribed in the white marble shaft are the words, "Chief Engineer, Master Builder, Engineer of Genius, Man of Vision."

Photo by Kevin Jenkins

of Gatun Lake flowing into and joining the Atlantic and Pacific oceans.

Designed by Alfred Shaw of the Chicago-based architectural and engineering firm of Shaw, Metz and Dolio, together with the Panamanian firm of Méndez and Sander, the 56-foot high monument was erected by Constructora Martinz of Panama.

As early as 1935, the U.S. Congress designated \$160,000 to build a memorial to Goethals. Ideas for a bronze plaque, obelisk and even a lighted beacon were suggested, but the economic depression of the early 1930s and then World War II delayed the final decision for almost 20 years.

The long-awaited monument was finally finished in 1953, and was officially dedicated a year later, the 50th anniversary of the beginning of U.S. construction of the Canal. The ceremony was attended by some 80 oldtimers from the United States who had worked under Goethals. Some of them were seeing the Canal filled with water for the very first time. Employees and visitors alike enjoyed three days of events that included picnics, baseball games played by the grandchildren of construction-era workers and a transit of the Canal.

During the dedication ceremony, the Administration Building steps and grassy

hill were used as a natural amphitheater to seat more than 2,000 attendees, including Panama President José A. Remón and Maurice Thatcher, the last surviving member of the Isthmian Canal Commission. A larger-than-life-size poster of Goethals displayed on the front of the lectern was recognizable from even the top of the hill as the crowd listened to a letter of congratulations from U.S. President Dwight D. Eisenhower. After the speakers had finished, Dr. Thomas R. Goethals, the general's son, pulled a cord, and the bunting that shielded the monument fell away.

Today, 90 years after the start of the U.S. effort, the Goethals monument serves not only as a symbol of one man's determination, but also as a community park.

Panama Canal Commission grounds maintenance crews recently re-landscaped the area, and the circle around it was newly paved three years ago, providing a place for children on bicycles, parents pushing baby strollers and joggers to enjoy a balmy afternoon. The monument will continue to testify to Goethals' achievements and offer recreational possibilities to the community for as long as visitors respect and treasure its presence.

"The canal will build itself if we can handle the men."

thority on tropical disease, was already on the Isthmus. Under Stevens, the doctor got the support he had not received from Wallace to control the yellow fever and malaria that had been taking such a heavy toll on the workers.

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Familiar sight

Goethals, dressed in his trademark straw hat and carrying his ubiquitous umbrella, stands in front of the Miraflores Spillway with construction of Miraflores Locks in the background. Thus attired, he spent most mornings walking among the work crews, observing as well as asking how projects were progressing.

... continued from other side

The resulting rivalry between the divisions over the amounts of excavation done, cement used and ironwork installed put new life into the project. Competition was further sparked by the weekly posting of individual steam shovel excavation statistics in the newly created Canal Record -- numbers that were as eagerly awaited as the baseball scores.

Goethals captured the hearts of his workers by declaring his office open on Sunday mornings to anyone for any reason. At the time of his arrival, there were about 32,000 employees -- and his door was open to each one. These Sunday conferences gave him insight into how things were working and kept injustices in check, for word of wrongdoing now had a way of making its way to the "Old Man."

Within a year of his arrival, important construction design changes were made. The bottom width of the channel through the Continental Divide at Culebra (now Gaillard) Cut was widened from 200 to 300 feet and the lock chambers were widened from 95 to 110 feet to accommodate the U.S. battleship *Pennsylvania*, still on the drawing board.

Goethals kept in touch with the progress by personally visiting the sites. Each morning, with his familiar straw hat and umbrella, the colonel would board his personal rail car, called the Yellow Peril be-

Goethals captured the workers' hearts by declaring his office open to everyone.

cause of its color, and disembark at some point along the construction line. He then proceeded to walk between the giant steam shovels or among the railroad gangs, chatting with workers and inspecting the work until mid-day, when he returned to his office to attack the never-ending pile of paperwork there.

Known for his punctuality, he once ordered a conductor to pull out of the railroad station at the stroke of 8 a.m., despite the fact that two U.S. congressmen and their wives could be seen approaching the station. Three hours later, the politicians caught up with the colonel by another train -- and not a word of apology was said about the incident.

Social engagements were viewed by Goethals as nuisances to be avoided except for those with "VIPs who are too high ranking to dodge." But the colonel did find

time to promote artistic interpretations of the enormous human undertaking unfolding around him.

As early as 1912, he exchanged letters with artist William Van Ingen, developing ideas for four murals depicting the Canal's construction. Goethals formally requested funds for the work in 1913, and the artist later installed the murals in the rotunda of

"Hell, dig it out again!" was his reply to Gaillard.

the Canal Administration Building in Balboa Heights, where they can still be seen today. Goethals was also instrumental in promoting the work of Joseph Pennel and E.J. Read, whose sketches and paintings of construction scenes also hang in the Administration Building.

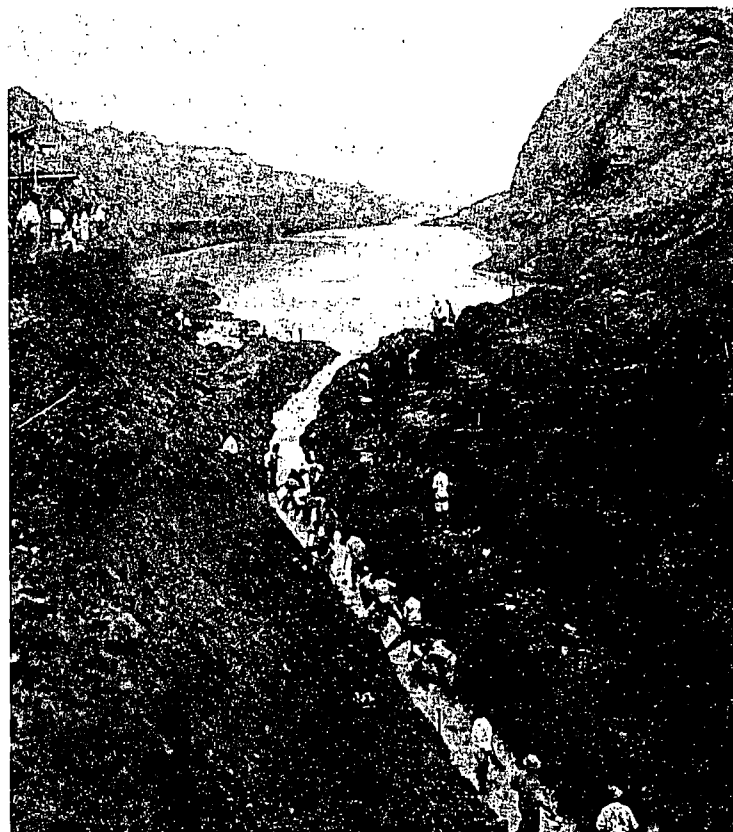
The construction effort continued, with the lamp in the chief engineer's office frequently burning until 10 p.m. His determination to succeed seemed undampened even by the landslides that plagued excavation of the Continental Divide. When work there was nearing completion in January 1913, a giant slide covered railroad tracks and equipment for the sixth or seventh time. An amazed Gaillard stood at the edge of the disaster, feeling the loss of all that had been gained. "Hell, dig it out again," was Goethals' only comment.

When at last the Canal was built and inaugurated on August 15, 1914, Goethals chose not to make the first official transit aboard the steamship *Ancon*, preferring to stay ashore and ensure that everything went smoothly.

His final exit from Panama about two years later was nothing like his arrival. As friends gathered at the dock to say a last goodbye, the ship *Pastores* pulled away, with Goethals waving from its deck. Samuel Grier, longtime motorman of the Yellow Peril, gave three blasts on the motor car's whistle as a final salute. Goethals disappeared momentarily from view; then, at his request, the *Pastores* made three answering blasts.

At the 1954 inauguration of the Goethals monument, Canal Zone Governor Jay J. Morrow said of Goethals, "His ability to judge and handle men was perhaps his most valuable asset and a factor of supreme importance in the successful completion of the Canal. Toward the close of his long administration, the admiration accorded to him by his subordinates assumed the proportions of a cult."

Although it was his intention to stay in



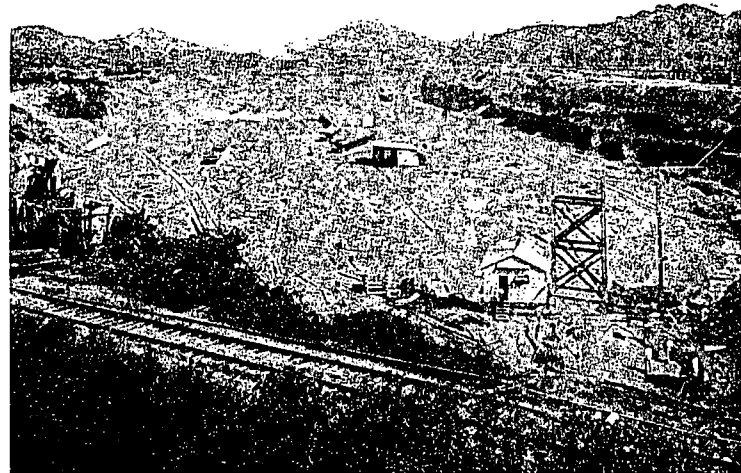
Clearing a slide

Workers clear a path by hand through a landslide in Culebra Cut, later renamed Gaillard Cut after Col. David D. Gaillard, the engineer in charge of its excavation. This photo was taken in October 1913, less than a year before the opening of the Panama Canal. Water from the Chagres River, seen in the background, had already been released to form Gatun Lake.



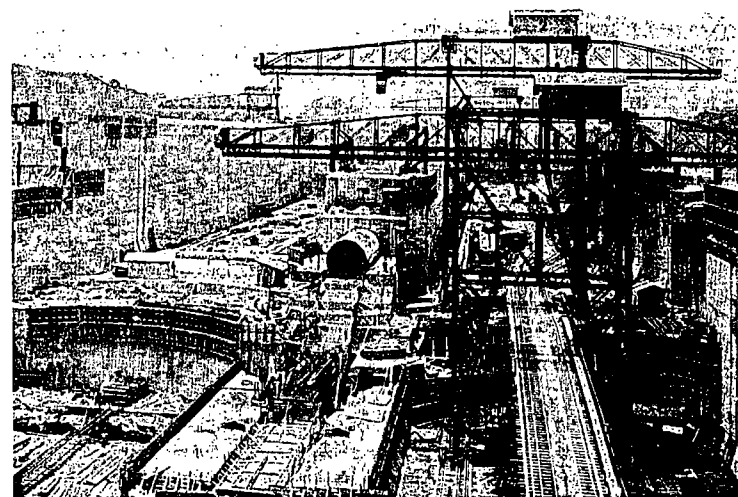
Yellow Peril

Goethals stands with a group of VIPs before boarding the "Yellow Peril," the small rail car he used to travel up and down the length of the future waterway during construction.



March 1910

Three years after Goethals' arrival on the Isthmus, excavation of the Miraflores Locks upper chambers gets under way in this historical photo.



... and two years later

In the same view taken in 1912, giant cranes tower over the construction site, with the center culvert visible in the middle. Over 900,000 cubic yards of concrete were poured in this lock.

Canal acelera modernización y mejoras

El siguiente artículo fue publicado en la edición del 26 de enero de 1996 del *Spillway*, la publicación oficial de la Comisión del Canal de Panamá.

Con el fin de garantizar que el Canal de Panamá estará equipado para atender la demanda futura de tráfico y que la calidad de los servicios de tránsito se mantenga a largo plazo, la Junta Directiva de la Comisión del Canal de Panamá aprobó un plan agresivo para ampliar el presupuesto de inversiones en los próximos cinco años. La decisión fue tomada durante la segunda reunión trimestral de la junta para el año fiscal 1996. El presupuesto expandido de inversiones permitirá a la Comisión incrementar con mayor rapidez la capacidad del Canal, al aumentar y acelerar la ejecución de programas de modernización y mejoras.

Capacidad expandida

La calidad del servicio ofrecido por el Canal a la comunidad marítima internacional está relacionada directamente con la capacidad de la vía acuática de satisfacer la demanda de tránsito. El tiempo es un factor crítico para la industria naviera, y uno de los indicadores de calidad más importantes es el tiempo en aguas del Canal, que mide el período que una nave permanece en la vía acuática una vez que se encuentra preparada para transitar.

Los niveles récord de tráfico alcanzados en el año fiscal 1995 pusieron a prueba la capacidad de la Comisión de cumplir su compromiso permanente con la industria marítima, pero el reto se cumplió a través de una serie de decisiones gerenciales y esfuerzos excepcionales de parte de los empleados del Canal. Aunque se espera que el tráfico retorne a niveles más moderados a fines del presente año fiscal, se proyecta un crecimiento anual a largo plazo de casi el 2 por ciento, con variaciones que podrán presentarse cada año.

La capacidad máxima sostenible del Canal es de 42 transitos al día, pero la capacidad operativa actual es de casi 39, el nivel promedio máximo de transitos diarios en que el tiempo en aguas del Canal puede mantenerse en 24 horas. El tiempo promedio en aguas del Canal aumentaría muy por encima de esta marca, si el nivel promedio de transitos diarios excediera la capacidad operativa.

El promedio de transitos diarios para el año fiscal 1995 excedió las 37 naves, y las proyecciones indican que el promedio podría alcanzar la actual capacidad de operación de 39 para el año fiscal 1999. El programa acelerado de modernización y mejoras aprobado por la junta ofrecerá al Canal los cambios estructurales necesarios para incrementar la capacidad operativa a casi 44, y una capacidad máxima sostenible de 50 transitos diarios,

Mayores inversiones
La tabla a la derecha refleja las inversiones aprobadas para los años fiscales 1996 y 1997, y las proyecciones de 1998 al 2000.

reflejando el compromiso de la Comisión de garantizar la capacidad del Canal para satisfacer la demanda de tránsito en el próximo siglo.

La tabla que acompaña este artículo muestra el presupuesto de inversiones básico y los recién aprobados requisitos adicionales para los próximos cinco años. El nuevo paquete de cinco años de \$129.6 millones aumenta el presupuesto de inversiones de los años fiscales 1996 al 2000 en casi 53 por ciento, de \$246.9 millones a \$376.5 millones.

Cinco esfuerzos primarios

El paquete de inversiones adicionales aumenta significativamente el ya considerable programa de inversiones, al suministrar fondos en cinco áreas principales: acelerar el programa de ensanche del Corte Gaillard, aumentar la flota de remolcadores, diseñar y adquirir locomotoras de esclusas nuevas, mejorar y modernizar el sistema de administración del tráfico de naves, y modernizar los sistemas de control de la maquinaria de las esclusas.

Ensanche del Corte Gaillard

Por razones de seguridad, se imponen restricciones de tráfico a ciertas categorías de naves en el Corte Gaillard de 13 kilómetros de largo, que resulta en un flujo de tráfico completamente hacia el norte en las primeras horas del día, un flujo totalmente hacia el sur en la tarde y un flujo combinado el resto del día.

En julio de 1991, la Junta Directiva de la Comisión aprobó un programa a largo plazo para ensanchar el corte de sus actuales 500 pies a un mínimo de 630 pies en las rectas y 730 pies en las curvas. Al completarse el ensanche, podrán eliminarse muchas de las restricciones existentes, incluyendo aquellas que limitan el flujo de tráfico en una sola dirección, aumentando el potencial de uso de las esclusas en más del 90 por ciento. No podrán alcanzarse mayores niveles de uso por las inevitables demoras ocasionadas por daños en naves y otros eventos que no se pueden anticipar.

Antes de que la junta aprobara el paquete expandido de inversiones, se había presupuestado un total de \$10 millones en inversiones anuales para el programa total de ensanche en cada uno de los próximos cinco años, con la meta de terminar la obra en el año 2014.

El nuevo paquete aumenta el total de inversiones en cinco años en más de 90 por ciento—de \$52.6 millones a \$100.9 millones—y contempla otorgar todos los contratos de excavación seca para el año fiscal 1999 y terminar la excavación para el 2001. El dragado deberá



Aceleran ensanche del Corte Gaillard

La Junta Directiva acordó terminar el ensanche del Corte Gaillard entre los años fiscales 2003 y 2005, diez años antes de lo programado en el plan original.

completarse entre los años fiscales 2003 y 2005. Los fondos para el programa después del año 2000 requerirán casi \$17 millones anuales.

El plan involucra adquirir equipo adicional para apoyar el dragado en el año fiscal 1996, aumentar la capacidad de perforación y voladuras, incrementar la operación de una sola draga de la agencia a dos dragas en el año fiscal 1997, y traer contratistas para complementar el dragado en el año fiscal 1998.

Flota de remolcadores

La actual flota de 17 remolcadores es adecuada para apoyar niveles de 37 naves diarias y proporcionar capacidad limitada de respuesta ante emergencias. El programa de presupuesto anterior asignaba un total de \$36.1 millones para adquirir un remolcador de reemplazo anual durante los próximos cinco años. El nuevo paquete incrementa el presupuesto de adquisición de remolcadores a \$60.2 millones, 67 por ciento más, e incluye la compra de dos remolcadores adicionales este año, un remolcador adicional y uno de repuesto en el año fiscal 1997, dos reemplazos en el año fiscal 1998 y un reemplazo al año posteriormente.

Aumentar la flota a 20 remolcadores permitirá al Canal operar a la capacidad sostenible máxima de 42 transitos al día cuando sea necesario, a la vez que ofrecerá una mayor flexibilidad para programar el mantenimiento de la flota y mejorará la capacidad de respuesta ante emergencias. Unidades adicionales podrán ser necesarias después del año 2000 para apoyar las operacio-

nes de tráfico en dos vías tras el ensanche del Corte Gaillard.

Locomotoras de las esclusas

El nuevo paquete de inversiones aumentará la flota de locomotoras de las esclusas de 82 a 110 unidades. Dos de las unidades adicionales son necesarias para apoyar un programa acelerado de rehabilitación, mientras que las 26 restantes se requerirán en las operaciones de relevo para apoyar el tráfico en dos vías luego del ensanche del Corte Gaillard. El paquete incluye \$39.4

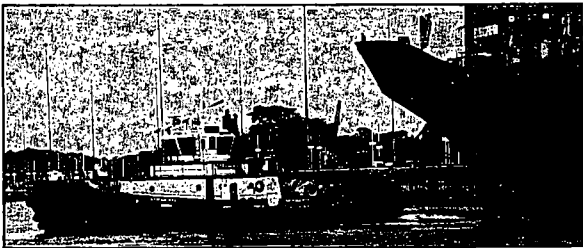
presupuestario para mejorar y modernizar el sistema de administración del tráfico de naves por el Canal. Los objetivos del programa incluyen integrar los subsistemas existentes, automatizar las principales funciones, mejorar las operaciones de programación de naves y asignación de recursos, y mejorar la seguridad de la navegación a través de la aplicación de nuevas tecnologías.

El Centro Volpe del Departamento de Transporte de los EE.UU., que ha desarrollado sistemas para la Administración Federal de Aviación, está evaluando el sistema actual y se espera que a fines de año recomendará mejoras conceptuales y un plan para ejecutarlas. La Comisión analizará las recomendaciones en base a las necesidades futuras proyectadas, y adoptará gradualmente el nuevo sistema, iniciando la investigación y el desarrollo en el año fiscal 1997, y el diseño del sistema computarizado y el desarrollo de programas entre los años fiscales 1998 y 2000.

Controles de las esclusas

La modernización del sistema usado para controlar la maquinaria de las esclusas se contempló previamente en el programa de inversiones, para lo cual se asignaron \$15.9 millones entre los años fiscales 1998 al 2000. Aunque no se proporcionan fondos adicionales para el programa, el nuevo presupuesto acelera el proyecto un año, pues los fondos ahora cubren del año fiscal 1997 al 1999.

Los controles de esclusas existentes, que están basados en la



Aumenta la flota de remolcadores

Uno de los beneficios de incrementar la flota de remolcadores de 17 a 20 unidades es que mejora la capacidad de estas embarcaciones para responder a las emergencias en la vía acuática.

millones para el diseño y la adquisición de nuevas locomotoras, con el objeto de recurrir a la tecnología moderna para adquirir unidades más confiables, que requieran menos mantenimiento y tengan menor cantidad de partes. A largo plazo, a las unidades existentes se les podrán adaptar las mejoras de los modelos nuevos.

El nuevo plan presupuestario contempla investigar entre fabricantes de locomotoras a nivel mundial y desarrollar las especificaciones este año, otorgar el contrato para el diseño de un nuevo prototipo de locomotora en el año fiscal 1997, fabricar tres prototipos en los años fiscales 1998 y 1999, probar los prototipos en el año fiscal 1999 y adquirir cinco unidades adicionales en el año fiscal 2000. Se anticipa la adquisición de casi cinco locomotoras al año hasta el año 2003.

Administración de tráfico de naves

Cerca de \$15.3 millones son considerados en el nuevo paquete

tecnología de hace un siglo, serán reemplazados por un sistema automático más confiable y fácil de mantener. Al minimizar las posibilidades de error de parte de los operadores, el sistema también aumenta la seguridad.

Compromiso a largo plazo

El paquete ampliado de mejoras, aprobado por la Junta Directiva para revisar el presupuesto de inversiones existente de los años fiscales 1996 y 1997, subraya el compromiso de la Comisión de emprender un plan acelerado de inversiones a largo plazo que cubra los años fiscales 1998 al 2000 y más allá. El programa expandido asegurará una vía acuática moderna en el siglo 21, proporcionando la capacidad suficiente para satisfacer la demanda proyectada de tráfico con la alta calidad de servicio que caracteriza al Canal de Panamá.

PRESUPUESTO DE INVERSIONES					
(En millones de dólares de 1996)					
	AF 1996	AF 1997	AF 1998	AF 1999	AF 2000
Aprobado Antes	41.0	45.3	52.0	53.6	55.0
Nuevo Paquete	22.8	21.1	33.3	31.8	20.6
TOTAL	63.8	66.4	85.3	85.4	75.6

Canal accelerates modernization, improvements

The following article is reprinted from the January 26, 1996, edition of the Panama Canal Spillway, an official publication of the Panama Canal Commission.

To ensure that the Panama Canal is equipped to meet future traffic demands and that quality transit service is maintained over the long term, the Panama Canal Commission Board of Directors approved an aggressive plan to expand the Commission capital program budget for the next five years. The decision was made during the board's second quarterly meeting for fiscal year 1996. The enhanced capital program budget will allow the Commission to increase Canal capacity more rapidly by augmenting and speeding up the implementation of modernization and improvement programs.

Expanded capacity

The quality of service provided by the Canal to the international maritime community is directly related to the waterway's capacity for meeting transit demand. Because time is critical in the shipping industry, one of the important indicators for judging quality is Canal waters time, which measures the period a vessel spends at the waterway once it is ready for transit.

Record-breaking traffic levels in fiscal year 1995 tested the Commission's ability to meet its longstanding commitment to shipping, but the challenge was met through a series of management actions and exceptional efforts on the part of Canal employees. Although traffic is expected to return to more moderate levels by the end of this fiscal year, annual growth of about 2 percent is expected over the long term, with variations occurring on a year-to-year basis.

The Canal's maximum sustainable capacity is 42 transits per day, but the current operating capacity is about 39, the maximum average daily transit level at which Canal waters time can be sustained at 24 hours. Average Canal waters time would increase well above this benchmark if the average daily transit level exceeds the operating capacity.

The daily transit average for fiscal year 1995 exceeded 37, and forecasts indicate that the average could approach the current operating capacity of 39 by fiscal year 1999. The accelerated modernization and improvement program approved by the board will provide the Canal with the structural changes needed to increase operating capacity to about 44 and maximum sustainable capacity to 50 transits per day, reflecting the Commission's commitment to guarantee the ability of the waterway to meet the transit demands of the next century.

Expanded investment plan

The chart at right reflects approved investments for fiscal years 1996 and 1997 and projections for fiscal years 1998 through 2000.

The accompanying table shows the basic capital budget and the newly approved supplemental requirements for the next five years. The new five-year package of \$129.6 million dollars raises the total capital investment for fiscal years 1996 through 2000 by some 53 percent, from \$246.9 million to \$376.5 million.

Five major efforts

The additional investment package significantly enhances the Commission's already large, ongoing capital program by providing funds for five major efforts — accelerating the Gaillard Cut widening program, augmenting the tugboat fleet, designing and procuring new locks locomotives, enhancing and modernizing the vessel traffic-management system and modernizing locks-machinery control systems.

Gaillard Cut widening

For safety reasons, restrictions are imposed on certain categories of vessel traffic in the 13-kilometer-long Gaillard Cut, resulting in an entirely northbound traffic flow during the early daylight hours, an entirely southbound flow by the afternoon and a mixed flow during the remaining hours. The flow changes that occur several times daily are required to maintain Canal waters time under 24 hours, but this results in a locks utilization of only about 80 percent.

In July 1991, the Commission Board of Directors approved a long-range program to widen the cut from its existing 500 feet to a minimum of 630 feet along straight stretches and 730 feet at curves. After the widening is completed, many of the existing restrictions, including those limiting traffic flow to a single direction, can be eliminated, increasing the potential for a locks utilization of more than 90 percent. Higher utilization levels would be impossible to achieve due to the inevitability of occasional system delays caused by vessel breakdowns and other events that cannot be anticipated.

Prior to the board's approval of the enhanced capital investment package, \$10 million in investment-year dollars had been budgeted for the overall widening program for each of the next five years, with a targeted completion by the year 2014.

The new package increases the total five-year investment by more than 90 percent — from \$52.6 million to \$100.9 million — and calls for all major dry-excavation contracts to be awarded by fiscal year



Cut widening program advanced

The Board of Directors agreed to move up the target completion date for the Gaillard Cut widening program from the year 2014 to sometime between fiscal years 2003 and 2005.

1999 and completed by 2001. The wet excavation should be completed between fiscal years 2003 and 2005. Funding the program after the year 2000 will require close to \$17 million annually.

The plan involves purchasing additional dredging support equipment in fiscal year 1996, augmenting the Commission's drilling and blasting capabilities, increasing the present in-house single-dredge operation to a two-dredge operation in fiscal year 1997 and bringing aboard contract support to supplement the in-house dredging in fiscal year 1998.

Tugboat fleet

The current fleet of 17 tugboats is adequate to support transit levels of 37 ships per day and provide limited emergency-response capabilities. The previous capital program budget allocated a total of \$36.1 million for the purchase of one replacement tug annually for the next five years. The new package, which increases the tugboat procurement budget by 67 percent to \$60.2 million, calls for the procurement of two additional tugs this year, one additional tug and a replacement in fiscal year 1997, two replacements in fiscal year 1998 and one replacement a year thereafter.

Increasing the fleet to 20 tugs will provide the capability to operate at the maximum sustainable capacity of 42 transits per day when required, while offering increased flexibility for scheduling maintenance and an improved emergency-

response capability. Additional units may be needed after the year 2000 to support two-way traffic operations after the widening of Gaillard Cut.

Locks locomotives

The new capital program package will increase the locks locomotive fleet from the current 82 to 110 units. Two of the extra units are necessary to support an accelerated rehabilitation program, while the remaining 26 will be required



Fleet expansion

Among the benefits of increasing the tugboat fleet from 17 to 20 units will be an improved emergency-response capability.

for relay operations in support of two-way traffic after the widening of Gaillard Cut.

The package includes \$39.4 million for the design and purchase of new locks locomotives, with the goal of drawing on modern technology to acquire units that are more reliable, require less maintenance and have fewer parts. Over the long term, existing units may be adapted to feature the improvements offered by the new models.

The new budget plan calls for a worldwide survey of locomotive manufacturers and the development of performance specifications this year, the awarding of a contract for the design of a new prototype locomotive in fiscal year 1997, the fabrication of three prototype units in both fiscal years 1998 and 1999, testing of the prototypes in fiscal year 1999 and the purchase of five more units in fiscal year 2000. The continuing procurement of about five locomotives per year is

anticipated until the year 2003.

Traffic-management system

Some \$15.3 million are considered in the new budget package to enhance and modernize the Canal's vessel-traffic management system. Program objectives include integrating existing subsystems, automating major functions, improving vessel scheduling operations and resource allocation and enhancing navigational safety through the application of new technologies.

The U.S. Department of Transportation's Volpe Center, which has developed systems for the U.S. Federal Aviation Administration, is currently assessing the existing system and is expected later this year to recommend conceptual enhancements and a plan for implementing them. The Commission will analyze the recommendations on the basis of projected future needs and will then phase in the new system gradually, with the initiation of research and development in fiscal year 1997 and the design of system hardware and development of software between fiscal years 1998 and 2000.

Locks controls

Modernization of the system used to control locks machinery was previously contemplated under the capital program with the allocation of \$15.9 million between fiscal years 1998 and 2000. Although providing no additional funding for the program, the new budget plan accelerates the project by one year, with the allocation now covering fiscal years 1997 through 1999.

The existing locks controls,

which are based on century-old technology, will be replaced with an automatic system that is more reliable and easier to maintain. By minimizing the possibilities for operator errors, the system will also enhance safety.

Long-range commitment

The approval of the enhanced improvement package by the Board of Directors to revise the existing capital program budget for fiscal years 1996 and 1997 underscores the Commission's commitment to the longer-range accelerated investment plan covering fiscal years 1998 through 2000 and the period beyond. The expanded program will ensure a modern Canal into the 21st century, providing sufficient capacity to meet expected traffic demands with the Canal's traditional high quality of service.

CAPITAL BUDGET
(In millions of current-year dollars)

	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000
Previously Approved	41.0	45.3	52.0	53.6	55.0
New Package	22.8	21.1	33.3	31.8	20.6
TOTAL	63.8	66.4	85.3	85.4	75.6