Space News
NASA ROUNDUP!
VOL. 2, NO. 22 MANNED SPACECRAFT CENTER, HOUSTON, TEXAS AUGUST 21, 1963

LOOKING TOWARD MERRITT ISLAND—The Banana River-Orsino Causeway will connect Cape Canaveral with Merritt Island via the Orsino Road when completed. The bridge in the center of the causeway is over the barge canal. SEE OTHER PICTURES ON PAGE TWO

Apollo Contract Is Largest NASA Has Negotiated To Date

A contract for $934,000,000, the largest ever negotiated by NASA, has been signed with North American Aviation Space and Information Systems Division, Downey, Calif., for the initial development and production of the Apollo spacecraft command and Service modules.

The Apollo command module will carry three United States astronauts into lunar orbit and return them to earth. The service module will contain the propulsion system and equipment to support the command module.

North American was selected by NASA to develop the Apollo spacecraft in December 1961 after an extensive industry competition. Since that date the company has been working under an interim contract.

North American is responsible for design, manufacture and testing of the command and service modules in this initial phase of the contract. The work program, which runs through mid-1965, calls for the company to provide eleven flight configuration spacecraft, 15 boilerplate spacecraft (engineering test models) and 10 mockups.

The development and testing program will include launching of seven boilerplates and four spacecraft from the White Sands Missile Range, N. M. and Cape Canaveral, Fla.

(Continued on page 6)

MSC Merritt Island Facilities Progressing Toward Completion

Considerable progress is being made in the construction of buildings for the Manned Spacecraft Center - Atlantic Missile Range Operations Facilities located at the Merritt Island Industrial Area.

Under construction at the facility at this time are the Operations and Checkout Building, Weight and Balance Building, Supply, Shipping and Receiving Building, Environmental Control Systems Building and the Fluid Test Complex which includes the Support Building, and the Cryogenic and Hypergolic Test Buildings.

The larger of the buildings is the multi-story Operations and Checkout Building. Total floor area is approximately 333,000 square feet which includes 33,000 feet of office space. Approximately 1,800 persons can be accommodated with office and shop space.

The O & C Bldg. will include areas for modification, assembly and checkout of manned spacecraft as well as space and equipment for crew training and preflight preparations.

Functional areas in the O & C Bldg. include engineering and administration, mission briefing, cafeteria, laboratory and control room, a high-bay and low-bay assembly and test area, and a utility and service area.

The Weight and Balance Building contains a high-bay test area 80 by 150 feet and two low-bay service areas 20 by 150 feet each.

Supply, Shipping and Receiving is a single story building 100 by 340 feet with a wing 50 by 100 feet. Varied ground support equipment and spacecraft parts will be maintained under humidity-controlled conditions to prevent deterioration. Shop facilities will also be in this building.

The Environmental Control Systems Building consists of two test cells with a central core. Control rooms are located on the second floor and equipment storage is provided for on the first floor. Also on the first floor are pre-installation acceptance laboratories for the validation of spacecraft components.

Support Building for the Fluid Test Complex is a single-story structure which provides laboratories, shops and offices.

The Hypergolic Test Building is for conducting end-to-end checkout of spacecraft hypergolic systems. The entire building is air conditioned and has several special features for the safe handling of hazardous fuels and oxidizers.

Cryogenic Test Building facilities include one test cell, a laboratory and a dressing room. A primary design feature is the capacity to effectively raise all four walls (four 40-foot-high motorized doors) of the test cell during the transfer of cryogenic fluids.

The buildings will be constructed of reinforced concrete with masonry ex-

(Continued on page 2)

Gemini Recovery System Qualifies

The first water drop test to qualify the parachute recovery system which will lower the two-man Gemini spacecraft to a water landing was completed successfully at Salton Sea, Calif., recently.

The drop was made over the San Felipe drop zone from 20,000 feet and follows a series of five successful land drops just completed at El Centro, Calif. during the past three months.

The parachute recovery system, designed by Northrops Ventura Division will be Gemini's prime recovery system until the paraglider system is developed. The paraglider, designed for dry-landings, can be guided by the astronaut to a controlled landing at a pre-selected point. The parachute system is designed for wet-landings and will be used for unmanned and early manned Gemini flights. The first manned flight is scheduled for 1964. It will be preceeded by two or three unmanned flights.

Project Gemini is designed to develop pilot techniques of docking and rendezvousing in space, and to extend space flight duration up to two weeks.

Twenty qualification tests have been scheduled for completion in early 1964 which will check out the operation of the recovery system. This will include the parachutes, the pyrotechnic devices which explosively trigger the deployment and release of the parachutes and the timing system -- technically called "sequencing," which triggers the various events at the proper time.

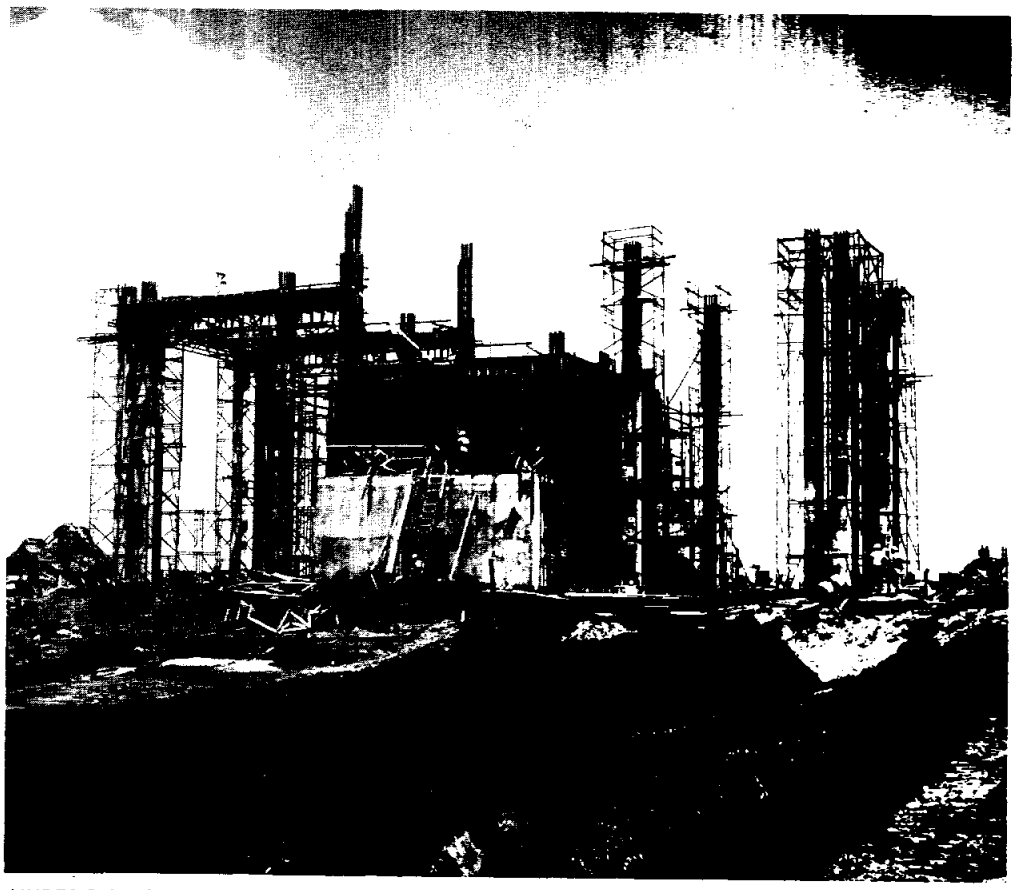
The tests call for use of a Gemini boilerplate, a dynamic duplication of the Gemini spacecraft in configuration, weight, weight distribution (center of gravity) and "response" through its size and weight.

Two additional tests using "static articles", a structural duplication of the Gemini spacecraft not only in size and weight, but in materials and construction, will finalize the testing of the recovery system.

The parachute recovery system consists of an 18-foot diameter ring-sail

(Continued on page 3)

INDIAN RIVER-ORSINO CAUSEWAY—Looking toward Merritt Island, with Cape Canaveral in the background, is the beginning of the fill that will connect the Florida mainland with Merritt Island. The causeway will extend some three miles across the Indian River.



HYPERGOLIC TEST BUILDING—The building is irregular in shape and contains a two-story central core with two test cells 40 by 40 feet and a crane hook height of 45 feet. Special features in the building provide for the safe handling of hazardous fuels and oxidizers.

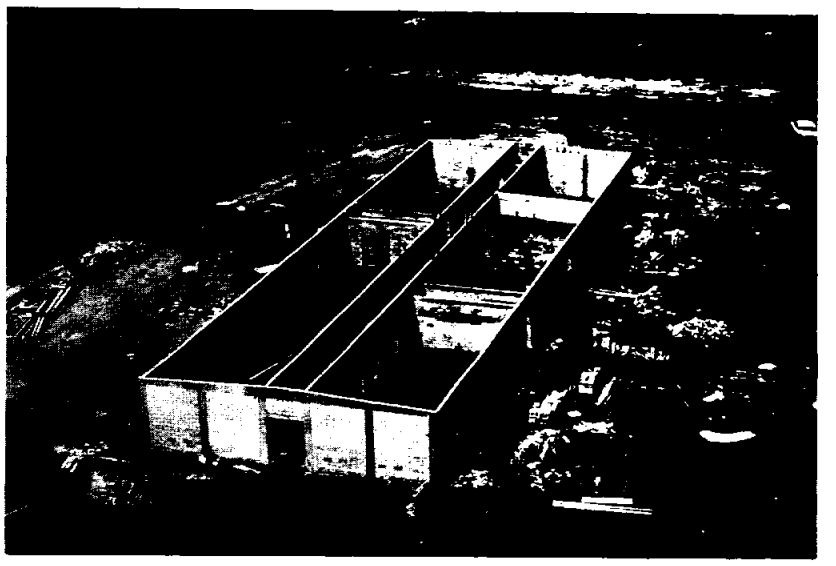
ENVIRONMENTAL CONTROL SYSTEMS BUILDING—This building is of irregular shape with overall dimensions of 110 by 68 feet. It contains two test cells which are equipped with cranes to place spacecraft on a fixture, or to mate and demate the spacecraft modules.

Merritt Island

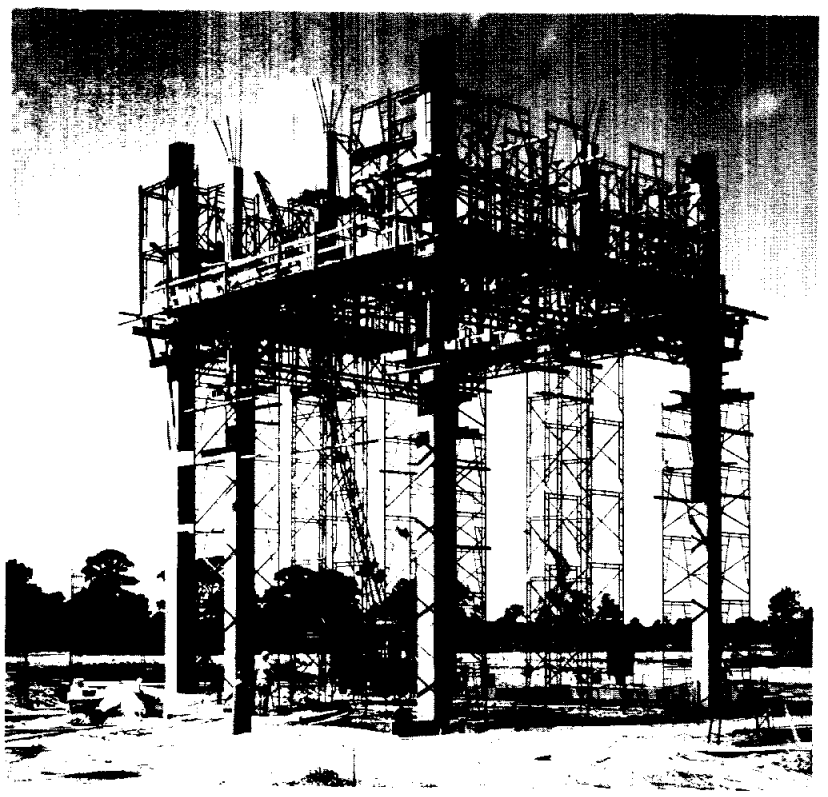
(Continued from page 1)

teriors and most areas will be air conditioned.

Completion dates vary, with Supply, Shipping and Receiving the first, scheduled for Nov. 15, 1963. The Operations and Checkout Building's scheduled completion date is April 1, 1964 with other building completions scheduled for the early part of 1964 and the Fluid Test Complex Buildings having a completion date set at Nov. 1, 1964.



FLUID TEST COMPLEX SUPPORT BUILDING—The main portion of the building is 50 by 160 feet. A 45 by 50 wing is to be added later. Laboratories, shops and offices will be in the facility.



CRYOGENIC TEST BUILDING—A test cell 40 by 40 feet and a laboratory and dressing room will be included in this building. A deluge fire protection system will be installed in the test cell and the building will be equipped with a gas detection and alarm systems.

MSC'S OPERATIONS AND CHECKOUT Building will be one of the larger structures on Merritt Island. The test area in the building will accommodate both the Gemini and Apollo spacecraft. The multi-story structure contains about 333,000 square feet.

HOUSTON AREA

Wage Board Employees Receive Raises At MSC

Pay raises will be included in the August 29 checks of some 165 Manned Spacecraft Center Wage Board employees in the Houston area, it was announced this week by the Civil Service Commission.

The pay boosts, averaging four to five cents per hour, apply to non-supervisory and leader employees at grades four and above and to supervisory personnel.

Higher rates were authorized in order to adjust wages to those paid by private industry in the Houston locality. Classification Act (GS) employees are not affected by the new wage schedules since their salaries are set by Congress.

The Commission also announced increased hiring rates for medical officers in the GS-602 series. The following minimum salaries are now established for grades GS-11 through GS-15 in this category: $9,635; $11,365; $13,340; $14,545 and $16,005. (See chart for Wage Board increases)

Effective date for both the new wage board and medical officer pay rates was August 4. The pay period beginning on that date closed August 17.

WAGE SCHEDULE for Manned Spacecraft Center Wage Board employees effective Aug. 4, 1963. Authorized hourly pay rates listed on this wage schedule apply only to NASA wage board employees assigned within commuting distance of MSC.

NON-SUPERVISORY

WB	Step 1	Step 2	Step 3	Step 4
1	1.89	1.99	2.09	2.19
2	2.00	2.11	2.22	2.32
3	2.12	2.23	2.34	2.45
4	2.24	2.36	2.48	2.60
5	2.36	2.48	2.60	2.73
6	2.48	2.61	2.74	2.87
7	2.60	2.74	2.88	3.01
8	2.73	2.87	3.01	3.16
9	2.84	2.99	3.14	3.29
10	2.96	3.12	3.28	3.43
11	3.10	3.26	3.42	3.59
12	3.24	3.41	3.58	3.75
13	3.37	3.55	3.73	3.91

LEADER

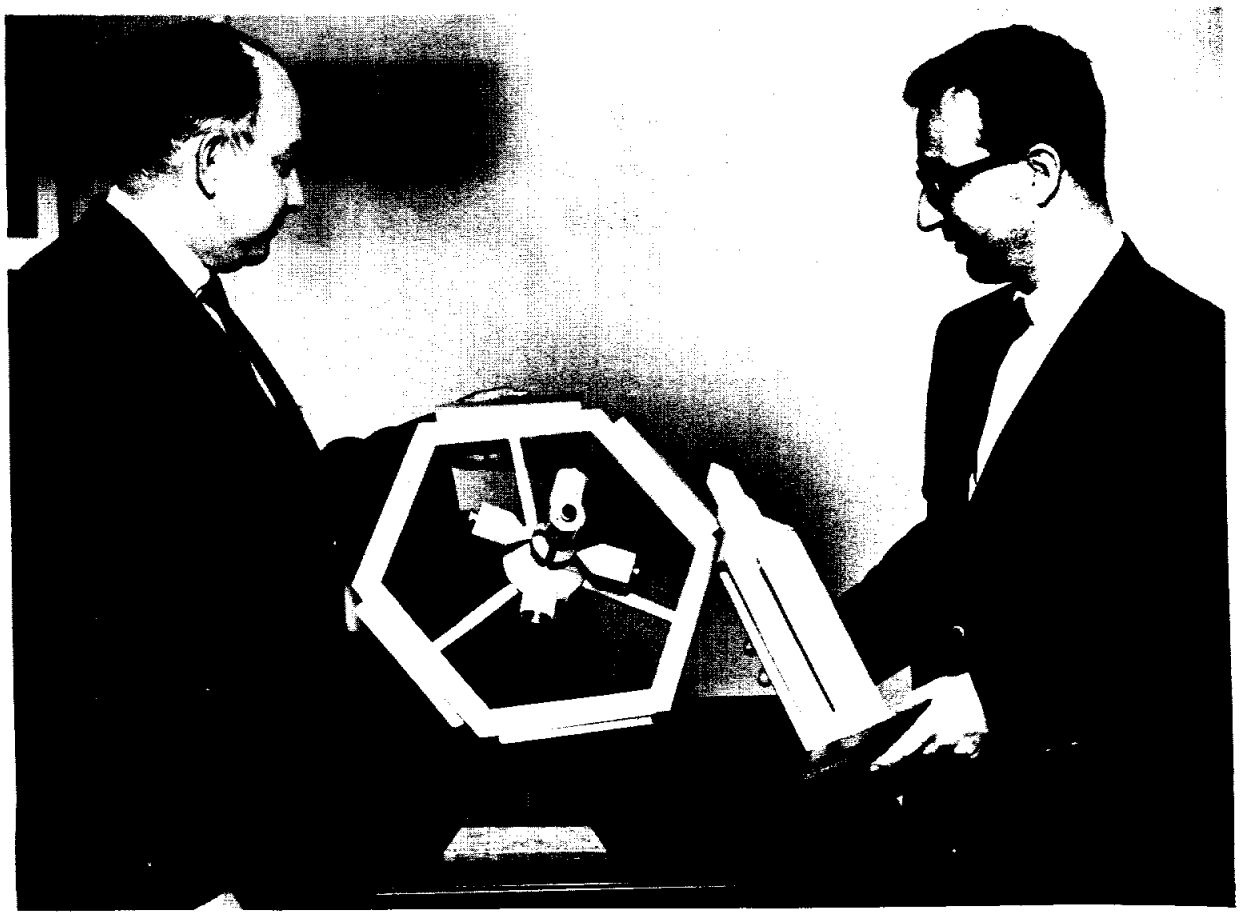
WL	Step 1	Step 2	Step 3	Step 4
1	2.08	2.19	2.30	2.41
2	2.20	2.32	2.44	2.55
3	2.33	2.45	2.57	2.70
4	2.47	2.60	2.73	2.86
5	2.59	2.73	2.87	3.00
6	2.73	2.87	3.01	3.16
7	2.86	3.01	3.16	3.31
8	3.00	3.16	3.32	3.48
9	3.13	3.29	3.45	3.62
10	3.26	3.43	3.60	3.77
11	3.41	3.59	3.77	3.95
12	3.56	3.75	3.94	4.13

SUPERVISORY

WS	Step 1	Step 2	Step 3	Step 4
1	2.60	2.74	2.88	3.01
2	2.83	2.98	3.13	3.28
3	3.07	3.23	3.39	3.55
4	3.19	3.36	3.53	3.70
5	3.32	3.49	3.66	3.84
6	3.44	3.62	3.80	3.98
7	3.55	3.74	3.93	4.11
8	3.68	3.87	4.06	4.26
9	3.86	4.06	4.26	4.47
10	4.00	4.21	4.42	4.63
11	4.29	4.52	4.75	4.97
12	4.60	4.84	5.08	5.32
13	4.89	5.15	5.41	5.67
14	5.19	5.46	5.73	6.01

Shift Differentials: 2nd Shift .08, 3rd Shift .12.

This schedule supersedes the schedule approved July 30, 1962.



SELF ERECTING SPACE STATION-- Rene A. Berglund, left, examines a model of the erected modular space station which he invented and was awarded $400 recently by NASA Inventions and Contributions Board. William E. Stoney Jr., chief, Spacecraft Technology Division of MSC, holds a model of the compactly clustered space station ready for launching.

Erectable Modular Space Station Designed By MSC Branch Chief

Large satellite islands or stations to be erected in near-earth orbit have long captured the imagination.

The establishment of a space laboratory of the size currently envisioned suggests a means for carrying out scientific and engineering research under real environmental conditions.

A result of investigations to determine the feasibility of a concept for an automatically deployed man orbital space station has led to the development of a base-point design of a 21-man station.

Inventor of the "Erectable Modular Space Station" is Rene A. Berglund, chief, Space Vehicle Design Branch, Manned Spacecraft Center.

NASA Inventions and Contribution Board awarded $400 recently to Berglund for his invention which was developed at the NASA Langley Research Center.

The concept of the space station is based upon the use of a series of rigid modules hinged together which can be compactly clustered for launch by a single launch vehicle.

A Saturn C-5 will place the package in orbit, the space station will automatically deploy itself; thus, in-orbit assembly is not required. The crew, launched with the station in a vehicle such as a modified Apollo, enters the space station and begins operations.

The 150-ft diameter space station design would have a gross weight of approximately 125,000 lbs, which included all equipment initially in the station.

An additional 30,000 lbs., which are launched with the station, include the ferry vehicle, command module, service module, launch-abort tower and the inter-stage structure.

The outer ring rotates to provide artifical gravity while the ron rotating center hub contains the docking facilities and the zero-g laboratory for experimental purposes.

Each module in the space station will have a completely self-sufficient life-support system, with pressure-tight doors and air locks between each of the adjoining modules.

A shirtsleeve environment is to be maintained throughout the 60,000 cu. ft. space station. With such a large volume, as many as 36 men can be accommodated in the space station at one time.

Of all the problem areas uncovered in building such a space station, the most important is the determination of methods of constructing large leakproof joints.

Gemini

(Continued from page 1)

drogue and an 84-foot diameter ring-sail recovery parachute placed in a rendezvous-and-recovery section mounted on the small end of the spacecraft. The canister also houses the Gemini rendezvous radar equipment. Mercury experience has been used extensively in the design of parachutes and necessary system components.

Tests over Salton Sea are made from a C-130 cargo-type aircraft. The boilerplate, mounted on a sled within the aircraft, is extracted from the rear of the cargo compartment by an extraction chute. After extraction, the boilerplate separates from the sled and "free falls" to around 12,000 feet where the stabilization parachute is separated and the Gemini recovery system is "armed."

At 10,600 feet above water, the sequencing is initiated with the deployment of the drogue parachutes. After a two-second delay, the canister separates to deploy the main parachute.

After 22 seconds, a single-point release is fired to free the bridle which allows the spacecraft to rotate on a two-point suspension system and assume a "nose-up" position 35 degrees from the horizontal. The 35-degree impact inclination lowers the spacecraft into the water on the "corner" of its heat shield, appreciably lessening the shock of landing impact. This method of water landing also eliminates the need for the impact bag which was used for Mercury spacecraft landings.

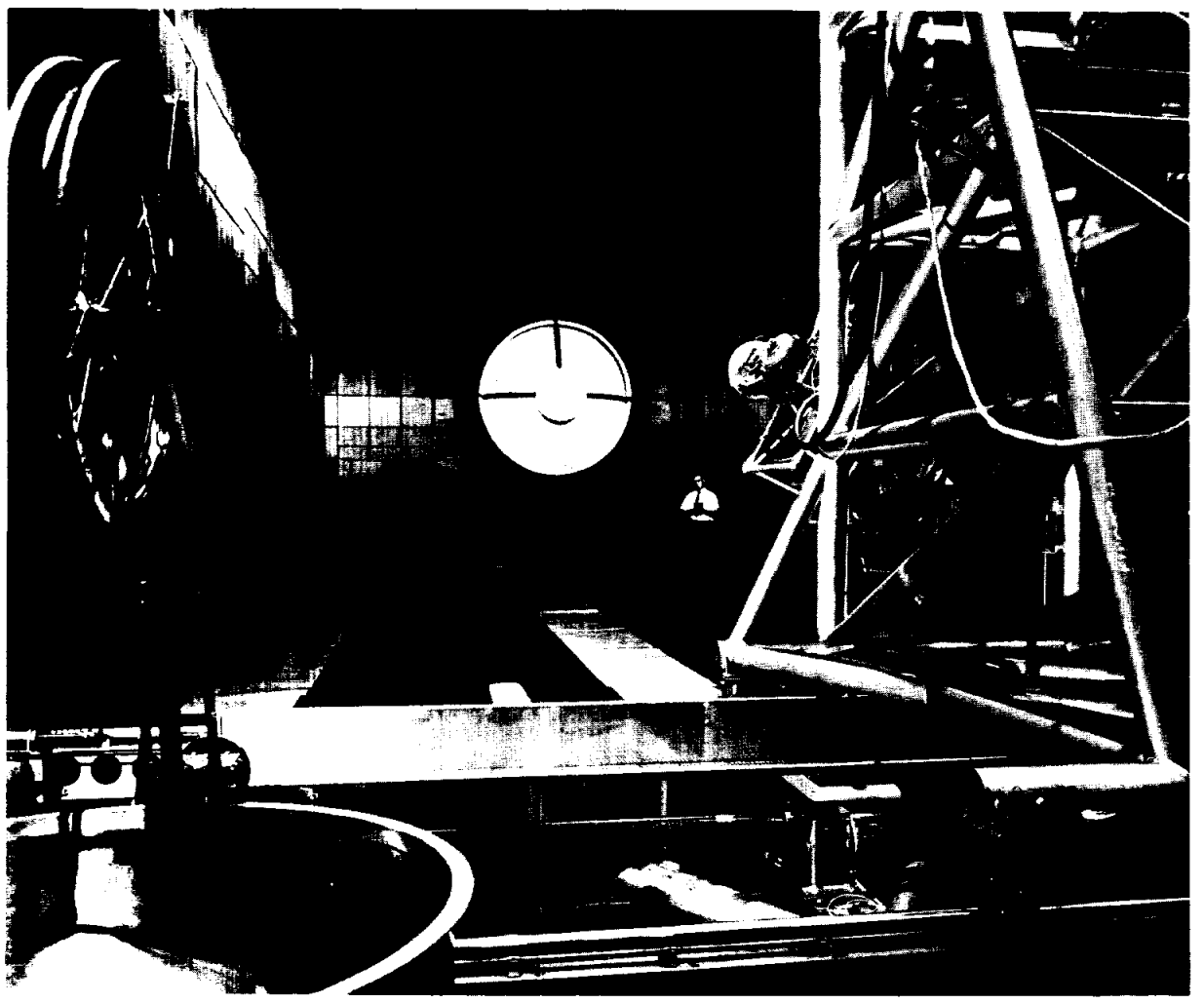
The parachute recovery system will be replaced later by a land landing system for which the paraglider is now under development. Throughout manned Gemini flights, ejection seats -- which can be triggered by each astronaut individually for a rapid escape from the spacecraft -- will serve as the emergency back-up recovery system.

Raytheon To Design,

Raytheon Company, the world's largest company devoted exclusively to electronics, is directing a wide range of special skills to the conquest of space.

Most significant space assignment to date is the design and development of the on-board digital guidance computer for the Apollo Command module, for which the company is providing industrial support to MIT's Instrumentation Laboratory. The computer will process data for the automatic operation of flight functions and will present essential information to the crew for the navigation and control of the Command module during the lunar mission. Also included is the production of the computer test set, simulator, and calibration equipment.

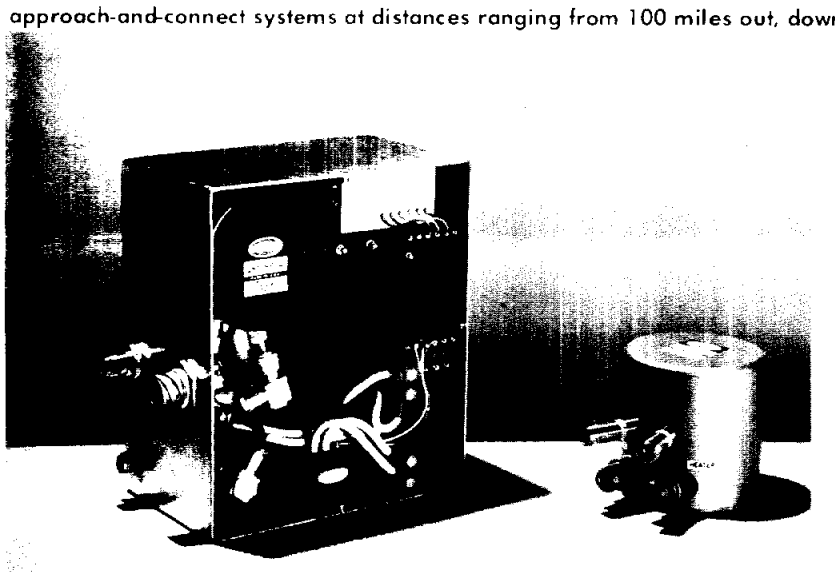
Founded some forty years ago when electronics was in its infancy, Raytheon established itself in the '20's and '30's primarily as a manufacturer of radio tubes. During World War II the company rose rapidly to major stature as the leading producer of sur-



RAYTHEON'S PROTOTYPE rendezvous radar undergoes tests in Martin Company's space flight simulator. Planned for advanced space systems use, the radar is designed to help astronauts maneuver their vehicles accurately from initial to final stages of rendezvousing at a specific point in space. Simulator can test automatic and manned approach-and-connect systems at distances ranging from 100 miles out, down to final docking.

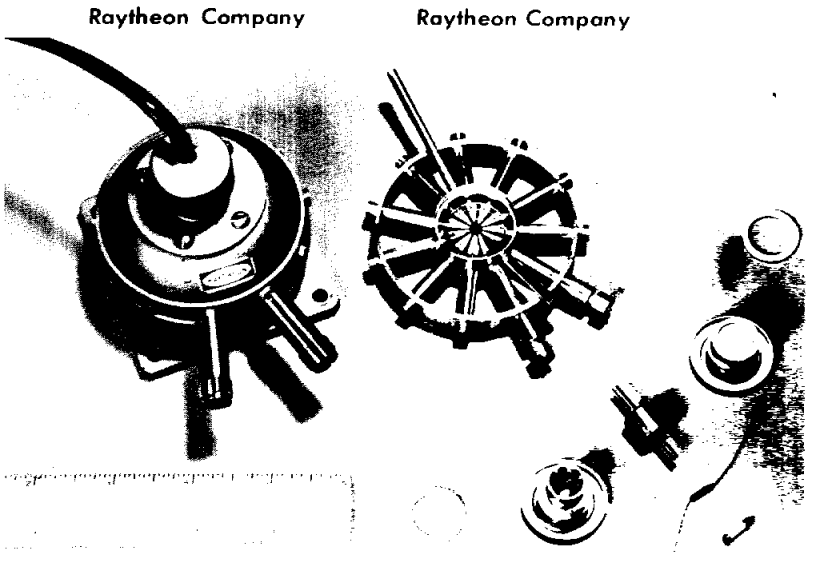
THOMAS L. PHILLIPS
Executive Vice President
Raytheon Company

DONALD N. YATES
Vice Pres. and Gen. Mgr. Space and Information Systems Division
Raytheon Company

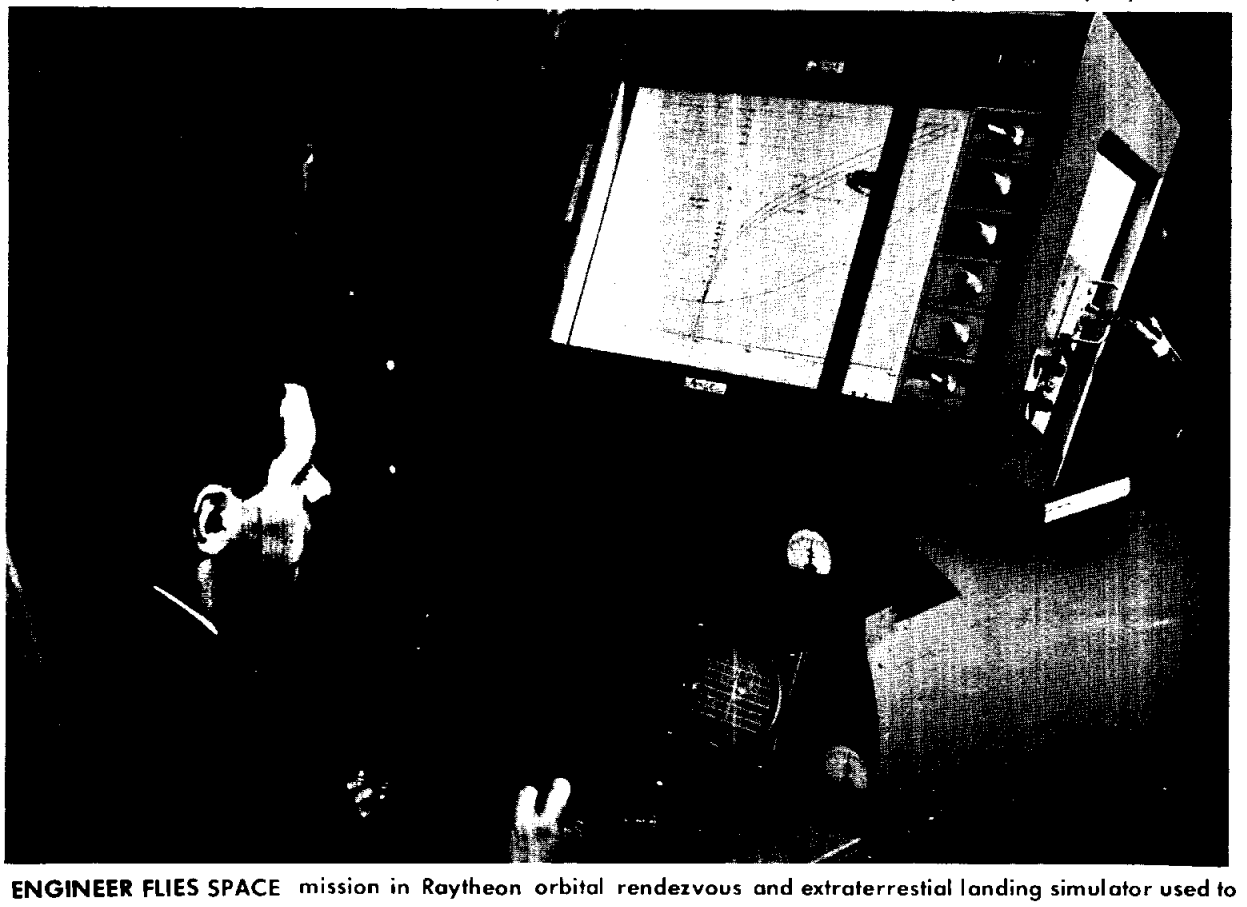


THE RAYTHEON DEVELOPED S-Band Telemetry Amplifier. This highly efficient, ruggedized amplifier is a portion of the Raytheon designed Telemetry and Communication Systems for Spacecraft Systems.

THOMAS P. CUTLER
Apollo Program Director
Raytheon Company



BASEBALL-SIZED Amplitron microwave amplifier selected by NASA for Mariner spacecraft telemetry and built by the Raytheon Company.



ENGINEER FLIES SPACE mission in Raytheon orbital rendezvous and extraterrestial landing simulator used to determine sensor functional requirements for space missions. The simulator was used in conjunction with a NASA funded study conducted by Space and Information Systems Division to establish the operational environment and determine the functional requirements of sensors needed for the lunar and earth orbit rendezvous phases and the lunar landing phase of future space missions.

TECHNICIANS AT RAYTHEON'S Sudbury plant working on component assemblies for Apollo Guidance Computer. NASA has awarded Raytheon a $15 million plus contract to produce the digital guidance computer for the Apollo manned lunar exploration program.

Develop Apollo On-Board Digital Guidance Computer

face-search radar for the U. S. Navy and of radar magnetrons for the Free World.

Since the war the firm has extended this leadership throughout the fields of radar and microwave components. Successfully completed projects include a nationwide network of "Storm-Finder" radars for the Weather Bureau and the Navy, "Flight-Tracker" radars deployed across the country for the FAA, and airborne navigational and bombing radars for Air Force B-52 and B-58 bombers.

Meanwhile Raytheon has been developing skills in a wide variety of other fields such as microwave and infrared communications, data processing, and semiconductors devices.

A unique asset for space systems work is Raytheon's head start in missile guidance and control. As early as World War II, the company was at work on a guidance system that would enable missiles to track and destroy Kamikaze planes. Continued development carried on after the end of hostilities despite the general postwar relaxation, proved out dramatically in 1950, when a Raytheon guidance system installed in the experimental U. S. Navy ground-to-air Lark missile achieved history's first interception by a guided missile of an aircraft in flight.

Following this success, the U. S. Navy called upon Raytheon to develop and produce an air-to-air missile system now known as Sparrow III.

In 1954, the U. S. Army assigned Raytheon complete systems responsibility for developing and producing a ground-to-air missile called Hawk. Thus Raytheon became the first and only electronics company to be awarded prime contracts for two missiles.

As a result of the performance of Sparrow III and Hawk, Raytheon was entrusted with the design and production of guidance systems and components for Tartar, Talos, Polaris, Mauler and other missiles. The same skills are now being directly applied to the Apollo guidance computer.

Raytheon today is a world-wide company with some 40 plants and 35,000 employees.

Highlighting the firm's increasing emphasis on aerospace at the corporate level, Thomas L. Phillips, who directed development of Sparrow III and Hawk, was named last year to the post of executive vice president. He will be joined this fall by D. Brainerd Holmes, formerly director of NASA's Manned Space Flight Program, as a senior vice president.

The company's spaceborne systems work is conducted by the Space and Information Systems Division, which was organized early last year with Donald N. Yates, formerly commander of the Air Force Missile Test Center at Cape Canaveral, Florida, as vice president and divisional general manager. The division maintains an R & D center in Bedford, Mass., with operations in nearby Sudbury and Waltham and in Santa Barbara, Calif.

Facilities include a unique space environmental simulator and a ballistic test facility -- both company-owned. The Raytheon rendezvous radar has been installed in the Martin Company's rendezvous, closure and docking laboratory.

In addition to the Apollo on-board guidance computer, the division is working on a wide variety of company-funded study and development projects such as: LEM sensors (altimeters, laser rangefinders, etc.); Lunar Logistics System navigation and guidance; LUMAS (lunar mapping system); Rendezvous guidance sensors; Lunar Communications systems; Deep space optical communications; Digital TV for satellites: and, Star field scanner.

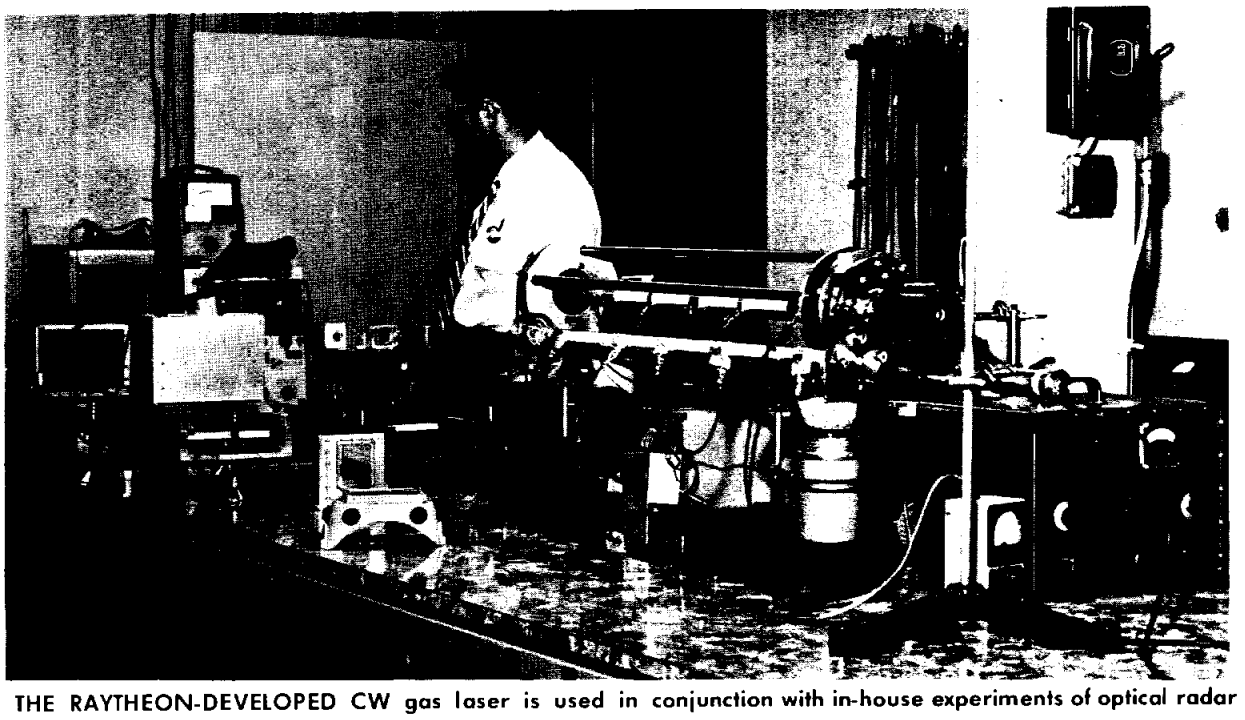
Also, Manned space station systems; guidance, control, navigation, communications; Manned satellite inspector navigation, guidance and control; Navigation satellite; and, Pyrolytic graphite high-temperature material for reentry bodies.

The Missile Systems Division is supplying the accelerometers used in the Syncom satellite. This division is continuing to develop heavy, sophisticated tracking radars for use in obtaining precise orbital and signature data. A contract has been completed for the study of an advanced earth satellite weapons system.

Several other Raytheon divisions are lending vital components support. The Microwave and Power Tube Division has developed a baseball-sized Amplitron microwave amplifier tube for telemetry transmission from deep-space probes; magnetrons and backward-wave oscillators for meteorological satellites and other space applications; and magnetic components for Apollo and Nimbus.

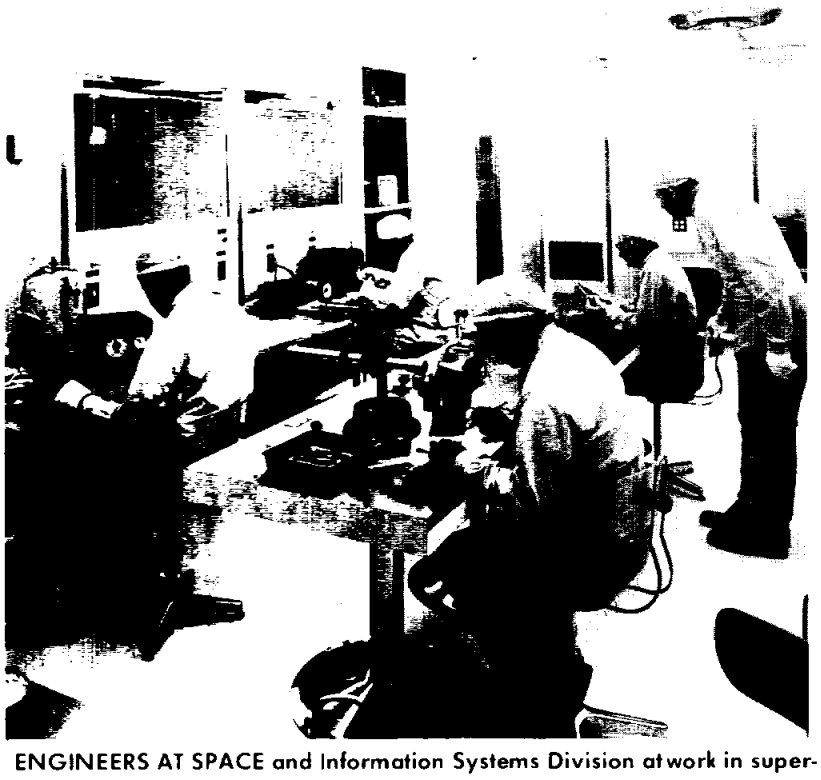
Since the early days of electronics, Raytheon has been building, diversifying, and strengthening its skills. Many of the skills on which the company has built its reputation are directly applicable to such space problems as satellite sensors, communications, guidance and control. A large integrated organization with both systems and components capabilities, Raytheon will play a significant role in the conquest of space.

M.I.T.'S HISTORIC MOON SHOT of 1962 employed a Raytheon 50-joule four-cavity laser, the most powerful then available. Raytheon is now producing lasers delivering as much as 500 joules and is actively developing space applications.

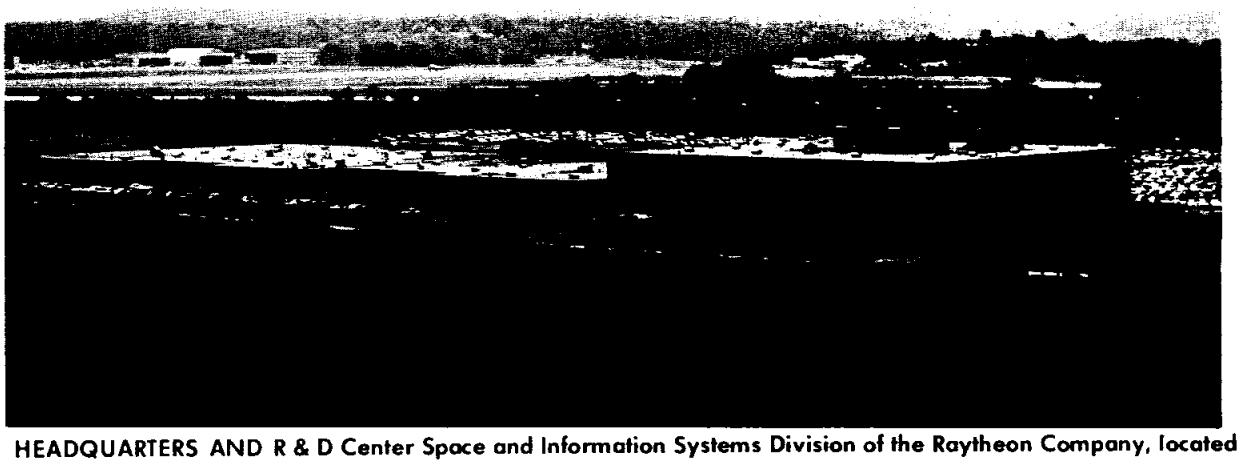


THE RAYTHEON-DEVELOPED CW gas laser is used in conjunction with in-house experiments of optical radar techniques. The above effort is part of an overall investigation of guidance, navigation and communications requirements for space missions using optical techniques. Raytheon Company is currently applying its knowledge as a leader in airborne radar to developing operational optical laser radar systems for space missions.

Editor's Note: This is the eleventh in a series of articles designed to acquaint MSC personnel with the Center's industrial family, the contractors who make MSC spacecraft, their launch vehicles and associated equipment. The material on these two pages was furnished by the Public Relations Department, the Raytheon Company.



ENGINEERS AT SPACE and Information Systems Division at work in superclean Inertial Guidance Laboratory working on Raytheon designed star-field scanning device. Unlike conventional star trackers, this device electronically scans a given field of view, then locates and reads out the star image within that field.



HEADQUARTERS AND R & D Center Space and Information Systems Division of the Raytheon Company, located in Bedford, Massachusetts

The SPACE NEWS ROUNDUP, an official publication of the Manned Spacecraft Center, National Aeronautics and Space Administration, Houston, Texas, is published for MSC personnel by the Public Affairs Office.

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Editor ..... Milton E. Reim

On The Lighter Side

What's In A Name ?

Names, when considered other than just a "handle" given people when they are born, may be construed to mean many things.

With this in mind, the MSC personnel roster was scanned and the following information developed for any value it might have. At least it is believed that MSC would be quite self sufficient in many ways if put on its own for survival.

One of the first conditions people think about for any area is the weather. MSC has two Summers and one Winterhalter to take care of that detail. It has three Carpenter(s), three Mason(s), a Painter and a Plummer for its House and seven Hall(s).

Otherwise occupationally speaking, it has an Archer, a Hunter, eight Fisher(s), seven Millers(s), three Cooper(s), two Driver(s), three Porter(s), two Purser(s), a Stoker, a Warden, a Wheelwright, and a Tanner for the Tannery.

In order to eat well it might be remembered that MSC has ten Baker(s) and three Cook(s). MSC personnel can Grow in its Fields and Meadows such items as Cotton, its four Berry(s), Appel, two Bean(s), Collard, two Curry(s), three Rice(s), three Green(s), and Carraway for seasoning, along with two Lemon(s).

They may also prepare in the Kitchens a Hogg, a Pigg, Lamb, Chop, Hamburger or Elk. For cooking and drinking purposes there are three Waters, four wells, Coffey, Stout and Beers for the one Boozer.

For those enjoying the great outdoors there are six Wood(s) with two Wolfe(s), three Hill(s), a Sea and two Shores, a Lea and a Moor for the eleven Walkers. There is also a Park with a Bird, a Wren, and a Peacock and a Teegarden with a Violette and a Rose and Thorn. Lest one might think that MSC encompasses only a small territory it might be well to point out that located in it are the Thames, Spain, Germany and Naples.

There are two Watts to furnish needed electricity for the one Light and one Schick, and three Weaver(s) and thirteen Taylor(s) to furnish the Suit with three Price(s). There is a Toy for recreation and six Ward(s) for any who might suffer injuries. For transportation there is a Filley and a Ford available and Faith in the country is exhibited by the Flagg.

If this has confused you and given you the impression that MSC is a rather different organization, be not dismayed - there are thirty Smith(s), twenty - one Jones, and thirteen Brown(s) here too. And if this is too much for today, there is always the Morrow.

At least MSC has used its own Paper for this Storey.

Saturn

(Continued from page 8)

pioneer the way for the first manned flights to the moon.

After the first fully powered Saturn I flight, a regular schedule of tests will follow, including both manned and unmanned exploratory missions to prepare for later flights to the moon with the Saturn V.

Checkout tests of the vehicle will continue prior to delivery to Cape Canaveral.

WELCOME ABOARD

Listed are the 53 new employees to come aboard MSC during the time of July 26 through August 14. All but 14 were assigned in Houston.

CENTER MEDICAL OPERATIONS OFFICE: John J. Gordon and Charles A. Berry.

FLIGHT OPERATIONS DIVISION: Harold R. Fortney, William F. Haldeman, Claude A. Graves, Jr., and Wiley P. Beal.

PERSONNEL DIVISION: Jack L. Wiley, Joan D. Fitzmorris, Edwin B. Cassady, Roberta B. Sleeper, John J. Daunt, Jane B. Peto and Lee R. Shearin.

MSC ATLANTIC MISSILE RANGE OPERATIONS (Cape Canaveral): James L. Bolton, Richard A. Serra, Robert L. Hughens, Jr., Leo C. Nicholas, David R. Forward and Charles B. Hirsch, Jr.

SPACECRAFT TECHNOLOGY DIVISION: Billy D. Sturm and Joe D. Gamble.

CREW SYSTEMS DIVISION: Douglas A. MacPherson, Roxanne C. Hoffman and James H. O'Kane.

FACILITIES DIVISION: Patricia G. Williams.

APOLLO PROJECT OFFICE: Joanne R. Cardillo (White Sands, N. M.), Henry T. Gawrylowicz (Bethpage, N. Y.), Alma L. Griffey (Downey, Calif.), Henry C. Sullivan, Jr. and Nelda C. Foster.

OFFICE SERVICES DIVISION: Bessie A. Ross.

COMPUTATION AND DATA REDUCTION: Barbara J. Arabian, Jeanette E. Mikus and Sidney L. Whitley.

INSTRUMENTATION & ELECTRONIC SYSTEMS DIVISION: Mary E. Barnes.

OFFICE OF DIRECTOR: Philip T. Hamburger.

WHITE SANDS MISSILE RANGE OPERATIONS: Braxton A. Leddon, Ruben Porras, Doris K. Ryan, Glen T. Grimes and Nestor G. Sandoval, Jr.

SYSTEMS EVALUATION & DEVELOPMENT DIVISION: Thomas M. McPherson and Carl T. Stewart.

FINANCIAL MANAGEMENT DIVISION: Monroe B. Sorge and William J. Ferguson.

OFFICE OF ADMINISTRATIVE SERVICES: Roy H. Field and Marjorie B. Brennan.

ASSISTANT DIRECTOR FOR INFORMATION AND CONTROL SYSTEMS: Lloyd L. Gordon.

SPACE ENVIRONMENT DIVISION: Robert L. Patterson and Donald A. Witt.

GROUND SYSTEMS PROJECT OFFICE: Charles W. Busch.

SECURITY DIVISION: Charlie E. Doty.

PROCUREMENT AND CONTRACTS DIVISION: Madeline I. Withoff.

MSC PERSONALITY

Former Houston Man Returns To Join MSC

Philip T. Hamburger, has returned to his native city of Houston to join the staff of the Manned Spacecraft Center as assistant for Congressional Relations (Office of Director) and will replace O. G. Lindquist who has held the position since October 1962.

Lindquist resigned effective August 15 to return to the field of banking and industry.

Hamburger is no stranger to Houston, having served two terms as City Tax Commissioner prior to entering the U. S. Navy to serve during World War II. He was discharged in 1946 with the rank of commander and returned to Houston to serve as Councilman - at - Large and Mayor pro tem for three terms.

From 1953 to 1957, Hamburger ran his own advertising and public relations business here in Houston. He holds a life membership in the Houston Salesmanship Club.

Duties in his new position will include the responsibility for coordinating matters involving Congressional relations; serving as a principle advisor to the MSC Director, Dr. Robert R. Gilruth; and coordinating details of visits to MSC by members of Congress and other VIP visitors. He will also report to NASA Headquarters in Washington on significant actions involving Congressional matters and coordinate responses at MSC to requests received from members of Congress.

PHILIP T. HAMBURGER

Prior to joining MSC, Hamburger served as Public Information Specialist in charge of training, education and public affairs in the Texas Regional Office of Civil Defense at Denton. Before that he held positions as Public Relations Officer at the Battle Creek, Mich. headquarters of Civil Defense mobilization.

Born in Houston, Hamburger studied journalism and public relations at Baylor and Houston University. He and his wife, the former Azalee Morgan also of Houston, reside at 4394 Varsity Lane.

While in Denton, Hamburger served in various positions of trust in the community. He was on the board of stewards of the First Methodist Church, board of directors Rotary Club, board of directors Chamber of Commerce, board of directors North Texas Chapter Public Relations Society of America, area governor Toastmaster International, head of the North Texas Longhorn Council of Boy Scouts and was a member of the Men's Garden Club of Denton.

Gardening happens to be one of his favorite hobbys along with playing the electric organ, ice skating, hunting and fishing.

Apollo

(Continued from page 1)

The remainder will undergo various ground, air drop and parachute descent tests.

The contract also calls for the company to provide ten additional spacecraft in various stages of production. Other equipment to be furnished by North American includes two mission simulator trainers, one to be located at Cape Canaveral and the other at MSC, Houston, Tex.

The $934,400,000 total includes fees and estimated costs of work performed at the North American Facility and at facilities of more than 1200 subcontractors and suppliers throughout the U. S. It is estimated that approximately 50 percent of the contract dollars will go to the subcontractors and suppliers.

The lunar excursion module of the Apollo spacecraft, the vehicle which will be detached from the command and service modules in lunar orbit and land two astronauts on the surface of the moon, is being developed by the Grumman Aircraft Engineering Corp., Bethpage, L. I., under a contract to NASA.

The NASA's Manned Spacecraft Center at Houston is responsible for technical management of the North American and Grumman contracts.

WORLD'S LARGEST– Astronaut Donald K. "Deke" Slayton is readied for a ride in the world's largest centrifuge at Johnsville, Pa. Called the 'Wheel' by astronauts, the centrifuge has been fitted with the two-man Gemini project displays and controls.

SIMULATED SEAT EJECTION– McDonnell Aircraft Corp. and NASA engineers perform a simulated seat ejection from the mock-up version of the Gemini spacecraft with Mercury astronaut Virgil I. "Gus" Grissom.

PREPARATION– After checking into a Los Angeles hotel, astronaut Charles Conrad Jr., studies the Apollo cockpit layouts to prepare for a meeting the next morning at North American Aviation Corp.

Constant Preparation A Prime Requirement Of Being An Astronaut

The day of an astronaut begins much like that of any other American, but once he arrives at his particular assignment for the day the similarity ceases.

Mercury astronaut Virgil I. "Gus" Grissom in a typical day took off from Ellington Air Force Base in a T-33 jet for St. Louis and McDonnell Aircraft Corp., prime contractor for Gemini.

Grissom's assignment was to provide a liaison between Gemini and his colleagues. While in St. Louis, he checked modifications in the Gemini pressure suit, a new seat installation and the new rocket ejection seat escape system in a mock-up of the Gemini spacecraft.

Following a busy day at McDonnell, Grissom prepared for some testing the next day in the Johnsville centrifuge in Pennsylvania, knowing that he would be returning to St. Louis soon for more reviews and other technical problems to bring Gemini closer to its first flight.

Grissom's work load is much the same as that of the other 15 astronauts at NASA's Manned Spacecraft Center in Houston. Seven, including Grissom, were chosen for Project Mercury in April of 1959. Nine more were added to the space flight pool in September of 1962.

Each of these 16 men has to be a "Jack-of-all-trades." He is a pioneer in the peaceful exploration of space, in top physical condition, proficient in piloting high performance aircraft and has a background in science or engineering.

All must study advanced concepts in the fields of geology, astronomy, guidance and navigation, and computer theory, as well as other related special courses of instruction.

Grissom, upon arrival in Johnsville, was joined by astronauts Donald K. "Deke" Slayton and Alan B. Shepard Jr., America's first man in space.

The three Mercury astronauts renewed their acquaintance with the big centrifuge where they experienced, in the gondola, up to 14 G's or 14 times the normal gravitational pull.

At the same time a conference was being held by North American Aviation Corporation in Los Angeles, Calif. for 11 of the astronauts to review the manned moon project Apollo. They were alerted to possible malfunctions that could jeopardize the mission. Every possible situation must be anticipated.

A member of this group, astronaut Edward H. White, went on to Edwards Air Force Base to evaluate the control systems used in the X-15 as part of his assignment to design and develop space flight control systems.

In the X-15, designed for speeds of 4,000 mph, the gravity forces are so severe that the pilot cannot use a conventional control stick. Instead, he employs two side-arm controllers which are operated by wrist movements.

White examined these side-arm controllers to gain information for the selection of controllers in MSC projects and after gathering other pertinent information returned to Houston.

Another of the astronauts, Thomas P. Stafford remained in Los Angeles an extra day to talk to NAA engineers further about communications and instrumentation systems in Apollo. His assignment is to insure that the on-board systems are properly integrated with the mission control system, ground operational support and other communications links.

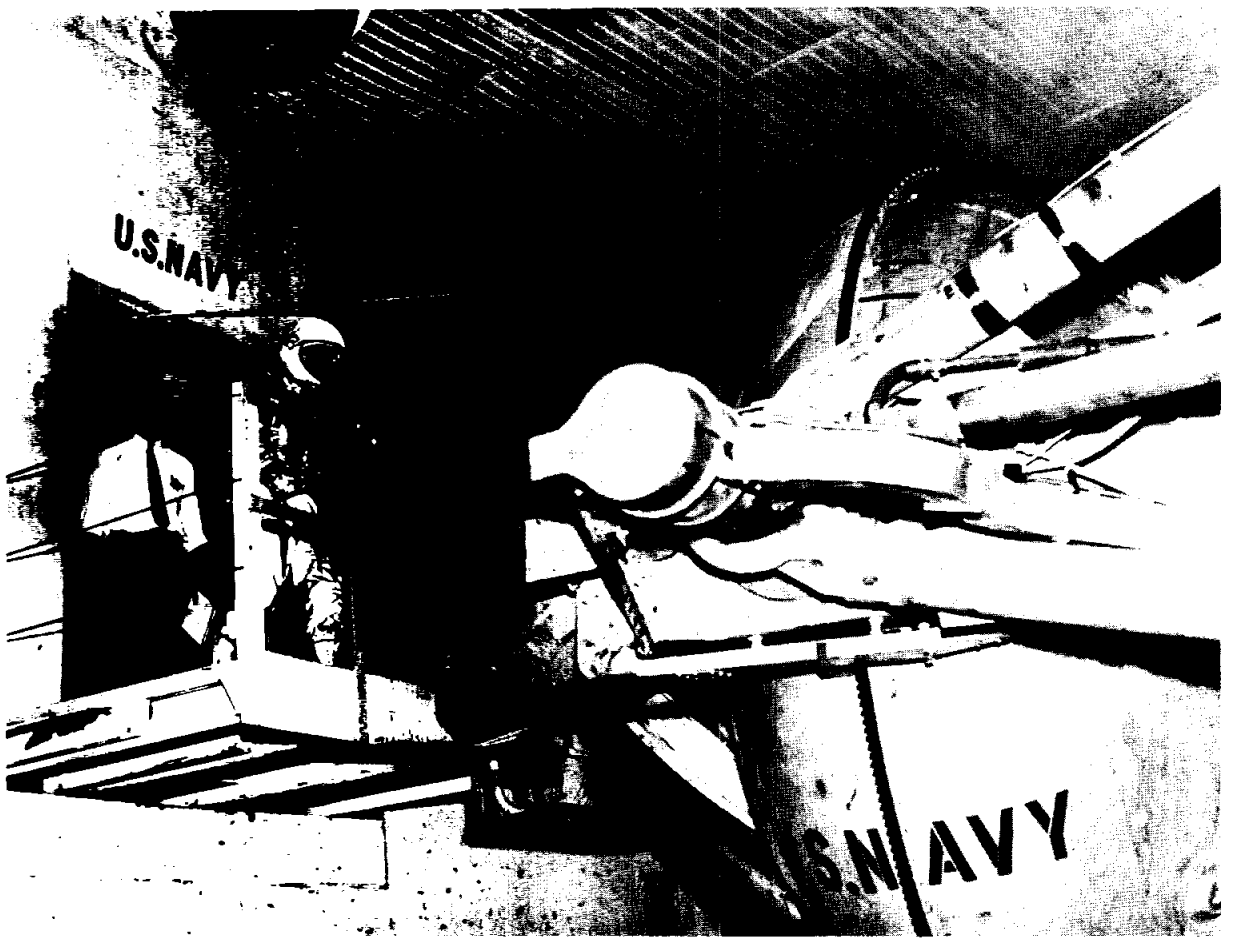
Leaving Los Angeles, Stafford joined astronaut Elliot M. See Jr. at Ames, 35 miles south of San Francisco, where they participated in a research program designed for later astronaut training.

Part of the training at Ames included a unique five-degree-of-freedom centrifuge that imposes stresses on the astronaut which the wheel at Johnsville cannot. The tests are designed to determine the astronaut's ability to read vital instruments during the flight of the spacecraft, and to test ability to react and take proper corrective control actions during the mission.

Returning to Houston and offices in the temporary facilities of MSC, the astronauts are confronted with mounds of mail and each has to answer about 100 letters a week.

In addition to letter writing, there are briefings to be held and technical reports to be written.

All in all, the day-to-day life of an astronaut does not leave much time for loafing or leisure. A constant air of preparation for the future seems to prevail.



FAST ACCELERATION– Astronaut Alan B. Shephard Jr., approaches the world's largest centrifuge at Johnsville, Pa. The centrifuge can accelerate from a dead stop to over 170 miles per hour in seven seconds.

Lunar Pup-Tent Is Being Developed As Survival Shelter

A pup tent is being designed for use by astronauts on the moon. The NASA-Manned Spacecraft Center here has asked Armour Research Foundation of Chicago to design a portable survival shelter which would protect two astronauts for two to 10 days in case they could not return to Earth on schedule.

Space News NASA ROUNDUP!

SECOND FRONT PAGE

Conferees Told Of Mercury Effect On Space Technology

Christopher C. Kraft, Jr., chief of the NASA Manned Spacecraft Center's Flight Operations Division, said in Blacksburg, Va. last week that the real knowledge that came from Project Mercury was of a need for a change in the basic philosophy of the program.

Speaking before some 300 scientists and engineers during the conference on Artificial Satellites at Virginia Polytechnic Institute, Kraft reviewed the scientific accomplishments of the Mercury program from its beginning until conclusion.

He noted that in the beginning the capabilities of man were not known and the systems had to be designed to function automatically. But with the addition of man to the loop, this philosophy changed 180 degrees since primary success of the mission depended upon man backing up automatic equipment that could fail.

MSC's Flight Operations Chief said that the basic aims of the program were accomplished in less than five years from the start of the program. "The first U. S. manned spaceflight program was designed to (1) put a man into earth orbit, (2) observe his reactions to the space environment and (3) bring him back to Earth safely at a point where he could be readily recovered. All of these objectives have been accomplished, and some have produced more information than we expected to receive."

The program demonstrated that man had a unique capability to reduce a mission that would not have been successfully completed with automatic equipment, Kraft said. "Man serves many purposes in the orbiting spacecraft.... he provides redundancy not obtainable by other means, he conducts scientific experiments and he can discover phenomenon not seen by automatic equipment."

According to Kraft, most important is "redundancy, the ability of a (man-rated) system to take over.... if the primary system fails." It might be called the safety valve feature of the spacecraft.

Kraft noted that the instance in Mercury flight in which the automatic system for reentry was used completely was at the end of Walter Schirra's six orbits. In all other flights, the astronaut took over and manually performed at least one part of the reentry.

The Mercury program also taught us about the "reliability requirement" and the need to check details carefully. It is a requirement that cannot be designed into a system on the drawing board. It consists of developing a contractor team that will take care to follow procedures and deliver a reliable product.

"The smallest mistake in a man-rated system can bring totally unexpected results, "Kraft told the scientific group. "The unexpected is the rule in the unknown, and if man is going to live in the region beyond our atmosphere, he is going to live under new rules or not at all. We have been aware of these rules.... but they have not been brought to our attention so vividly as they have in the manned flight program."

To the question: Can man adapt to an environment which violates most of the laws under which his body operates? Kraft said "yes....for the period of one to two days." He listed the problems that were solved as: (1) the crushing acceleration of launch, (2) weightlessness, (3) the effects of weightlessness on the cardiovascular system, (4) disorientation and (5) environmental equipment to provide life support.

Another of the contributions was in the area of aeromedical equipment development. Blood pressure measuring systems were manufactured that would automatically take readings and transmit them by telemetry to the ground. These increased the accuracy of data coming back from the man in space. The inflight studies of the space pilot's reactions are probably the most complete medical records ever kept on an individual. Their value, Kraft said, has been to reaffirm that man can function normally in the space environment.

Kraft explained that Mercury also taught us not to stack the components on top of each other. It forces limited access. Failure of one component makes it necessary to pull out other functioning systems to replace the malfunctioning part. In the Gemini and Apollo spacecraft, Kraft said equipment will be modular and replaceable, allowing the substitution of alternate parts without tearing out whole subsystems.

The Flight Operations Chief concluded by stating: "The manned space flight program has added greatly to our knowledge of the universe around us and demonstrated that man has a proper role in exploring it. There are many unknowns that lie ahead in space, but we are reassured because we are confident in overcoming them by using man's capabilities to the fullest... We now depend on man in the loop to back up the automatic systems rather than using automatic systems alone to insure that the mission is accomplished.... we have arrived at what we think is the propper mixture of that formula. Man is the deciding element; but we cannot ignore the usefulness of the automatic systems."

NASA SPONSORED SEMINAR– Shown are leaders of the recent NASA sponsored seminar in Downey, Calif. to discuss more effective means of obtaining NASA's Reliability and Quality Control objectives at contractors and subcontractors manufacturing systems, subsystems, or components for the Apollo Program. They are: (l. to r.) Harvey W. Fritz, manager of Reliability and Quality Assurance; Earl K. Smith, head of Quality Control, Resident Apollo Spacecraft Project Office (RASPO); Robert O. Piland, acting manager of the MSC Apollo Spacecraft Project Office; and George A. Lemke, manager of RASPO. Lemke welcomed the 50 government inspection agency representatives and Piland delivered the keynote address to the group. Smith served as moderator of the seminar.

Many Mercury Launch Delays Explained To Quality Assurance Inspector Seminar

Failure to seek out and eliminate discrepant components at the supplying source, before they became a part of a Mercury flight system, generated many delays in the Mercury launch schedules, Manned Spacecraft Center's Frank M. Crichton told a Seminar for Government Inspection Agency Personnel.

Crichton, chief of MSC-Atlantic Missile Range Inspection and Quality Control, spoke on quality control experience of the Mercury program at the recent NASA sponsored seminar at North American Aviation in Downey, Calif.

"Since every malfunction or discrepant component uncovered during preflight checkout at Cape Canaveral was regarded as a possible source of potential disaster, each defective component had to be removed from the spacecraft and thoroughly investigated, analyzed and corrected," Crichton said.

"This created a requirement for an extensive feed back of material reviews, unsatisfactory reports, and failure analysis to obtain meaningful corrective action to eliminate these components from subsequent spacecraft systems," he continued.

"It also generated a tremendous flow of spare parts to be returned to suppliers for rework or redesign," he added.

Crichton displayed photographic evidence of unsatisfactory spacecraft components and parts uncovered during the exhaustive preflight test and checkout operations at Cape Canaveral.

The purpose of the seminar was to pass on to the Apollo program inspectors the quality assurance experience and techniques developed during the recently completed Project Mercury Program.

Fifty government quality assurance inspectors attended from Washington, D. C., North American Aviation, MSC Houston and from the Resident Apollo Spacecraft Project Office in Downey.

Saturn's Second-Stage S-IV Static Test Firing Successful

NASA's Saturn second-stage S-IV vehicle moved to the threshold of space flight last week when it was successfully static test fired at Sacramento, Calif. by Douglas Aircraft Company in preparation for first launch this Fall at Cape Canaveral.

Firing of the six-engine propulsion system, lasting for more than 7 minutes, was a major milestone in the S-IV development program conducted by Douglas' Missile and Space Systems Division for NASA's Marshall Space Flight Center.

Saturn S-IV will be flown for the first time later this year. It will be mated to a S-I booster stage at the Cape for the first complete flight test of the integrated Saturn I launch vehicle.

Liftoff at Cape Canaveral of the two-stage Saturn I rocket, 170 feet tall, will signal a research and development flight test program to be concluded late in 1964. These tests will

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