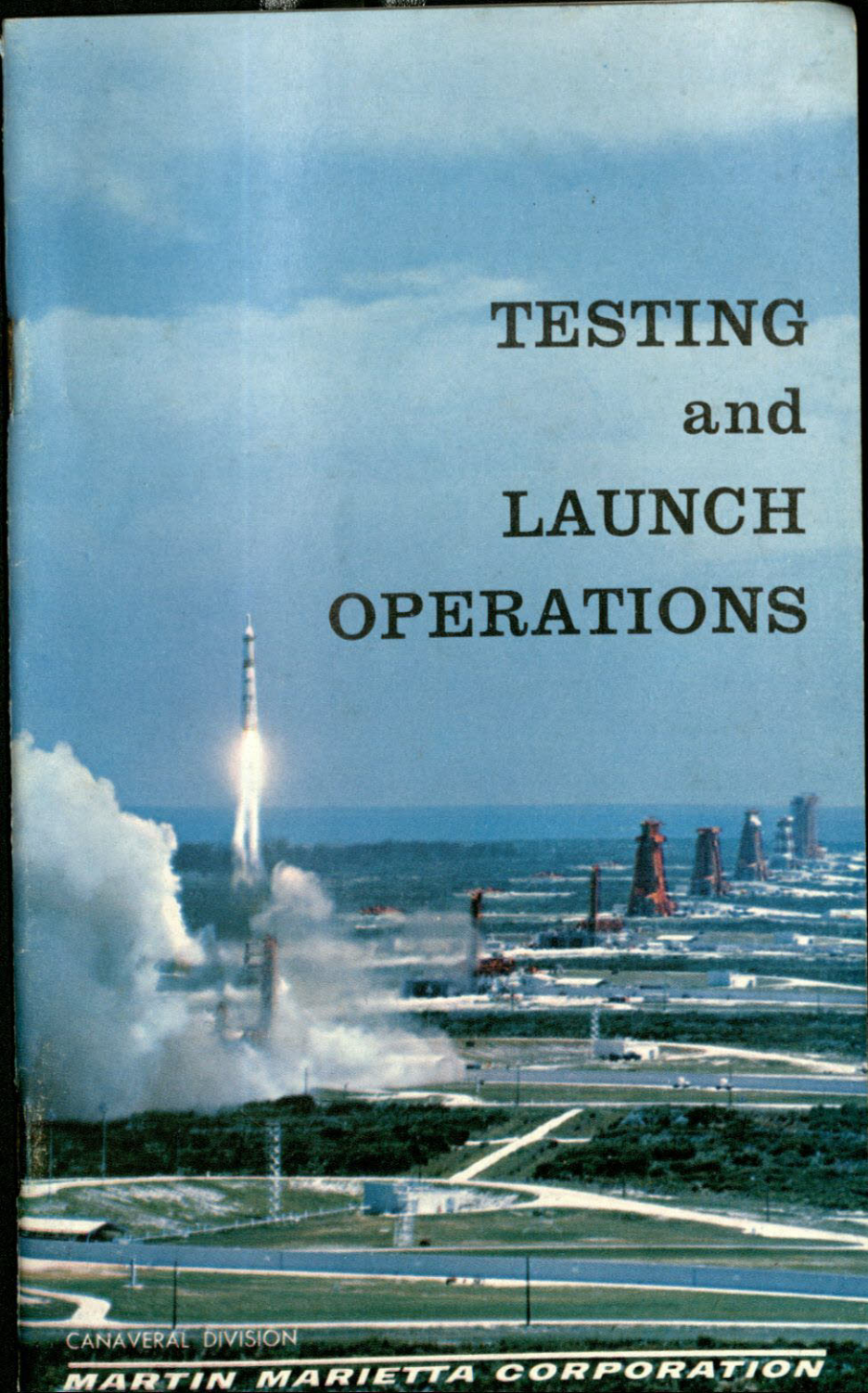
TESTING and LAUNCH OPERATIONS



CANAVERAL DIVISION

MARTIN MARIETTA CORPORATION

CANAVERAL DIVISION
Cocoa Beach
Florida

SUnset 3-2231

It is only by thorough testing and painstaking evaluation that reliability of a missile weapon or space system can be achieved and proved.

Recognizing this fundamental importance of testing and determined to build performance and reliability into every missile, space, nuclear, and electronic system it produces, the Martin Marietta Corporation maintains at Cape Canaveral a uniquely autonomous division whose task is testing for all systems built by the Corporation and assigned to the Atlantic Missile Range.

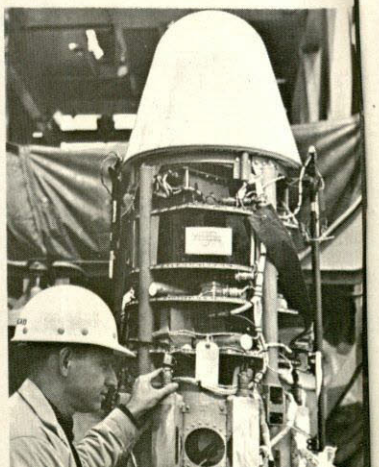
This, then, is the story of Martin Marietta's Canaveral Division.

Established in 1958, the Canaveral Division remains the only organization of its type at the Cape.

As the flight test arm of the Martin Marietta Corporation, the Division conducts all research and development programs for missile, rocket, and spacecraft assigned to the Atlantic Missile Range from any of the Corporation's major aerospace manufacturing facilities—Baltimore, Denver, and Orlando.

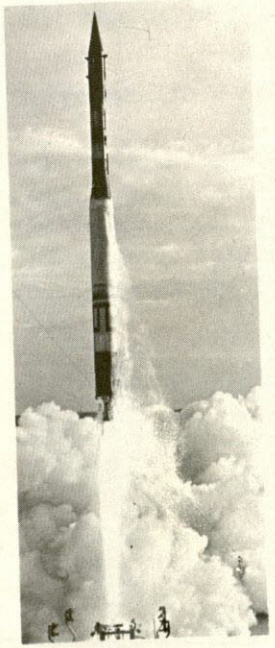
In addition, programs involving corporation-built satellites, space experiments, nuclear power devices, or hardware which may ride on other than Martin Marietta vehicles are supported by the Canaveral Division.

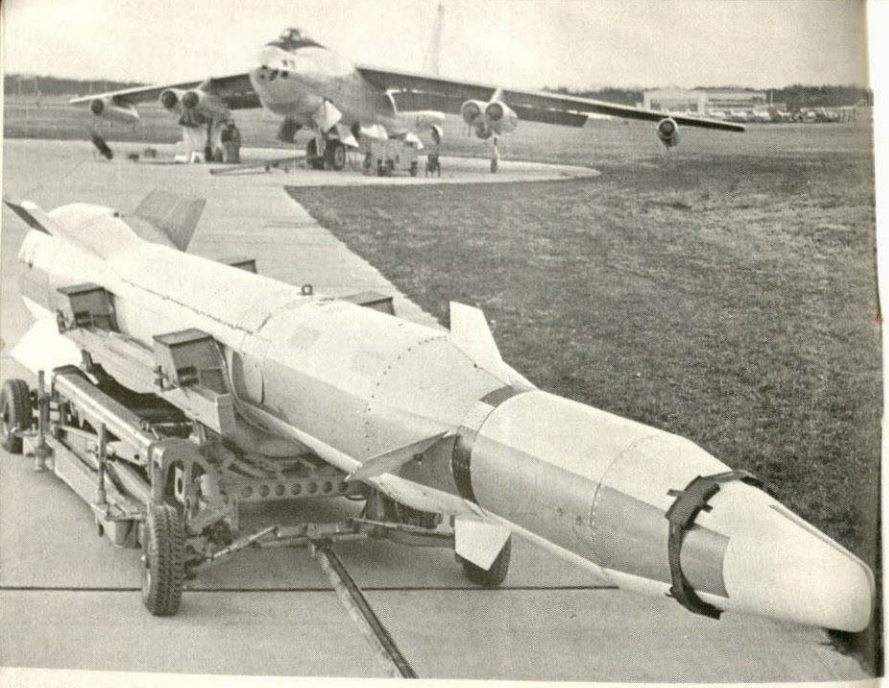
Martin Marietta is the only contractor at Cape Canaveral to establish an organization devoted exclusively to the critical launching phase of the research and development (R&D) operation—from activation, ground handling, and testing to countdown, launch, and data control.



Although Martin Marietta's tenure at Cape Canaveral dates back almost to formation of the Air Force Missile Test Center and the Atlantic Missile Range (July 24, 1950), the Corporation functioned with field test crews until January, 1958.

At that time, the VANGUARD satellite launching program was just under way. Testing of the TITAN intercontinental ballistic missile system was scheduled to begin at the Cape by the end of that year. Development of an air-launched ballistic missile (199-B) was approaching the flight phase. And launch programs for the advanced MACE-B and PERSHING weapon systems were anticipated. The importance of these programs indicated a need to elevate the test operation from field status. Therefore, the Canaveral Division was established as an independent operating division, autonomous with the research and manufacturing divisions of the Corporation.





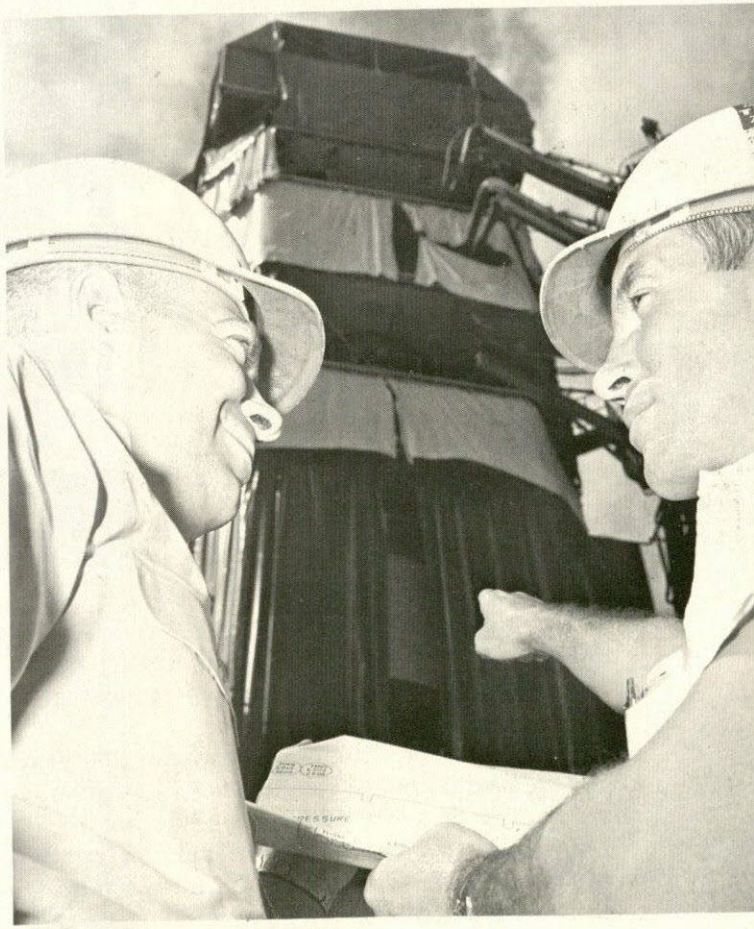
Operating as a Division with its own general manager, Canaveral offers distinct advantages over normal field test organizations:

On-the-spot decisions at highest management level.

The Canaveral Division General Manager reports to the president of the Corporation's Aerospace Divisions. His department directors enjoy equal status with directors of the larger operating divisions which produce the hardware tested at Cape Canaveral

The ability to wear the customer's hat during the critical proving ground phase of the R&D effort.

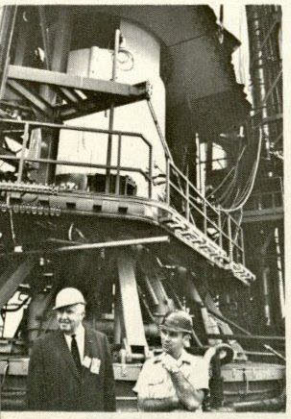
Since the Test Division is not subordinate to the manufacturing divisions, Canaveral speaks with the customer's voice in proving the feasibility of weapon systems from the viewpoint of the customer—the user. Desirable changes in engineering—design and modification—as well as in quality assurance can be effected from a position of authority.



Continuity of experience, both technical and administrative.

A permanent Test Division develops a highly specialized group of experts — engineers and technicians thoroughly versed in all phases of the test operation — facilities engineering, instrumentation, missile test and operational engineering, quality assurance, data evaluation, and range operations. Experience gained on one missile program is carried to another by these highly skilled people.

Of the top engineering, technical, and administrative personnel on board in 1958 when the Division was created, 60 per cent remained in similar or higher capacities four years later.



Depth of Experience

The Canaveral Division's 50 top managers represent more than 500 years of missile testing experience (exclusive of aircraft testing) — an average of 10 years per man.

Over 150 graduate engineers represent 900 years of missile or related test experience — an average of more than six years experience per man.

These statistics are truly remarkable since they were compiled at a time when the missile industry itself was little more than 10 years old.

Each test project is supported by a permanent staff experienced in the areas of engineering, industrial relations, finance, procurement, quality assurance, programming, contracts, customer requirements, and information services. These staff functions not only preclude over-staffing and duplication of effort but assure standardization, economy, and efficiency.

Lower Costs

The benefits of such an organization to the customer, to the Corporation, to the employees, and to the community are numerous.

To cite a few:

The customer benefits through economies which reduce the contract dollars required for the testing phase.

In the first two and a half years of existence as a Division, Canaveral operated three major research and development launch programs at costs consistently within or well below budget limitations.

Test operations traditionally call for higher percentages of overtime than do straight manufacturing efforts, where work can be more evenly scheduled. The Canaveral Division, however, has operated with a lower percentage of overtime than is normally expected from an R&D organization.

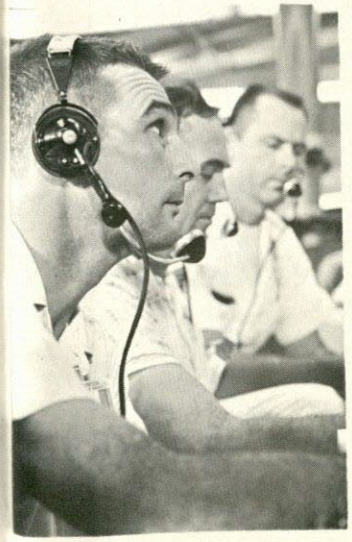
Interchange of Ideas

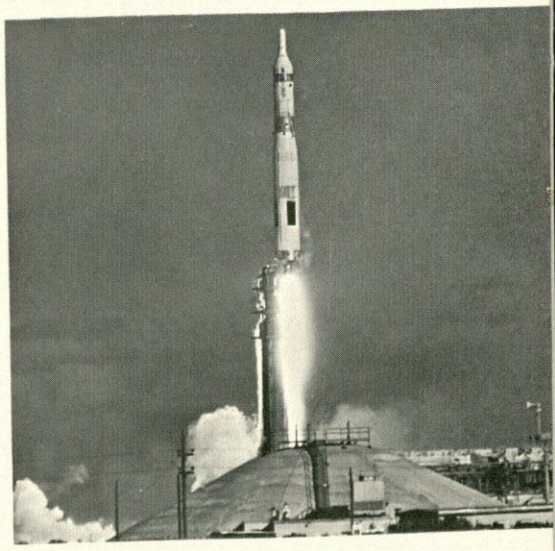
The Corporation benefits in many ways, all of which work to the customer's advantage either directly or indirectly.

Interchange of ideas, techniques, and procedures from one project to another enables the Test Division to borrow on experience gained from one project and its manufacturing division and pass it on to another project and a second manufacturing operation. This exchange eliminates many potential trouble spots before they appear and frequently results in time and money saved.

Retention within the Division of the best and most experienced personnel provides for smooth transition as one test program phases out and a new one comes in.

Benefits of this careful planning and manpower utilization include elimination of relocation costs, less training time, and job security — the latter a strong factor for the Corporation in attracting top-level employees. More effective display and greater





recognition of Corporation products, talents, and performance are realized through the small, closely-knit, hard-hitting team which makes up the Test Division.

In addition, the Division's depth of experience and talent has been tapped from time to time to staff new endeavors such as activation of TITAN

hardsites throughout the western half of the country.

The Employees benefit directly from the aforementioned advantages to the Corporation and enjoy these additional rewards:

Greater recognition is afforded the individual because of the inherently small size of the Test Division compared to a production division.

Greater recognition within the corporation is given his team's effort because of the Test Division's organizational position only two levels beneath the Corporation president. (A field test unit normally is at least two levels lower in the table of organization.)

Added prestige.

Greater job security with longer tenure can be expected in the Test Division, compared to a single project field operation.

The Community benefits from many of the same items affecting the customer, Corporation and employee plus these:

Canaveral Division personnel are relatively permanent in the area compared to field crew personnel, who normally remain at a test site for six months to a year, then are replaced by a new group arriving with a new project.

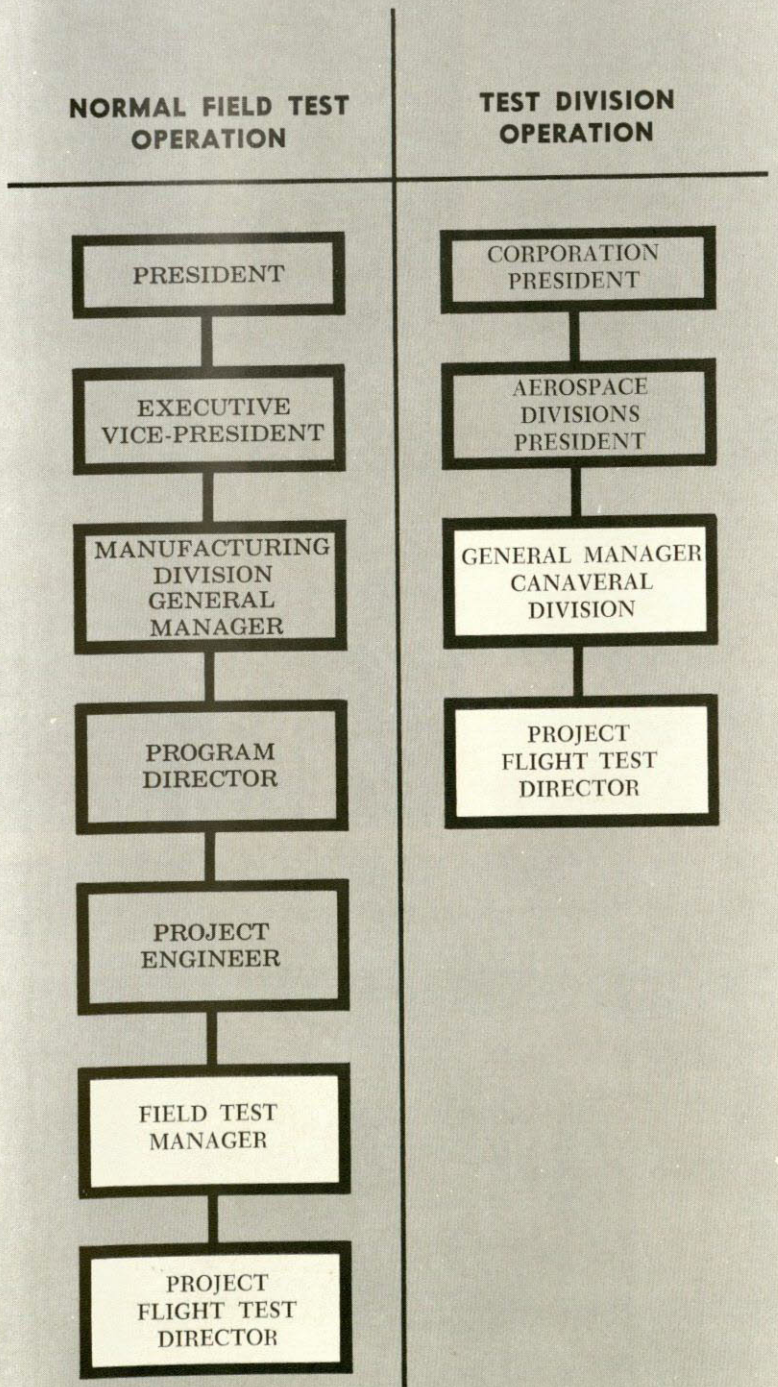
A more stable economy results from steadiness of Martin Marietta payroll.

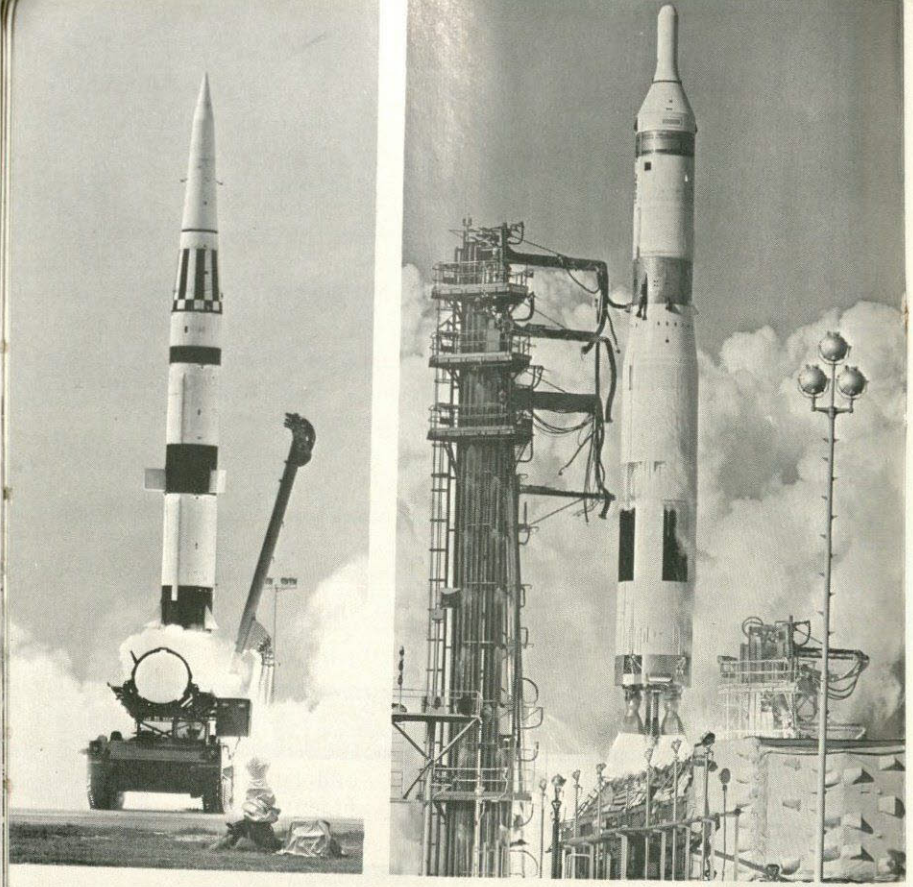
More procurement dollars are spent locally than would be spent if procurement were handled by a far-removed manufacturing division.

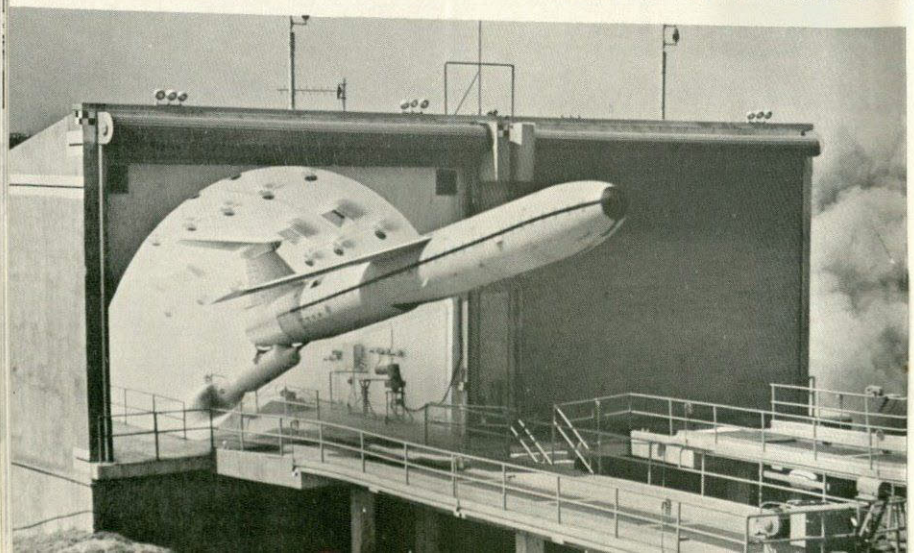
A Tenant at AFMTC

The Canaveral Division fits into the over-all scheme of the AFMTC as one of some 20 missile contractors who are tenants of the center.

Martin Marietta is the oldest tenant from the standpoint of continuous residence, having first established a field test unit at the Cape in 1951 for launches of the MATADOR, which began flight tests in June of that year.







In the early 1960's Martin Marietta was the most active contractor at the Cape with three major missile test programs (TITAN, MACE, and PERSHING) in progress simultaneously and launch facilities for TITAN II and TITAN II GEMINI (the 2-man Mercury spacecraft) in the process of activation.

Impressive Launch Record

In the first four years of its existence, the Canaveral Division launched 116 missiles—a launch rate of 2.4 missiles per month*.

Of more than 1,000 missiles launched from Cape Canaveral during the first 11 years of AFMTC, one third were built by Martin Marietta.

Although Martin Marietta holds a prominent place in the annals of Atlantic Missile Range testing, the Corporation has never laid claim to being the largest contractor at the Cape in total number of personnel. On the contrary, at peak periods of employment (about 1,000 persons), the Division has operated with fewer employees than several other contractors with only one test project — another advantage attributed to the Test Division concept.

The Canaveral Division occupies and operates for the government 20 buildings and launch complexes containing a quarter million square feet of floor space. These government-owned structures, all located on Cape Canaveral, and the equipment they house exceed $25,000,000 in value.

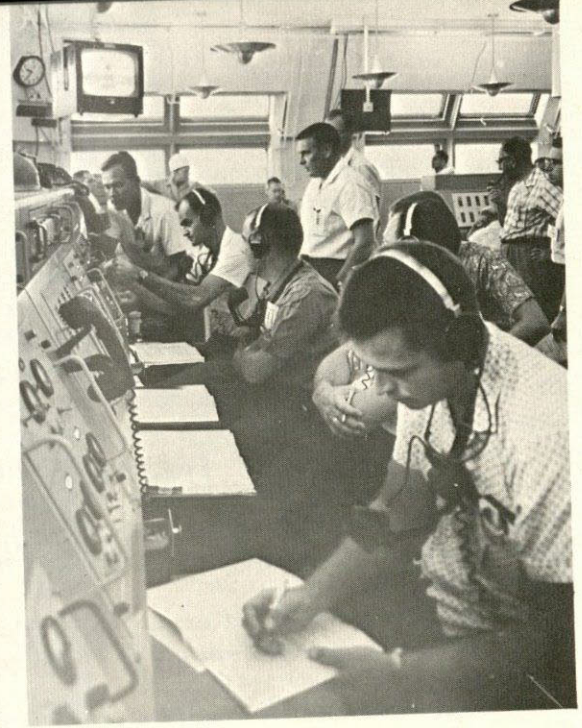
Ninety per cent of Martin Marietta employees are located in these facilities — hangars, blockhouses, and ready rooms.

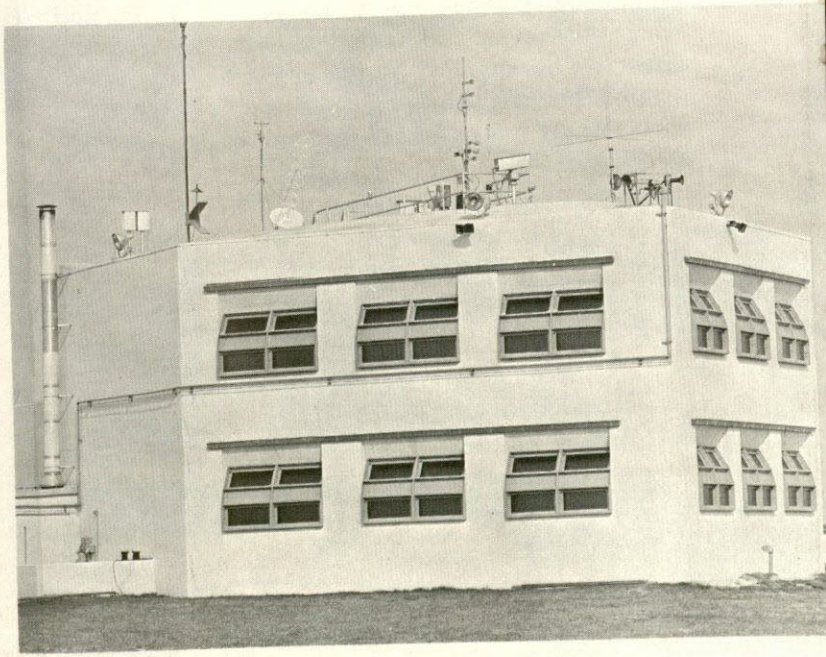
The remaining 10 per cent of the Canaveral Division's personnel are housed in a modern, one-story, air-conditioned office building located off the Cape at Cocoa Beach. This Administration Building, containing 12,000 square feet, is located on State Route 401, four miles south of the Cape and nine miles north of A F M T C headquarters at Patrick Air Force Base.

Martin Marietta was the first to establish such an

*As of November 30, 1961.


MARTIN





office building which is now the hub of a growing complex of missile contractor offices.

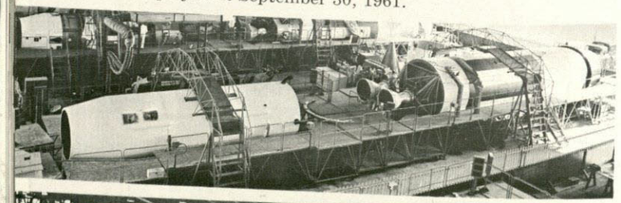
The Cape community in which the Canaveral Division operates embraces a working population of more than 23,800 persons*—civilian and military—who are directly assigned to the Air Force Missile Test Center.

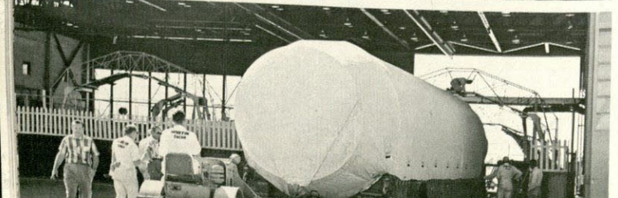
Approximately 11,600 of this total, including the majority of Martin Marietta personnel, work on Cape Canaveral, Station No. 1 and the launching site of the Atlantic Missile Range. Approximately 3,600 more work at 12 downrange sites and on board tracking ships extending through the Caribbean, across the equator to Ascension Island in the South Atlantic Ocean.

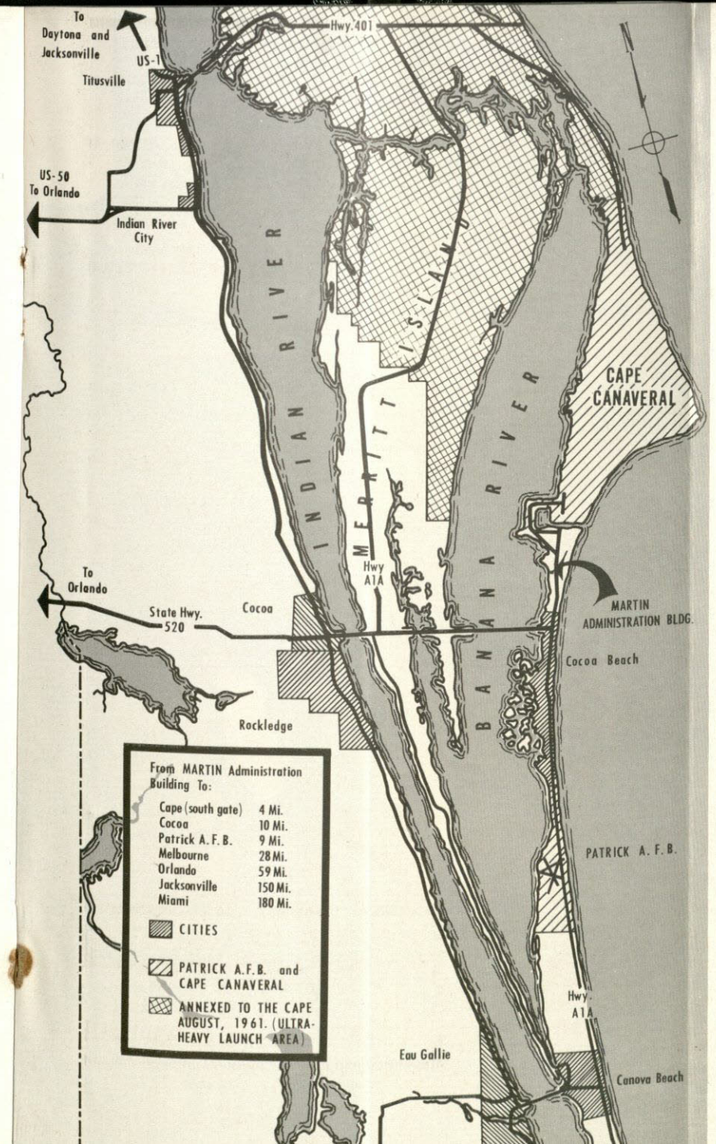
The remaining 8,600 are employed at Patrick AFB or at the various off-Cape offices of the missile contractors.

Although 5,000 miles constitutes the standard distance over which the TITAN, TITAN II, and other intercontinental ballistic missiles are fired, the range can be extended by the use of heavily instrumented tracking ships and planes up to 10,000 miles with impact points in the Indian Ocean southeast of Africa's tip.

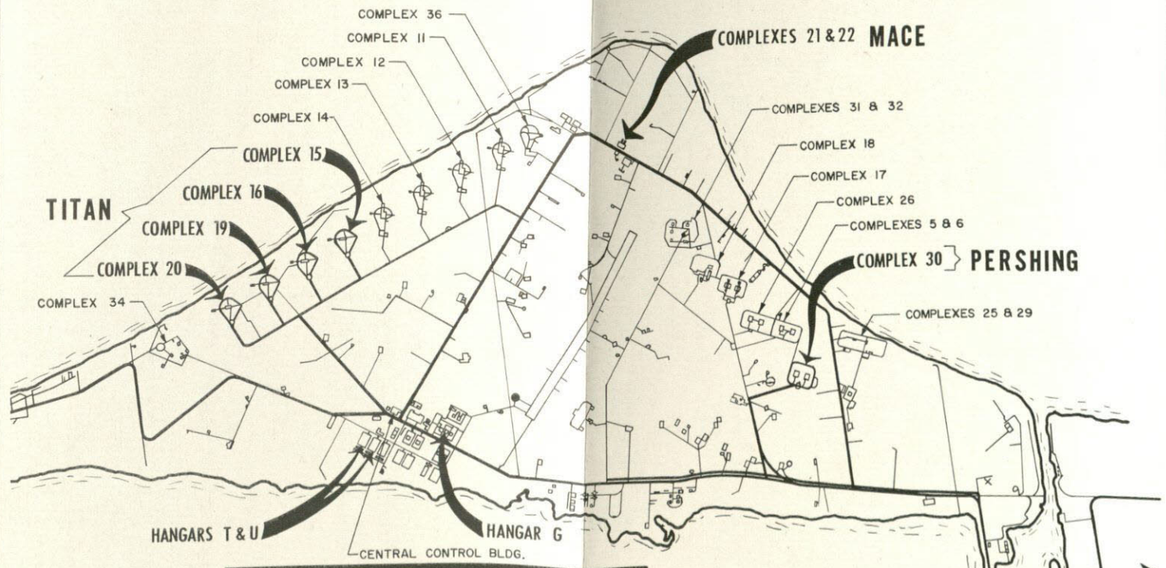
*Employment September 30, 1961.



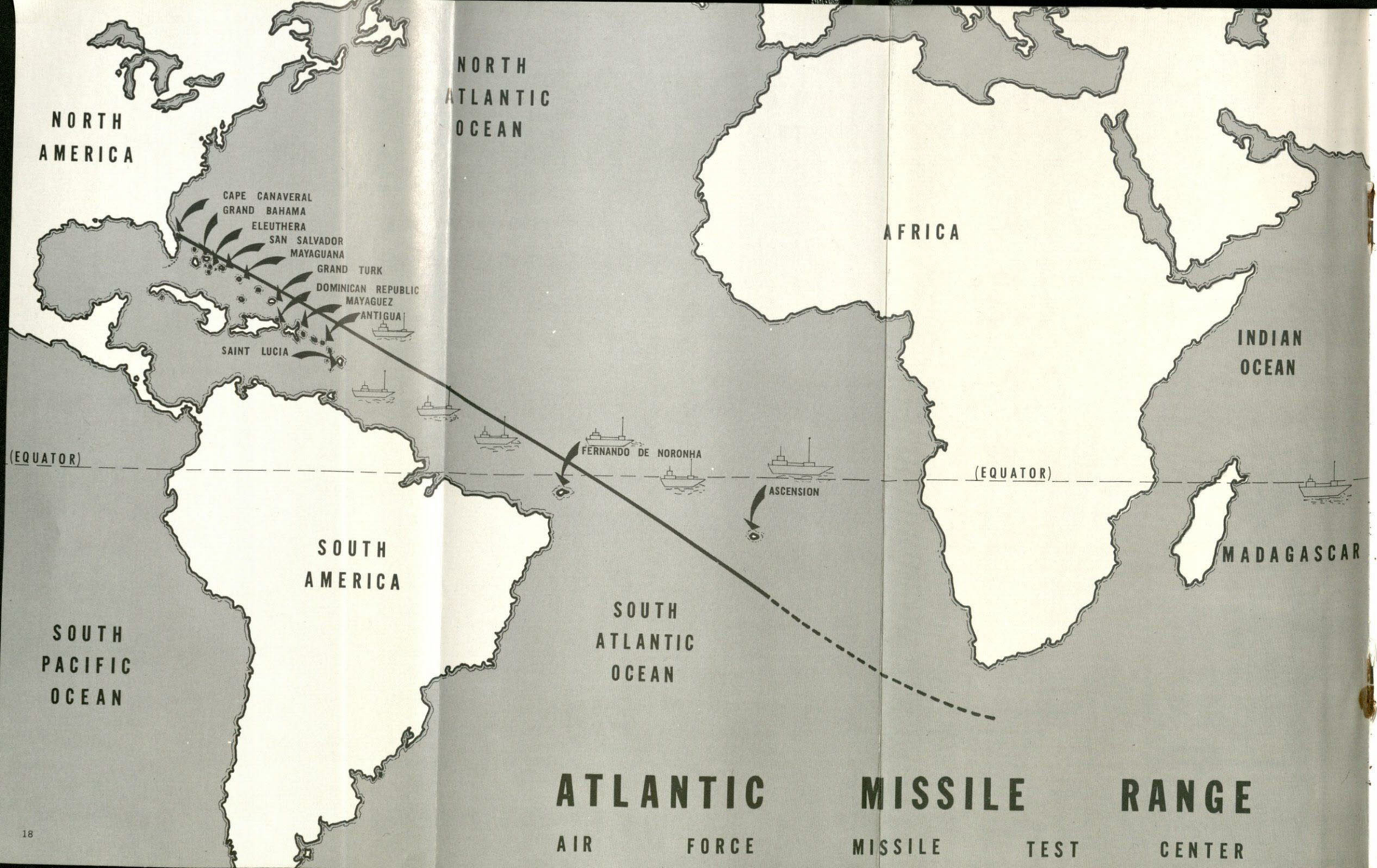


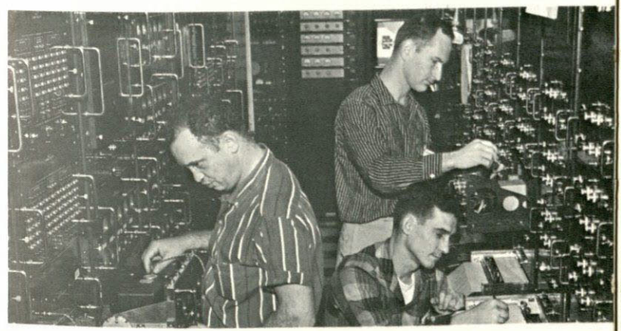


COMPLEX NO.	& MISSILE
5&6	REDSTONE
11 12 13 14	– ATLAS
17	THOR
18	BLUE SCOUT (FORMERLY VANGUARD)
25&29	POLARIS
26	JUPITER
31&32	MINUTEMAN
34	SATURN
36	CENTAUR



CAPE CANAVERAL
A. F. M. T. C.
MARTIN OPERATED FACILITIES

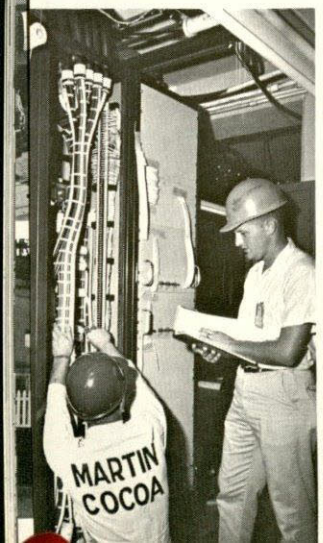


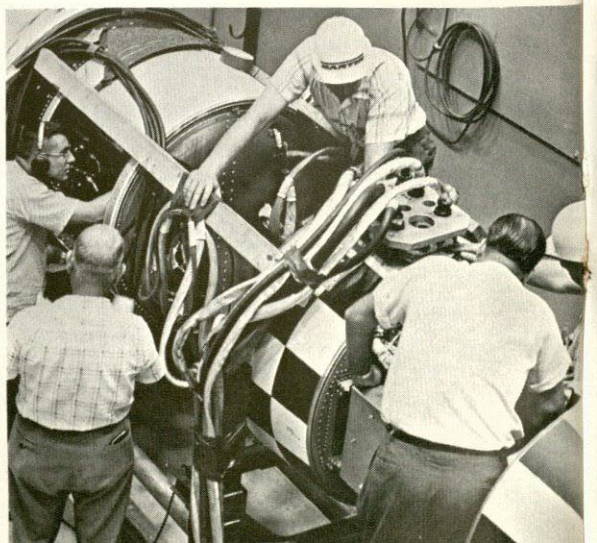


Range Operations

Martin Marietta, like other Missile contractors at AFMTC, depends upon and works closely with two range contractors for logistic and maintenance support as well as for instrumentation and test operations support.

The range contractors are responsible to AFMTC for management and operation of the range and the launching sites at Cape Canaveral, as well as maintenance of equipment and facilities. They also plan and carry out range test operations to support the individual missile launchings and to acquire test data. In addition, they are charged with development of engineering techniques needed to prove new instrumentation equipment in order to meet the requirements of new missile programs.





Pan American World Airways provides all housekeeping functions on the Cape, from police, fire, and food services to fuel handling, pad safety, and supervision of range operations for the Air Force. The Radio Corporation of America (RCA) provides instrumentation and data acquisition, including all range photography.

In addition, the Canaveral Division operates limited specialized facilities — not provided by the range — in direct support of its various projects.

Included among these Division operated facilities are:

ANALYTICAL LABORATORY for analytical control of specification cleanliness levels for chemicals, components, propellants, gases, and fluid systems.

BATTERY LABORATORY maintains and supports missile power including instrumentation and accessory power supply, diesel emergency power batteries, and emergency power batteries.

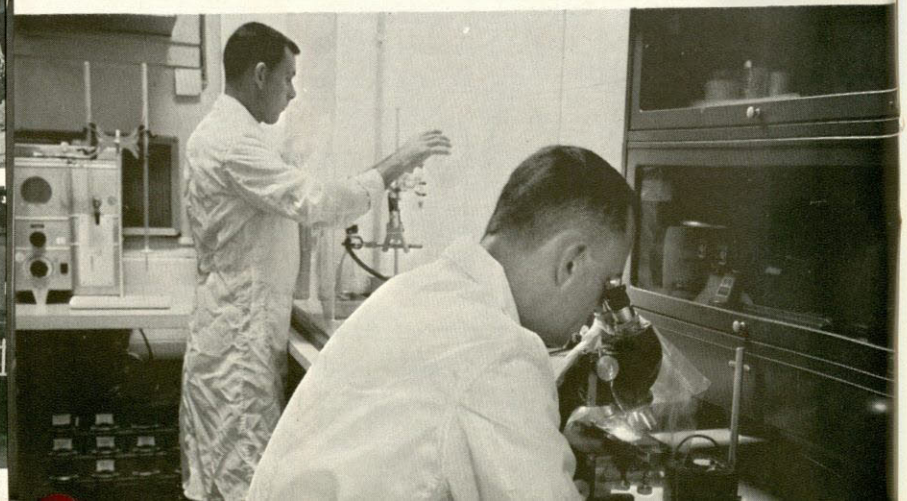
COMPONENT CLEANING LABORATORY for cleaning missile and ground support equipment components to specification cleanliness level requirements.

ELECTRO-MECHANICAL LABORATORY fabricates, repairs, modifies, calibrates, and stocks test tools.

FAILURE ANALYSIS LABORATORY performs special tests pertaining to failure analysis and systems reliability activities.

FILM SERVICES LABORATORY provides emergency photographic services, film viewing and data analysis facilities and supports, with limited dark room capability, quick-look engineering, and quality control picture requirements.

COMPONENTS TESTING LABORATORY performs hydrostatic tests on pressure systems for leak



detection. The laboratory includes a dust-free room for assembling units after repair and cleaning.

QUALITY ASSURANCE CALIBRATION LABORATORY repairs and calibrates commercial electronics equipment and working standards.

PLAYBACK AREA supports test operations by simultaneously providing a readable breakdown of current telemetry data as well as playback of telemetry data from other tests.

MECHANICAL LABORATORY repairs and calibrates hydraulic and pneumatic gauges, calipers, micrometers, wire strippers, torque wrenches, and other instruments.

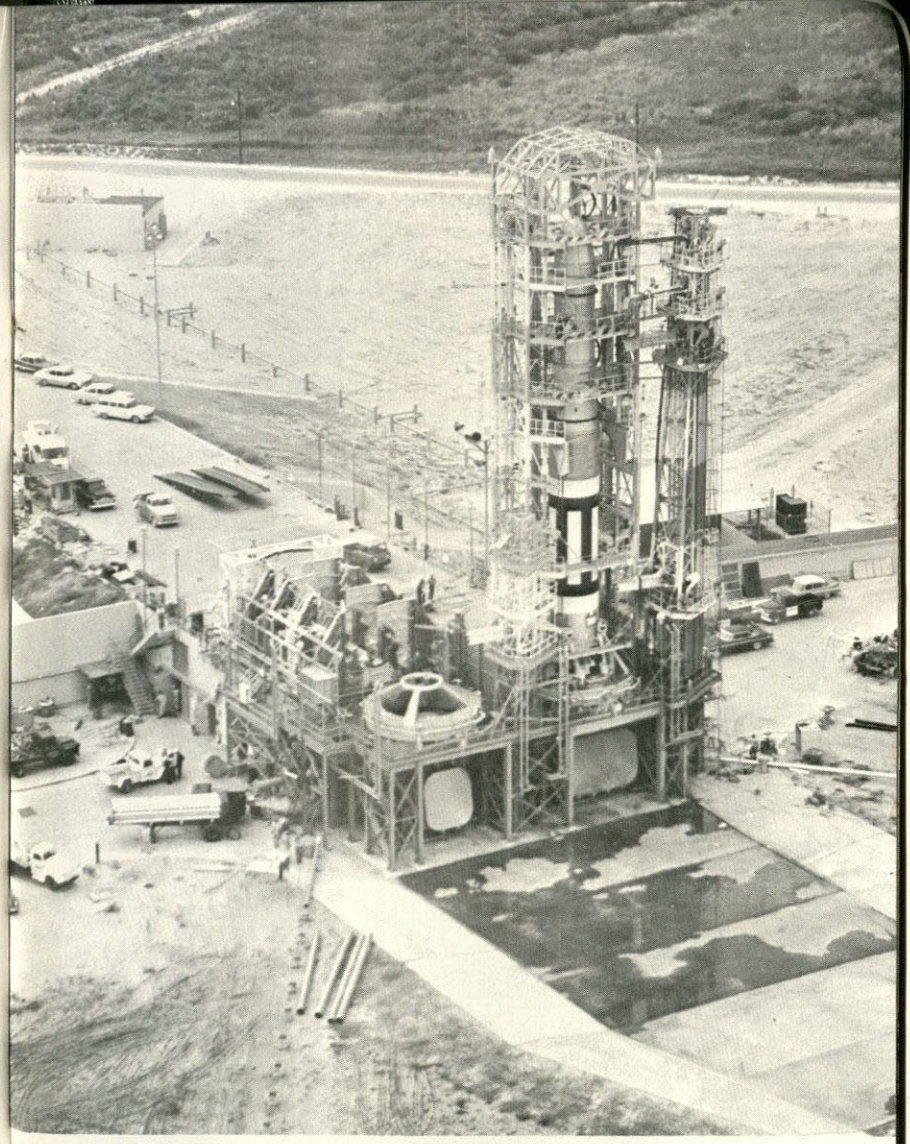
MACHINE SHOP which provides minor metal working, welding, brazing, and soldering service.

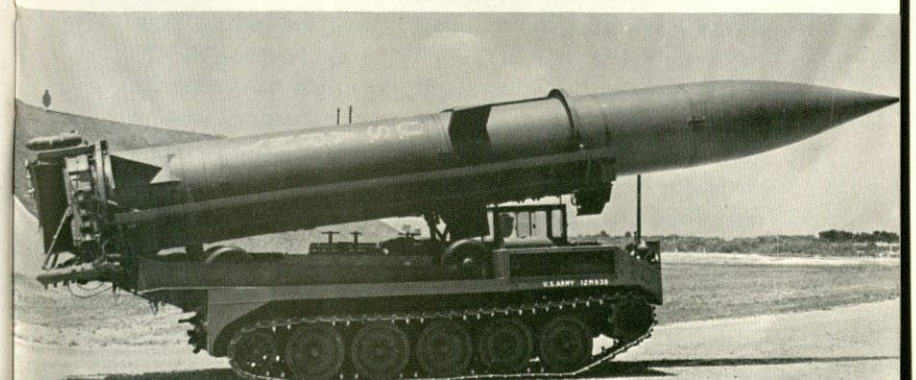
WOOD SHOP which performs minor general carpentry work.

The organization of the Canaveral Division consists of four administrative staff departments — Industrial Relations, Finance, Customer Requirements and Information Services; three support departments — Engineering, Materiel, and Quality

Assurance; plus the operating departments or test projects, depending upon the number of systems currently under test.

All projects—TITAN, PERSHING, MACE and others — are supported in the areas of engineering, quality, and materiel by personnel from those departments who are assigned directly to the projects. Industrial Relations, Finance—which includes programming and contracts; Customer Requirements and Information Services are across-the-board functions supporting all departments.





INDUSTRIAL RELATIONS performs the traditional functions of employment, security, employee relations, labor relations, wage and salary administration, management engineering, office services, and personnel training and development. In addition to the training and constant development of Canaveral employees, the latter section has the added responsibility of setting up training programs for members of the military services who will act as instructors or who will actually man the operational weapon systems once the research and development testing has been completed.

FINANCE, including programming and contracts, manages all Canaveral Division funds. It prepares limitations of expenditures, authorizes funding limitations, prepares cost analyses and cash forecasts, compiles financial control data, supplies cost information to other divisions and administers an overtime control program. In addition, the Finance Department, through the contracts section, controls customer correspondence, prepares, negotiates and executes, as required, proposals for contract and interdivisional work agreements. Finance also has responsibility for programming and scheduling on all projects.

One of the programming section functions is operation of a Master Chart Room. This is the nerve center of the Canaveral Division, where a quick glance will reveal all Division activities — missile deliveries and launch schedules, manpower, overtime rates, launch stand construction, status of tests, budget limitations, and many other items, including projections of the above.

In addition to close and constant surveillance of Canaveral schedules, the programming section charts the status of hardware in the manufacturing divisions. By effective liaison with their counterparts in Baltimore, Denver, and Orlando, Canaveral Division programmers are able to spot potential bottlenecks and trouble areas and bring them to the project's attention before they affect end dates.

CUSTOMER REQUIREMENTS is a one-man operation at the director level. His responsibility is chiefly that of liaison and coordination with the various military agencies, the National Aeronautics and Space Administration, and the range. In addition to coordination on existing programs, the Customer Requirements Director keeps the range informed of anticipated requirements necessitated by changes in current programs or by new programs. He also disseminates throughout the Corporation range requirements influencing flight hardware, ground support equipment or instrumentation supplied by Martin Marietta.

INFORMATION SERVICES, including Film Services, has responsibility for all phases of the Corporation's information program at the Cape, including press releases, community relations, Division newspaper, and the photography effort required to support these services as well as the test operations.

Primary responsibility of Film Services is in the area of photographic instrumentation and data gathering on all Martin Marietta projects. In addition to documentary photographic requirements, both still and motion picture, Film Services is charged with the responsibility of coordinating and directing all engineering photography required for the various Martin Marietta missile projects. Nearly all the actual picture taking is accomplished by a range contractor to the Air Force. But Canaveral Film Services directs this effort on Corporation projects and works closely with the range contractor in seeing that the photographic requirements are met.

ENGINEERING provides across-the-board support and staffing on all projects. Operating under a chief engineer, who is also director of the department, Engineering is responsible for maintaining technical liaison with other divisions; evaluating design performance of all weapon systems undergoing testing at the Cape; analyzing quick-look system data; compiling test data and generating test reports; disseminating to all concerned divisions significant technical information gained from the various test programs; generating "make work" design changes; evaluating home-plant-generated

design changes, and generating any other design engineering that may be required by other divisions, including equipment installation drawings during the activation or modification of a complex.

In addition, the Engineering Department is responsible for activation of the launch stands, maintains and controls technical data files, provides reproduction services for all departments, and participates in proposal activities of all divisions concerning off-site system testing.

QUALITY ASSURANCE establishes policies for maintaining high standards of product quality and test validity and establishes and enforces quality requirements assigned in accordance with the contract, engineering specifications, and technical publications. The department also is responsible for a coordinated system of evaluating reliability characteristics for each missile or space system undergoing flight test. It evaluates and develops new quality, reliability, maintainability, and safety techniques and methods. In addition, the department establishes and maintains a safety program consistent with the specialized needs of flight test programs and range policies and operates the analytical, component cleaning, and calibration laboratories.

The department has been highly effective in designing and applying advanced quality techniques for off-site testing. The quality measurement of materiel, ground and flight test articles received from various manufacturing facilities results in a timely and effective method of continuously enhancing design and fabricating processes by recommended improvements. This approach has been instrumental in achieving a very high success ratio in flight test results and contributes to reduced spares costs and maximum reliability in operational use.

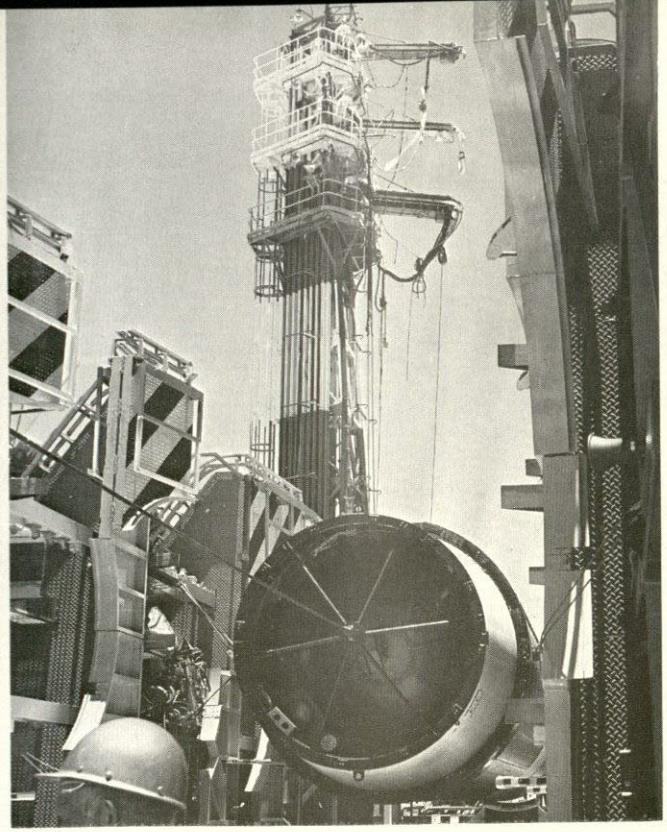
MATERIEL is responsible for placing and administering procurement contracts as well as the co-

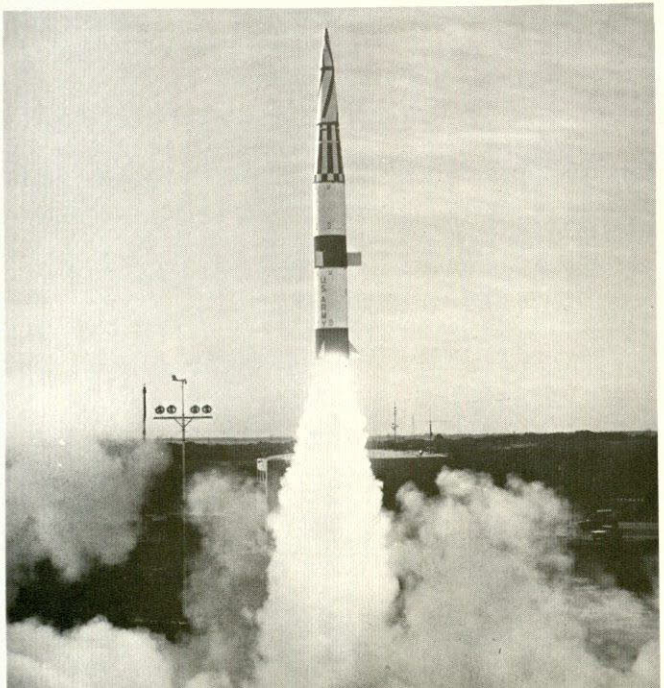
ordination and evaluation of subcontracting activities. It also procures all end items — some 16,000 per year — peculiar to flight test and expedites material through Martin Marietta and government agencies as required by test operations or test support. The department receives, ships, stores, and controls all materials prior to their withdrawal by the using department and maintains and operates a motor pool, including a fleet of taxicabs used on the Cape and a fleet of automobiles assigned to the administration building.

Depth of Experience

Each of the test projects, headed by a director, is made up of complex managers, test conductors, lead engineers and technicians for the various subsystems of the particular missile involved. These people plus representatives assigned to the test project from engineering, programming, quality, materiel, contracts, and finance make up the operations team.

This combination of skills and depth of experience, forged into a tight, fast-moving operations





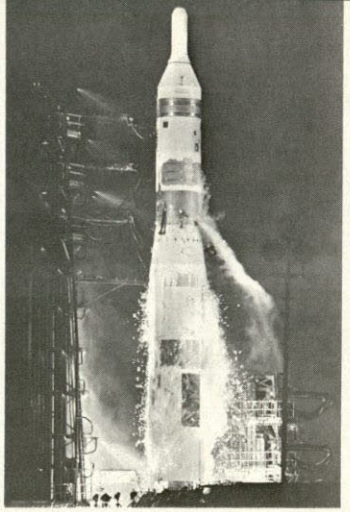
team for each test program, has been a significant factor in the outstanding record of Martin Marietta's test programs at Cape Canaveral.

From every missile handled and from every test conducted something has been learned and applied to other missiles and other tests.

As a result of this cross-pollination of ideas and techniques, the Canaveral Division has been able to anticipate problem areas, avoid past mistakes, and contribute generally to the development of better missiles.

The Division's continuity of experience has paid solid dividends in greater efficiency, economy and performance — dividends shared jointly by the Corporation, the customer, and the taxpayers.

Per-missile launching costs have been reduced an average of 25 per cent from one year to another. In the case of one missile project, launching costs were cut as much as 40 per cent from one year to the next.



Another Milestone

The Canaveral Division represents another in a long line of pioneering efforts which have marked the Corporation's first half-century — a period bracketing man's 50-year effort to lift himself off the face of the earth.

With firsts in manufacturing techniques, types of aircraft, research rockets, missiles, satellites, and related equipment, Martin Marietta again has been first in employing a test philosophy which already has made its mark in the research and development field.

The hallmark of the Canaveral Division is experience. From that experience comes reliability which in turn means performance.

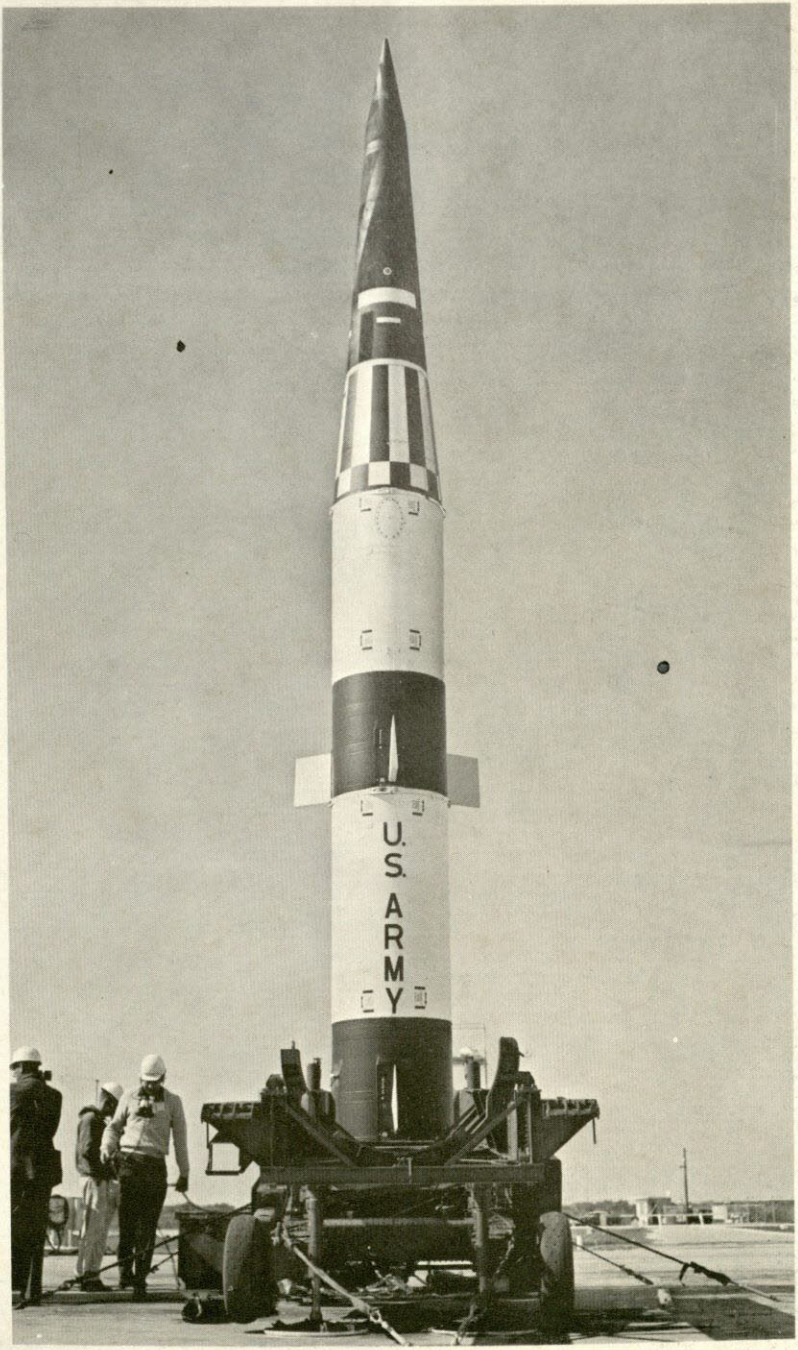
Of the first 105 missiles tested by Martin Marietta at the Cape, 80 per cent performed successfully.

While continuing to test weapons for the Free World's defense, the Canaveral Division is looking ahead to the testing of manned space systems.

Putting the man back in the vehicle will mean even more stringent test procedures to insure the integrity and safety of the system.

The Canaveral Division is prepared to meet these and other new challenges of manned space travel as the testing and launching arm of the Martin Marietta Corporation.

Success of any test program hinges not only on the product handed you but on the effort of each individual involved.



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