

U. S. ARMY ENGINEER DIVISION, PACIFIC OCEAN
CORPS OF ENGINEERS
Honolulu 13, Hawaii

12 January 1962

*Mr. Lloyd Martin
General Manager
Pacific-Martin-Zachry Constructors
Building 65, Fort Armstrong
Honolulu 13, Hawaii*

Dear Mr. Martin:

With this new year of 1962, I wish to express to you the appreciation of the Pacific Ocean Division, U. S. Army Corps of Engineers, for the outstanding performance by Pacific-Martin-Zachry Constructors on the Kwajalein Atoll. This joint venture under your very able direction set a fine record in the timely construction of complex facilities for the Nike-Zeus and Project PRESS programs on the isolated islands of Kwajalein and Roi-Namur.

On Kwajalein, PMZ since August 1959 has placed over \$43,000,000 of construction in widely-varied types of structures, many of them intricate and complex. This construction of Nike-Zeus facilities has been of high quality. Good workmanship is evident. You have invariably met availability dates of the weapons system contractor for installation of technical equipment

by him. Your aggressive safety program has held the accident rate to a low level.

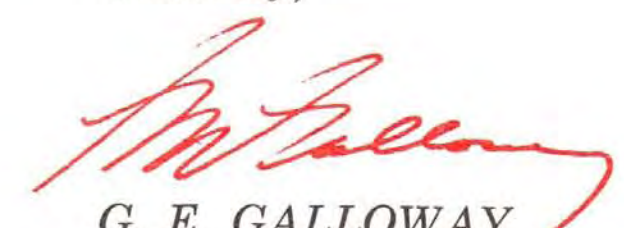
For Project PRESS on Roi-Namur, where existing facilities consisted of only a coral airstrip and a small dock, PMZ scored another success. To accomplish work on that isolated and barren island, you had to provide your own air support from nearby Kwajalein and operate an auxiliary personnel lighter boat as well as an on-shore camp to house and support a portion of your work force. Despite this and a serious early setback by the loss of two bargeloads of equipment and materials, PMZ has consistently completed work safely, on schedule, and in excellent fashion. Since November 1960, your company has placed over \$16,000,000 of construction on Roi-Namur.

Your companies achieved success on these two

projects despite challenges of distance, compressed schedules, variance of structures, and numerous change orders. This success is indicative of a high order of competence, initiative, professional and managerial skill, and excellent cooperation. In no small way, this reflects great credit on you personally because of your outstanding and effective leadership and ability. It must be very satisfying for you to know your efforts have contributed materially to the success of important Department of Defense missions on the Kwajalein Atoll.

I am proud and happy to have been associated with you and others in your joint venture in these projects and wish you continued success in your undertakings. I look forward to this new year with anticipation and confidence in the continuation of your excellent performance.

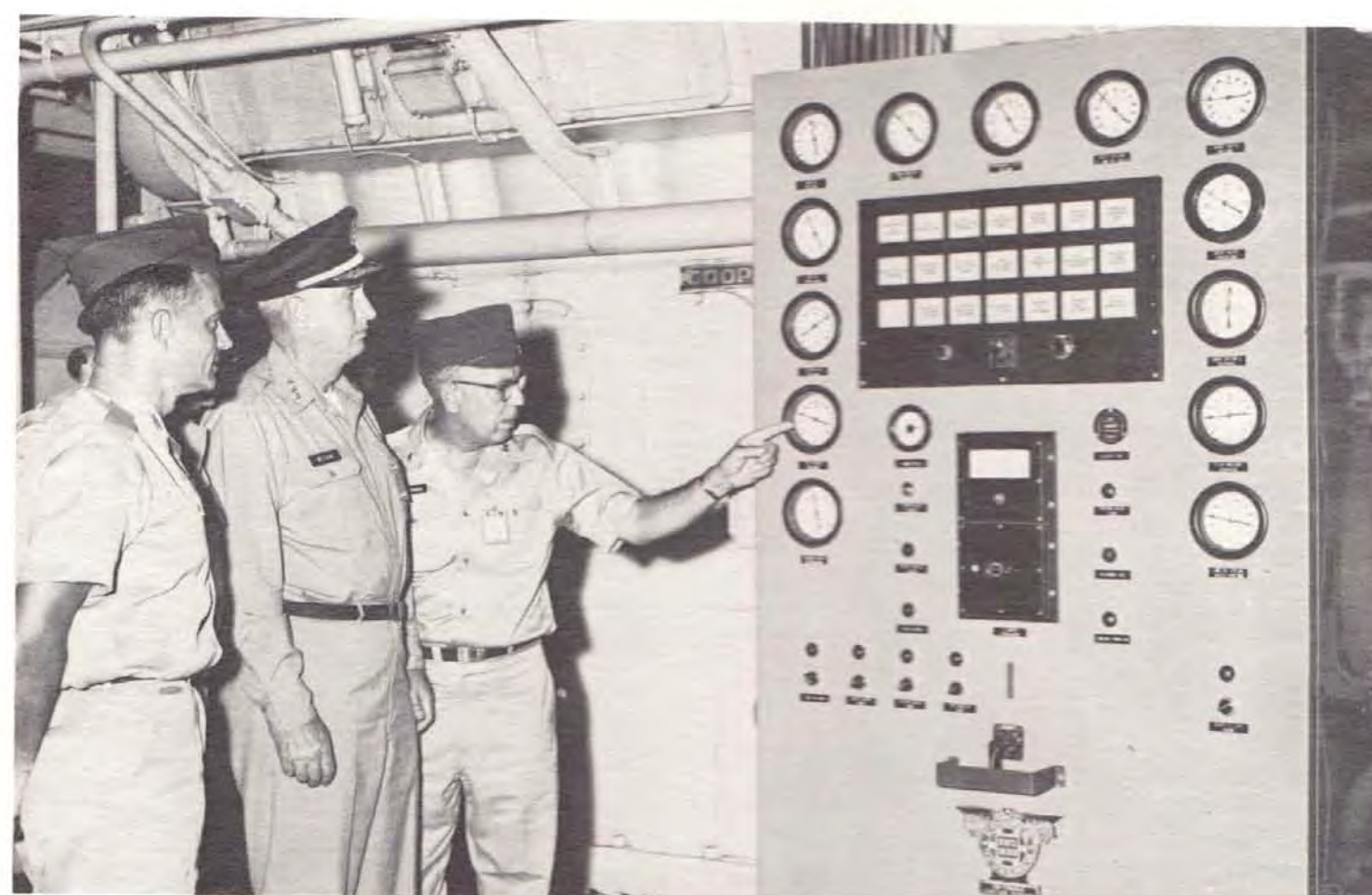
Sincerely,



G. E. GALLOWAY
Major General, U. S. Army
Division Engineer



Col. Walter P. Blum and Col. John R. Clifton were key personnel of the Corps of Engineers during construction.



Colonel Williams, General Wilson and Colonel Brunke inspect one of the equipment control panels in the ZAR Power House.



CORPS OF ENGINEERS U.S. ARMY

OFFICE, CHIEF OF ENGINEERS
WASHINGTON, D. C.

Lieutenant General E. C. Itschner

Lieutenant General W. K. Wilson, Jr.

PACIFIC OCEAN DIVISION

Major General Ellsworth I. Davis

Major General Gerald E. Galloway

HONOLULU DISTRICT

Colonel John R. Clifton

Colonel Donald G. Williams

AREA ENGINEER — KWAJALEIN

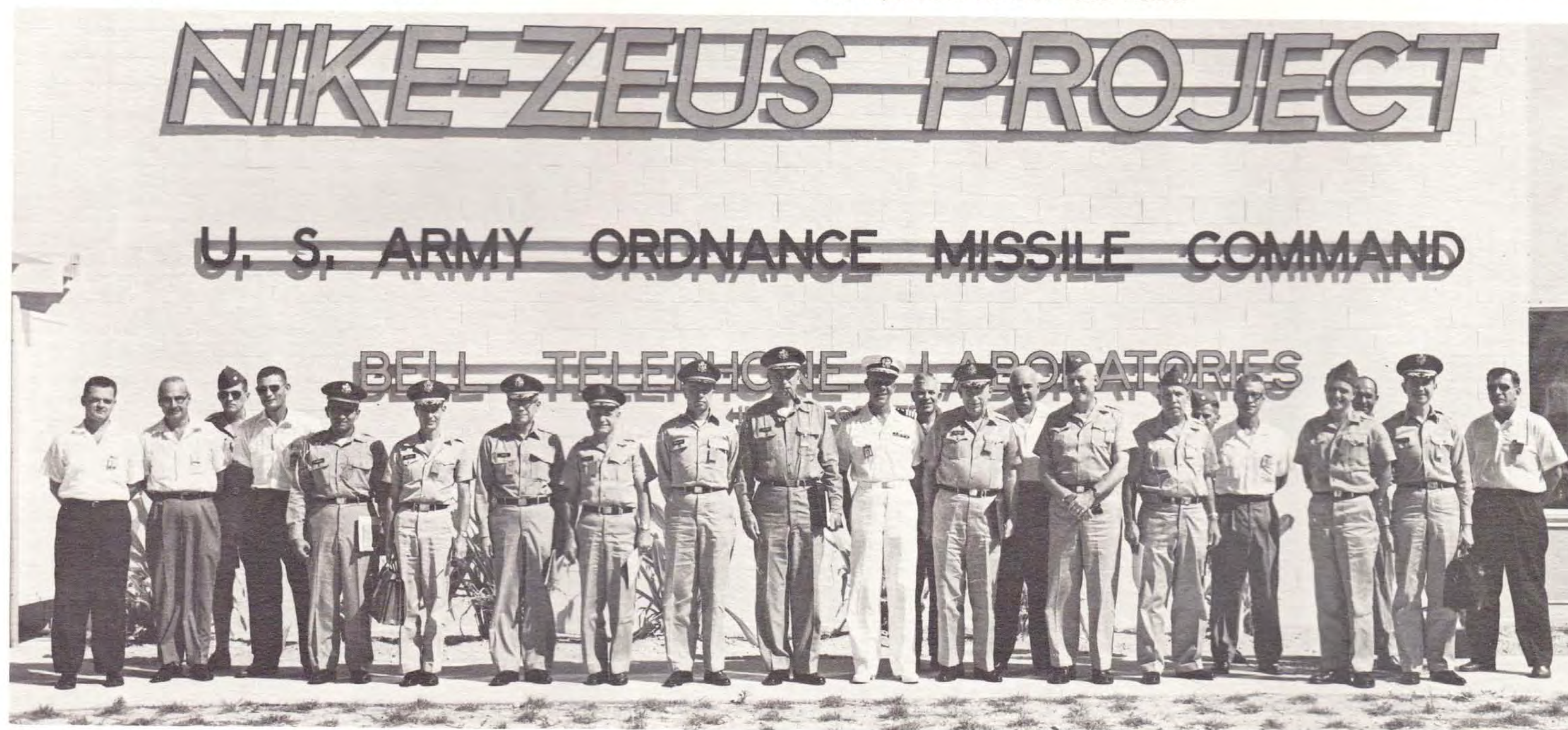
Colonel Walter P. Blum

Lieutenant Colonel H. Brunke

MOBILE DISTRICT

Colonel Robert W. Love

Colonel Daniel A. Raymond



Lieutenant General Wilson, Chief of Engineers, inspection party on Kwajalein. The General is in the center. Lloyd Martin is at far right.

The story behind the pictures

The outstanding feature of the Kwajalein project was its challenge.

First there was the variety of construction. PACIFIC-MARTIN-ZACHRY was called on to build everything from the most precise buildings to a large airstrip.

Then there was the remoteness. Supplies were thousands of miles away.

The islands themselves presented problems. Coral on top and water below. Pest ridden. Jungles in some cases. A veritable ammunition dump of unexploded shells underfoot. And sea air that could corrode the fenders off of a truck in less than a year.

In addition to all of this was the avalanche of changes, dictated by the nature of the job... changes which meant rescheduling, redesigning, reordering... yet the time elements and the precision demands remained the same.

Kwajalein was a challenge which PACIFIC-MARTIN-ZACHRY met headon... and conquered.

On June 30, 1962 PACIFIC-MARTIN-ZACHRY will celebrate its third birthday in the Marshalls. The Nike-Zeus original contract from an initial low bid of \$3,260,609 over 16 other bidders grew by additions and changes to nearly \$56,000,000... a tribute to good construction, management and ability to produce. The initial contract for PRESS on Roi-Namur, in the same manner and for the same reasons, grew from \$2,800,000 to \$19,200,000. Peak monthly earnings exceeded \$5,000,000. Both contracts will be price redetermined and then established at a fixed amount.

MANAGEMENT



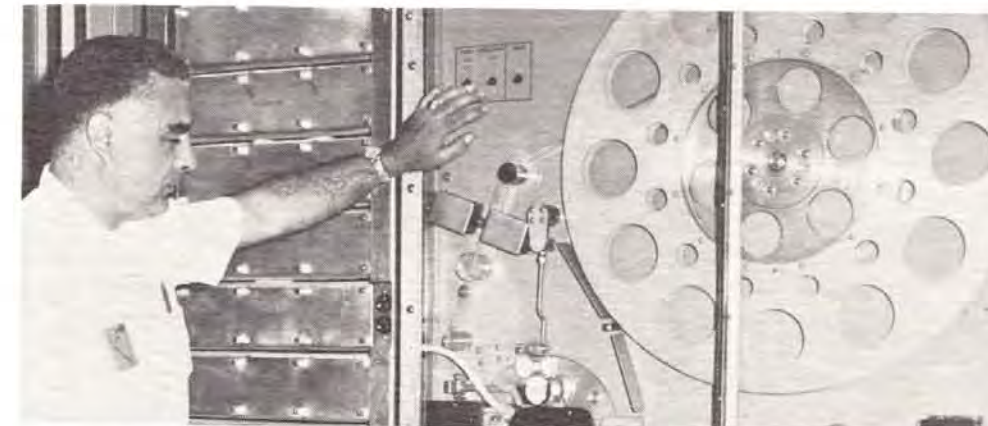
Pacific-Martin-Zachry home office in Honolulu located at Fort Armstrong across the street from the Corps of Engineers.

The Honolulu home office in 1959 was an old unoccupied building at Fort Armstrong. Extensive remodeling plus an addition was accomplished to make it the pleasing and serviceable building it is today. Its strategic location, just across the street from the District Engineer Office, permitted quick and easy personal contacts between Government and Contractor personnel. Thus, close co-operation, so vital to the vast and continually changing programs, was maintained.

Under the general managership of Lloyd W. Martin, President of Reed & Martin, Inc., skilled and experienced people carried out their functions involving engineering, accounting, personnel and procurement, as required by the projects.

Both projects in the field were headed by a Project Manager. He was responsible for the overall management of construction and related administrative functions. Highly qualified superintendents were employed for all phases of the work.

ENGINEERING



Precise engineering was necessary to house extremely sensitive technical equipment.

Our Honolulu Office Engineering Staff handled all estimating and negotiating for new work and most of the large volume of change orders. They also processed shop drawings and submittals of samples, coordinated subcontractor business and scheduling of work.

Total change orders — Nike-Zeus — 810

Total change orders — PRESS — 180

Drawing changes — over 22,000 for Nike-Zeus and 4,000 for PRESS.

To speed up Mainland submittals of shop drawings and samples, we established a sub-office in Los Angeles. This office worked closely with the Corps of Engineers liaison office to expedite approvals.

Field offices on Kwajalein and Roi-Namur were staffed with a Project Engineer, survey and layout parties and office personnel as needed. They handled all field layout, often to close tolerances; coordinated all engineering problems with Corps of Engineers and subcontractor personnel; scheduled work; supplied change order prints and data as needed and processed monthly payment estimates.

A large blueprint machine in each office often ran 10 to 14 hours per day, 6 days per week to keep pace with new work and change order drawings.

CONSTRUCTION

Barracks ship at Roi-Namur was home for over 300 workers. Marshallese natives with their outrigger canoe, their sole transportation between islands, in foreground.



Construction forces of PACIFIC-MARTIN-ZACHRY were versatile. They had to be. Speed and more speed was required to meet program schedules. Yet the highest quality of work was demanded and delivered.

Foundations went deep and dewatering problems were overcome. Kwajalein Island became too small. Fills were constructed by dredging to make land for added facilities including 20 acres for 257 family mobile homes. Heavy rock shore protection for such fills was placed.

Aggregate for concrete and asphalt paving was obtained by blasting the coral reefs. The coral rocks were processed through a crushing and screening plant that produced coarse and fine aggregate meeting tight specifications.

Radar and missile technical buildings with highly specialized mechanical and electrical equipment demanded the highest quality of workmanship. Hold down rings for revolving antennas were set to a degree of accuracy approaching that of watchmaking. High shielding fences were erected.

Demands for precise power were great. Men of PACIFIC-MARTIN-ZACHRY constructed 5 new power houses plus an addition to the Kwajalein station plant. These



Placing concrete, part of the 69,500 c.y. placed for Nike-Zeus. Another 23,300 c.y. was placed on Roi-Namur.

installations were complete with sea water intake lines, pump stations and other auxiliaries.

The expanding population of Kwajalein demanded other new facilities and rehabilitation of existing installations. Three new B.O.Q.'s were built to house 500 men. A new school was added. Electrical distribution, telephone and street lighting went underground. The water system was expanded and repaired. A brackish water system was installed. Sewers were cleaned. Most of the existing buildings were rehabilitated and new air conditioning systems installed as needed. The P.O.L. system was repaired and enlarged. Mobile Homes for 257 families were set and hooked up to new underground services.

PACIFIC-MARTIN-ZACHRY expanded to the islands of Gueegue and Ennylabegan; each slightly over 8 miles from Kwajalein. Transmitting and Receiving facilities, optical stations and personnel quarters and mess were constructed on these two islands. Their contract amount exceeded \$7,000,000. An old existing Japanese dock was repaired at Gueegue and a new dock built at Ennylabegan. Construction men made the round trip by LCM from Kwajalein each day, since no temporary personnel



Equipment working on Mobile Homes Park fill. This spread is only a small part of the total Pacific-Martin-Zachry equipment in the Marshalls.

facilities were available on either island. The water in the lagoon was often choppy and the trips rough.

Project PRESS on Roi-Namur developed at the peak of the Zeus program. Temporary facilities for construction and Government personnel had to be provided. PACIFIC-MARTIN-ZACHRY refurbished a Government furnished APL barracks ship. It was towed to Roi-Namur from Honolulu and anchored where it provided housing for 300 men and messing for all construction forces. Barracks for 300 men were constructed on shore, plus office buildings, warehouses, an outdoor movie, temporary power plant and outside utilities. A general store building and recreation hall with snack bar was a focal point of the camp.

LOGISTICS

Kwajalein is about 4,500 miles from San Francisco and 2,200 miles from Honolulu. It is not on any commercial sea or air route. Surface shipments from Oakland were handled by MSTs (Military Sea Transport Service) and air shipments by MATS (Military Air Transport Service). MATS operated out of Travis A.F.B., California and Hickam A.F.B., Honolulu.



"Redbird," the Pacific-Martin-Zachry aircraft, proved a vital transportation facility for men and equipment between Kwajalein and Roi-Namur.

To supplement the above services PACIFIC-MARTIN-ZACHRY used chartered barges and a small freighter as needed to supply the projects. These were operated from the West Coast and Honolulu. Commercial air shipments were also made to Honolulu.

Approximately 65,000 tons were shipped by surface for the Nike-Zeus program and 24,000 tons for Roi-Namur. Continuing changes and emergency equipment repairs

required heavy air shipments of material and parts. Over 2,200 tons went by air to Kwajalein for both projects.

Advanced procurement planning was essential. PACIFIC-MARTIN-ZACHRY established a branch office in San Francisco to make Mainland purchases and to expedite freight. This office coordinated our shipments and sub-contractor material with port and air authorities and the liaison office of the Corps of Engineers. Direct teletype service on a 24 hour basis was maintained between our Honolulu Office and San Francisco Office. Local purchases in Hawaii were made by the purchasing section of the Honolulu Office.

Roi-Namur received a set-back at the start of the project. Two barges carrying over two million dollars worth of materials and equipment for Roi-Namur were sunk at sea in a heavy storm.

Star Bulletin - Nov. 28, 1960 Tug Abandons Barges at Sea

The tug Martin abandoned two barges loaded with construction material for missile stations on Kwajalein in rough seas 600 miles south-west of Oahu this morning, the Coast Guard reported.

The Martin, owned by the Alaska Freight Lines of Seattle, left Honolulu November 20 with the construction items furnished by the local firm of Pacific Martin Zachary Constructors.

The captain of the tug radioed the Coast Guard here at 8:45 a.m. that his 117-foot craft was in rough seas when one barge capsized.

The skipper said this forced him to cut both barges loose.

He said the capsized barge's bow was 20 feet out of the water.

The Coast Guard said it is notifying ships in the area to go to the tug's aid at the request of the skipper.

The only danger is to navigation. Those aboard the tug are in no danger, the Coast Guard said. No one was aboard the barges.

The capsized barge was still afloat when the report was made.

PACIFIC-MARTIN-ZACHRY recovered quickly from this blow by having a duplicate shipment almost immediately on the way. The construction program was delayed less than 30 days.

Both surface and air shipments were discharged at Kwajalein. Material and equipment for Gueegue and Ennylabegan were transported by LCU to these outer islands.

Barge shipments for Roi-Namur went direct to the island where they were unloaded at a small existing dock. PACIFIC-MARTIN-ZACHRY bought an LSM and another small ship called the Maui Queen for surface shipments between Kwajalein and Roi-Namur. The Maui Queen used to operate between the Hawaiian Islands.

PACIFIC-MARTIN-ZACHRY also operated a C-45 Beechcraft plane between Kwajalein and Roi-Namur. This plane transported personnel and critical material. It made 3 or more round trips per day during the peak construction period.

Receipt of cargo and warehousing for both projects was most important and experienced personnel carried out



Maui Queen, a converted AVR, was purchased in Honolulu for transporting material between islands. Its most important function was the movement of frozen meats and food.

The "Sally" was an important part of the Pacific-Martin-Zachry "Navy" which carried materials to Roi-Namur.



this vital function. Damages and shortages were noted upon receipt and reorders were expedited to the fullest extent.

Heavy lifts up to 80 tons required special treatment and advance planning. These items were loaded out from the West Coast according to well conceived unloading plans at Kwajalein. More than 90 special heavy lifts were off-loaded without trouble.



80-ton powerhouse engine being unloaded at dockside, Kwajalein. Loading at Army Pier 6 in Oakland.



MANPOWER



Private carriers operating on MATS contracts were the only personnel transportation link from Honolulu to Kwajalein.

There was a shortage of certain trades in Hawaii. Approximately 85% of the masons, 20% of the heavy equipment operators, 80% of the pipefitters and welders and 100% of the millwrights were brought in from the Mainland. However, about 90% of the total labor on both projects was recruited in Hawaii. Aliens who were residents of the United States or its territories were eligible for employment, but aliens from foreign countries could not be employed under contract terms.

Navy area clearance had to be obtained for each person. Medical examinations and inoculations were also required before anyone could go to the islands.

All personnel were transported to and from the islands by air. The runway on Kwajalein was not long enough to accommodate jets and all flights were made by propeller driven aircraft. Average travel time from Honolulu was 10 hours.

Each employee signed a labor contract, which stipulated employment terms and agreements by both parties. Labor rates were equal to Honolulu rates and in some trades slightly higher. The average work week ran about 60 hours with time and a half paid for all hours over 40. PACIFIC-MARTIN-ZACHRY paid all housing and mess bills for hourly employees and supervisory men in B.O.Q. status. Housing bills for supervisory personnel with their families were also paid, but each family was responsible for its own subsistence.

Up to 40 houses were made available to PACIFIC-MARTIN-ZACHRY on Kwajalein. There was no family housing on Roi-Namur. Company employees took an

Rosalie Stevenson, at microphone, and her troupe perform for construction personnel at Kwajalein & Roi-Namur.



active interest in community affairs and contributed to Island recreation, school, church and social programs.

Labor problems were minor. Practically all labor complaints were speedily settled at jobsite level. Local labor unions co-operated very well and supplied available men upon request.

Total man months worked on the Zeus program was about 15,000 or an average of 5,000 per year over a three year period. About 5,000 man months were worked on the PRESS project. Peak manpower on Nike-Zeus was 890 and on PRESS, 645. Labor turnover for both projects was less than 1%.

Recreation programs were a contributing factor to the low labor turnover rate.

PACIFIC-MARTIN-ZACHRY encouraged all recreation programs. Uniforms and equipment were furnished



Pacific-Martin-Zachry basketball team.

for softball, volleyball and basketball teams. Our teams gave a good account of themselves in the leagues that were formed with other units. Scuba diving equipment, throw nets, spears, etc. were sent down for those who wished to participate in the diving and fishing sports. Boats and outboard motors were also provided.



Entrance to PMZ Kwajalein Country Club.



Oceanside view of PMZ Kwajalein Country Club.

On special holidays and other occasions, pigs with all the trimmings were sent for luaus and kalua-pohaku rocks for the imu pits were provided. An entertainment

troupe from Honolulu provided Christmas shows on Kwajalein and Roi-Namur in 1960 and further shows for the 4th of July 1961.

Men of PACIFIC-MARTIN-ZACHRY built their own club during off hours.

This pleasing retreat provided a place where they could go after work in the evening and on week ends to fish, barbeque, drink beer or just plain loaf. A unique law of this club permits supervisors to belong, but not hold office.

SAFETY



477 days without lost time accident as of May 15, 1962. Total man-hours during this period 1,873,861.

PACIFIC-MARTIN-ZACHRY stressed safety from the start. Our full time Safety Engineer was with the first crew of men that went to Kwajalein in August 1959.

477 days as of May 15, 1962 without a lost time accident on Nike-Zeus.

These records represent a major contribution to the high overall safety standing of the entire Pacific Ocean Division, Corps of Engineers.

MISCELLANEOUS

Corrosion conditions were extremely high:

Maintenance of equipment presented more problems than normally encountered in the industry. PACIFIC-MARTIN-ZACHRY had to maintain a continual painting program. Requirements for spare parts were abnormal. Available parts in Hawaii were limited and the majority of items needed had to be procured and expedited by air from the Mainland.

Permanent buildings and facilities required special metals and alloys plus careful installation of these items. This situation complicated procurement problems and required highly skilled labor for installation.

Flys and mosquitos on Roi-Namur required stringent pest control. PACIFIC-MARTIN-ZACHRY instituted and maintained a pest control program largely with a fog machine and a daily fogging program. Today such pests are practically extinct.

There was never an accident due to unexploded ammunition although hundreds of live shells from World War II were encountered during clearing and excavation work on all islands. PACIFIC-MARTIN-ZACHRY cooperated with Navy demolition personnel for their proper and safe disposal.

Contract Tabulation

Nike-Zeus Facilities

Kwajalein

AREA WORK	Contract Amount
Site Preparation, Roads & Earthwork	\$ 895,000
Utilities, Fresh & Sea Water Supply & Storage	791,000

ZAR COMPLEX

Receiver Antenna Foundation & Ground Plane	3,042,000
Transmitter Building & Beam Forming Fence	3,163,000
Receiver Building	1,121,000
Power Plant, Pumphouse & Facilities	4,243,000

MISSILE COMPLEX

Target Track Radar Building #4 & Boresight Tower . . .	1,200,000
Target Track Radar Building #5	1,622,000
Discrimination Radar Building & R. F. Shielding Fences	4,722,000
Battery Control Building & Missile Track Radar	1,220,000
Launch Cells, Live Storage, Assembly & Inert Bays . . .	1,977,000
Power Plant, Pumphouse & Facilities	2,544,000
"Speedball" Missile Facilities (Roi-Namur)	645,000

COMMUNICATION & INSTRUMENTATION

Optical & Camera Stations	2,863,000
Telemetry Structures	220,000
Airborne Instrumentation Laboratory	180,000

ADMINISTRATION FACILITIES

Joint Technical Operations (JTO) Building	1,979,000
Navy Communications Building	650,000
Navy Operations Control Center	493,000
Photographic Laboratory	685,000
Security Structures — Fences & Control Stations	532,000

HOUSING & SUPPORT FACILITIES

3 Bachelor Quarters Buildings — 500 Men	3,985,000
Site & Facilities for 257 Family Mobile Homes	3,020,000
New School	722,000
Underground Power, Lighting & Telephone	1,736,000
Rehabilitation of Existing Housing, Mess Hall & Service Buildings	2,324,000
Rehabilitation & Expansion of P.O.L. Tanks, Pumps & Piping	582,000
Major Addition to Station Power Plant	1,604,000

COMMUNICATION & INSTRUMENTATION

Gugeegue

Transmitter Building, Power Plant & Personnel Facilities	3,355,000
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Ennylabegan

Receiver Building, Power Plant, Telemetry Structures & Personnel Facilities	3,708,000
Total	\$55,823,000

Project "PRESS"

Roi-Namur

AREA WORK	Amount
Utilities, Mobilization & Contractors Camp	\$ 3,375,000
Preliminary Site Work, Roads & Paved Areas	642,000
Airfield	736,000

TECHNICAL FACILITIES

Tradex Building, Optical Tracker & Boresight Towers . .	3,744,000
Computer Building	758,000
Optical Stations	527,000
Power Plant & Installation of Equipment	1,438,000
Power Distribution & Communication Systems	1,634,000
Station Keeping Radar	435,000

SUPPORT FACILITIES

Dormitories & Mess Hall	2,160,000
Administration & Service Structures	1,052,000
P.O.L. Storage & Distribution	263,000
Dock and Harbor Work	342,000
Fresh Water Supply, Storage & Piping	876,000
Sea Water Distribution System; Sanitary Sewers	1,218,000

Total Contract	\$19,200,000
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Nike-Zeus System Contractors

Bell Telephone Laboratories
Whippany, New Jersey

Western Electric Company
New York City, New York

Douglas Aircraft Corporation
Santa Monica, California

Radio Corporation of America
Morristown, New Jersey

Sub- Contractors

Kwajalein and Roi-Namur

American Electric Co., Ltd.
Ets-Hokin & Galvan, Joint Venture
Honolulu, Hawaii
Electrical

Atlas Heating & Ventilating Co., Ltd.
K. J. Lillie Co., Ltd., Joint Venture
Honolulu, Hawaii
Duct Work, Sheet Metal and Terne Metal Shielding

Chicago Bridge & Iron Company
Chicago, Illinois
Steel Tanks & Elevated Water Tank

Craig & Company, Ltd.
Honolulu, Hawaii
*Structural Insulated Panels, Metal Partitions,
Acoustical, Floor Covering and Pipe Insulation.*

Emerson & Cuming, Inc.
Canton, Massachusetts
Interior Shielding

Filtron Co., Inc.
Culver City, California
Interior Shielding

Haughton Elevator Company
(Division of Toledo Scale Corporation)
Los Angeles, California
Elevators

Hawaii Plastering & Contracting Corp.
Honolulu, Hawaii
Plastering

Hawaii Welding Company, Ltd.
Honolulu, Hawaii
Structural Steel

Hawaiian Reinforcing Steel Co., Ltd.
Honolulu, Hawaii
Reinforcing Steel

Heide & Cook, Ltd.
Honolulu, Hawaii
Mechanical

Honolulu Painting Company, Ltd.
Eric Lundeen Inc., Joint Venture
Honolulu, Hawaii
Painting

Honolulu Roofing Company, Ltd.
Honolulu, Hawaii
Roofing and Waterproofing

Leckenby Structural Steel Co.
Seattle, Washington
Structural Steel

Massart, Inc.
Seattle, Washington
Mechanical

Olympic Prefabricators
Seattle, Washington
Complete Construction Camp

Pacific Electric, Inc.
Seattle, Washington
Electrical — Gugeegue and Ennylabegan

Pacific Shielding
Seattle, Washington
Interior Shielding

Terminal Steel Co., Ltd.
Honolulu, Hawaii
Structural Steel, P.O.L. Work & Elevated Water Tank

Universal Services, Inc.
Seattle, Washington
Housing and Feeding — APL and Construction Camp

X-Ray Engineering Company, Hawaii, Ltd.
Honolulu, Hawaii
Shielding Testing

Architect/ Engineers

Nike-Zeus

The Ralph M. Parsons Company
Los Angeles, California

Project "PRESS"

AETRON

Covina Plant
Covina, California
A Division of Aerojet General Corporation

Quinton Engineers, Ltd.
Los Angeles, California

WE ARE INDEBTED TO THE CORPS OF ENGINEERS AND THE U. S. NAVY FOR A NUMBER OF THE PRECEDING PHOTOS.
NO GOVERNMENT FUNDS WERE USED IN THE PRODUCTION OF THIS BROCHURE. IT WAS CREATED AND PAID FOR BY PACIFIC-MARTIN-ZACHRY.

Produced by Vance Fawcett Associates, Honolulu, Hawaii.

