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**AA INTEGRATION RFPs ISSUED.** The requests for proposals for two or more parallel nine-month study contracts for defining the **AA (APOLLO Applications)** experiment integration for the **LEM**, **SATURN** Instrument Unit and the **S-IVB** transportation vehicles for the **SATURN I** and **SATURN V** are being issued by NASA-Marshall.

Studies will include the consideration of mission analysis experiment equipment, installation and integration equipment, specialized crew requirements, launch facility requirements, tracking and other support requirements.

The two or more firms selected for the definition study contracts will be required to produce documentation for defining the next phase of the **AA** effort, i.e., the development and operations phase. Payload integration contracts for the **APOLLO** Command and Service Module for the **AA** program will be issued at a later date by NASA-Houston.

Companies receiving the RFPs: Aerojet-General, Avco, Bell Aerospace, Bendix, Boeing, Chrysler, Douglas, General Dynamics, General Electric, Goodyear Aerospace, Honeywell, Hughes, IBM, Ling-Temco-Vought, Lockheed, Martin, McDonnell, Northrop, Fairchild-Republic, Raytheon, Sperry Rand, TRW Systems, and RCA.

**NASA SEEKS DATA RELAY SATELLITE NETWORK.** NASA-Washington has begun issuing RFPs for a program of investigation of feasibility and preliminary design consideration of a system of data relay satellites to be positioned in synchronous equatorial Earth orbit combined with a complimentary network of ground stations. The network would transmit two-way voice and data communications between space vehicles and mission control centers, much in the same way as the ComSat **APOLLO** satellite system is supposed to do. The RFP (10-8561) has a due date of February 9. The system is identified as an Orbiting Data Relay Network (ODRN).

**AIR FORCE ORDERS LOCKHEED ONCORE PULSE ROCKET.** The Rocket Propulsion Laboratory at Edwards has entered into negotiations with Lockheed-Propulsion for the delivery of one 10-pulse **ONCORE (ON Command REstartable)** solid rocket motor.

Several months ago (SPACE Daily, July 7) Lockheed received a \$1,274,632 contract from the Air Force for the development of a dual-thrust, pulsed solid propellant system which is sought for the development of maneuvering satellite systems such as would be needed for rendezvous, inspection, evasion, or interception space systems.

*The Leader in Missile/Space Reporting*

**MORE**

The Air Force has expressed a desire for the development of an attitude control system for an advanced maneuvering satellite system which could produce 2000 seconds of pulsed operation (SPACE Daily, Oct. 5 & Nov. 10, '64). The latest development in this area is an anticipated contract from the AF Rocket Propulsion Laboratory to Rocketdyne for the continuation of a maneuvering satellite rocket system (SPACE Daily, Jan. 13).

**VULNERABILITY TO ARM MISSILES TO BE STUDIED.** The Army's Fort Monmouth procurement division will issue requests for quotations today for a program of research and development to establish the vulnerability of Army complexes to attacks by Anti-Radiation Missiles (ARM). A 12-month program will be contracted and will culminate in the delivery of a program plan, a computer program, and the necessary technical reports. Due date for the RFQs will be about Feb. 17.

Monmouth is already engaged in a program to develop ARM countermeasures. One program, contracted with Philco's Aeronutronic division (SPACE Daily, May 4 & 5) is in the early planning stages for the design and development of an anti-ARM decoy system. Still another Monmouth program (SPACE Daily, Sept. 28, '64) is seeking an anti-ARM system which would employ a multimode radar jammer and a pod-mounted radar repeater jammer to protect aircraft from radar-directed weapons.

**NASA MAY GO AHEAD WITH ADDITIONAL SURVEYORS.** The award by Hughes of a \$2 million contract to Thiokol for four retro-rockets (three flight models, one spare) for the heavier 2500-pound operational model **SURVEYOR** (SPACE Daily, Jan. 14) sets the stage in case NASA decides to proceed with the full 10 spacecraft plan in the **SURVEYOR** program.

The JPL contract with Hughes, as it was most recently renegotiated (SPACE Daily, Dec. 16 & 20), calls for seven engineering test spacecraft plus the long-lead-time items for the three additional operational spacecraft in NASA's approved program. One of these long-lead-time items is the solid retro-rockets produced by Thiokol. NASA still has not commenced negotiations with Hughes for the three operational spacecraft. The original **SURVEYOR** program called for 17 spacecraft (3-engineering, 7-operational, 7-advanced models) which was reduced to 10 spacecraft (3-engineering, 7-operational) and then again reoriented (7-engineering, 3-operational). With the shrinking background of the **SURVEYOR** program plus the high cost over-runs and constant scheduled slippage (SPACE Daily, Oct. 28) it is questionable whether NASA will continue with the last three spacecraft in the program.

**AEROJET TESTS SPRINT FIRST-STAGE MOTOR.** Aerojet-General has successfully performed the first of two test firings of a full-scale, solid-fueled, first-stage engine for the **SPRINT** missile. The motor has a glass filament case and uses a composite class-2 propellant, which is similar to that used for the **MINUTEMAN** missile.

## AF CHIEF ASKS INCREASED ABM/PENETRATION AIDS DEVELOPMENT

The United States must take the lead in development of anti-ballistic missile defense systems and in penetration aid offense systems if it is to maintain military superiority over the Soviet Union, AF Chief of Staff, Gen. John P. McConnell said last week (SPACE Daily, Jan. 14).

Moreover, the General said, we must maintain research and development efforts in our space program--such as the Manned Orbiting Laboratory (MOL)--to insure against a "potential...space threat posed by the Soviets...by the Red Chinese or conceivably by some other nation which, in the course of time, may acquire an offensive space capability."

### The Nuclear Strategy Threat

The United States, with some 1400 ICBM's and POLARIS missiles as well as almost 700 strategic bombers, has "unquestionable nuclear superiority today and for the immediate future," McConnell said. However, we can "easily lose that superiority" unless we can match, step by step, any technological progress by the Soviet Union.

It is essential that the United States develop means for insuring warhead penetration to the target against any predictable missile defenses, such as batteries of anti-missile missiles, he said. This includes a variety of electronic and mechanical penetration aids and decoys which would make defense not only very complicated but also extremely costly. At the same time, McConnell said, we must make continuing advances in our missile technology to keep up with any progress the Communist nations might achieve.

### Missile Defense Breakthrough and Bombers

We must be prepared, in any event, against a technological breakthrough which may lead to a "revolutionary principle of missile defense," the AF Chief of Staff said. He said this "is one compelling factor" in retaining a mixed force of missiles and bombers.

He said it is highly desirable to pursue development of the AMSA (Advanced Manned Strategic Aircraft) which would be even more advanced than the FB-111. The AMSA payload would include nuclear weapons and missiles. Also needed would be an advanced interceptor such as the YF-12A, of which a prototype is being flight tested. This craft would carry highly maneuverable air-to-air missiles.

### Need for Space Development

It is still too early to speak about a space threat except in terms of potential, McConnell said. But our future security demands that we look far ahead with regard to any potential space threat. "Our only alternative, therefore, is to learn as much as we can about the space medium so that, if and when a threat should begin to materialize, we have the knowledge and 'building blocks' to develop a proper defense against it."

## BOEING'S LUNAR ORBITER CONTRACT MODIFIED

NASA-Langley has modified the LUNAR ORBITER contract with Boeing by the addition of \$2,844,100 for development of real time and near real time computer programs for the mission.

### AF ARMAMENT OFFICE CHANGED TO LAB

As of March 1, the Directorate of Armament Development at Eglin AFB will be the Air Force Armament Laboratory. The move is part of an organizational improvement campaign and, according to the AFSC's Major General M. C. Demler, "places added emphasis on our limited war capabilities under development here." The Directorate is commanded by Colonel Walter Glover and staffed by about 300 people. The value of its current contracts exceeds \$50 million.

### GEN. MANSON NAMED TO REPLACE GEN. BRANCH

Brigadier General Hugh Manson will command the Air Force Flight Test Center at Edwards AFB in the place of the late Major General Irving Branch, who died in a recent air accident. Manson was the commander of Wright-Patterson AFB's Systems Engineering Group, a job he assumed about four months ago. He was deputy chief for operations at the Flight Test Center in 1959.

### C-E-I-R RETAINS DIRECTORS/GAINS NEW STOCK

C-E-I-R stockholders voted last week to continue with the seven incumbent directors, and to increase Class A common stock to 2,750,000 shares. Board chairman Dr. Herbert Robinson told them gross income for the past fiscal year rose 20 per cent to \$20,400,000, with a net operating income of \$1,300,000, and that the company should begin to pay dividends by the end of the next fiscal year. President Robert Holland noted the company's expansion into the TV-radio audience measurement field and the automation education area.

### CALIF COMPUTER TO PURCHASE DATA-PLOT ASSOCIATES

California Computer Products, Anaheim, Calif., has concluded an agreement to acquire Data-Plot Associates, Bethesda, Md., for a stock consideration. Data-Plot is presently CalComp's sales representative in the Washington, D. C., area. As a wholly owned subsidiary, it will become the area headquarters for sales, service and programming for CalComp's line of digital plotters and plotting equipment used to produce graphic display of digital computer data.

Harry H. Wetzel, president of Garrett, has been elected chief executive officer and chairman of the board of the corporation. Wetzel replaces Edward A. Bellande, who is retiring.

William J. Thayer, director of engineering, and O. Cleveland Laird, general manager of the Hydra-Point Division, have been elected vice president of Moog Inc.

William F. Fantone has been named director of engineering, and William F. Vetter, director of advanced engineering of the Electronics and Information Systems Division of Fairchild Hiller. Both men previously held management positions with Republic Aviation before the merger of Republic and Fairchild.

### BYRD REPLACES TYDINGS ON SPACE COMMITTEE

Senator Joseph D. Tydings (D-Md.) has transferred from the Senate Space Committee to the Public Works Committee. He was replaced on the Committee by Senator Harry F. Byrd, Jr. (D-Va.). This was the only change in the membership of the Senate and House Committees for the second session of the 89th Congress.

The members of the Democratic majority of the Senate Space Committee are: Anderson (N.M.) (Chairman), Russell (Ga.), Magnuson (Wash.), Symington (Mo.), Stennis (Miss.), Young (Ohio), Dodd (Conn.), Cannon (Nev.), Holland (Fla.), Mondale (Minn.), Byrd (Va.). Members of the Republican minority are: Smith (Me.), Hickenlooper (Iowa), Curtis (Nebr.), Aiken (Vt.), Jordan (Idaho).

Members of the Democratic majority of the House Space Committee are: Miller (Calif.) (Chairman), Teague (Tex.), Karth (Minn.), Hechler (W.Va.), Daddario (Conn.), Roush (Ind.), Casey (Tex.), Davis (Ga.), Ryan (N.Y.), Downing (Va.), Waggoner (La.), Fuqua (Fla.), Albert (Okla.), Taylor (N.C.), Brown (Calif.), Moeller (Ohio), Anderson (Tenn.), Adams (Wash.), Wolf (N.Y.), Vivian (Mich.), Schisler (Ill.). The members of the Republican minority on the committee are: Martin (Mass.), Fulton (Pa.), Mosher (Ohio), Roudebush (Ind.), Bell (Calif.), Pelly (Wash.), Rumsfeld (Ill.), Gurney (Fla.), Wydler (N.Y.), Conable (N.Y.).

### GODDARD LIBRARY INTERNATIONAL COMMITTEE EXPANDS

Dr. Wernher von Braun, chairman of the International Sponsors Committee of the Robert Hutchings Goddard Library Program at Clark University, has named seven new Committee members, thus bringing the membership to 13.

Those chosen are: Dr. Edmund Brun, vice president of the International Academy of Astronautics; Rep. Harold Donohue (D-Mass.), congressman from the district Clark University is in; Dale Grubb, Avco Washington representative and National Space Club president; Paul Johnson, director of the National Air Museum; Harrison Storms, president of North American Space and Information Systems; Thomas Turner, director of marketing for Fairchild-Hiller-Republic; and Albert Williams, president of IBM.

Committee members previously named are Waller Barrett, author; Arthur Collins, president of Collins Radio; Dr. Robert Gilruth, director of NASA-Houston; Rep. George Miller (D-Cal.), chairman of the House Science and Astronautics Committee; Dr. William Pickering, director of NASA-JPL; and Sen. Leverett Saltonstall (R-Mass.). The late Dr. Hugh Dryden of NASA was also to have served.

### S-IC ACTIVITY AT MARSHALL ON RISE

As reported (SPACE Daily, Dec. 16), the work with the **SATURN V** first stages at NASA-Marshall is intensifying. **S-IC-D** (Dynamic) will be mated with **S-II-T**, **S-IVB-D**, an instrument unit, and **APOLLO** modules to undergo vibration tests. **S-IC-T** (Tooling), having completed its test series (SPACE Daily, Dec. 23), will be moved out of the stand to make way for **S-IC-T**, the first flight model. And **S-IC-2**, the second flight model, is still under post-assembly checkout.

### NEW FALCON CONFIGURATION HYBRID BY HUGHES

The Air Force will contract with Hughes on an expected \$70 million program to modify the company's **FALCON** GAR-2A air-to-air missile system for the new AF F-4 tactical fighter. The modification calls for installation of the infrared homing guidance head of the advanced GAR-4 **FALCON** on the GAR-2A system.

The resultant configuration will be known as the AIM-4D, and will be used by both the Air Defense Command (previously the sole user of **FALCON**) and the Tactical Air Command. Hughes has started conversion efforts on "thousands" of older **FALCONs**. In addition to F-4, the AIM-4D can be carried by the F-102 and F-101 interceptors.

### AERONCA BACKLOG AT RECORD HIGH

Aeronca Manufacturing had a \$48,300,000 record high of backlog orders at the close of last year. The comparable 1964 figure is \$40,200,000. However, on 1965 sales of \$35,000,000, a \$2.7 million loss was realized, compared with a 1964 profit of \$840,306 on sales of \$36,272,301. The loss resulted from a "downward inventory adjustment on three large government programs" that were "initiated by the previous management under what developed to be very unfavorable contract terms." Aeronca board chairman A. G. Handschumacher says that "during the past six months numerous management and operational changes have been effected to assure profitable operation in the future."

### U2-DESIGNER JOHNSON TO BE HONORED

Clarence Johnson, designer of the U2 reconnaissance plane and the YF-12A interceptor, will receive the AIAA 1966 Sylvanus Albert Reed Award at the upcoming Aerospace Sciences Meeting of the Institute (SPACE Daily, Jan. 10).

The citation to the Lockheed vice president for advanced development projects will read: "As currently illustrated by the production of two triple-sonic military aircraft, for continuing personal design innovations, imaginative engineering, and practical manufacturing techniques that over the years have aided immeasurably in maintaining U.S. ascendancy in defensive aerial weaponry."

Johnson received the same award in 1956 for design and development aircraft work. He has also been given the Institute's Lawrence Sperry Award. He joined Lockheed in 1933. Other men to be honored this year are professor Chao-Chi Lin and researcher Francis Johnson (SPACE Daily, Jan. 12).

**Dr. Donald S. Orkand** has been elected a vice president of Operations Research Inc. Orkand has directed the development of major computerized information systems and the performance of cost and economic analyses for a number of government agencies since joining ORI in 1960.

**Allan J. Gaynor** has been promoted to manager of industrial development for the chemistry divisions at IIT Research Institute. Gaynor will be responsible for all group-sponsored research promotion and for assisting industrial clients in determining how the firm's capabilities can best serve the particular needs of each client.

## NAS RECOMMENDS POST-APOLLO SPACE PROGRAM (A Special Report)

A priority list of lunar and planetary exploration goals and programs for the 1970-1985 post **APOLLO** period has been submitted to NASA by the Space Science Board of the National Academy of Sciences. The report, prepared by a working group of scientists under the chairmanship of Gordon J. F. MacDonald (Institute of Geophysics and Planetary Physics, University of California), is Part I of a three section report produced by the Space Science Board at the request of NASA.

Part I of the report affirms early recommendations from the Space Science Board to NASA that the unmanned exploration of Mars should have first priority in the post-**APOLLO** period, with secondary importance divided equally to more detailed investigation of the lunar and to the unmanned exploration of Venus. Next, in exact order of priority, are exploration of: other major planets, comets and asteroids, Mercury, Pluto, and interplanetary dust.

The Lunar and Planetary Working Group said that the priorities, which it emphasized are "preliminary", were assigned on the basis "of current scientific interest and on the bases of their relevance to the questions of the origin of the solar system, the origin of life, and the understanding of the Earth." The Working Group said the priorities are "preliminary" in the sense that they should be modified by further debate among scientists in general and by the application of new data as it is acquired.

### Shift from Lunar to Planetary Exploration Urged

More specifically, in regard to overall funding, the Working Group recommended that starting in the 1965-1975 period a shift of emphasis be made in the NASA lunar and planetary exploration program with emphasis toward the planets and away from the Moon--a move which would result in a "roughly equal" expenditure for lunar and planetary exploration in the 1970-1985 period.

### Non-Scientific Goals Termed Secondary

The Working Group further recommended that support for the lunar and planetary exploration program, which currently accounts for two-thirds of NASA's budget, be maintained over the 1965-1985 time period and "be devoted predominantly to scientific objectives and that programs whose objectives are other than scientific be started only as additional resources become available."

### Facility/Advisory Structure Changes Urged

With the above recommendation calling for a shift from the current manned Moon landing objective to a program of lunar and planetary research in the post-**APOLLO** period, the Space Science Board said it is mandatory to increase the manpower and facilities available to the lunar and planetary science programs.

The new program also dictates that an advisory committee to the NASA Administrator be formed, largely of non-NASA scientists, to provide advice on current and future efforts in the area of planetary and lunar exploration.

### Two Reports Coming Up Soon

Parts II and III of the Space Science Board's overall report to NASA (Space Research: Directions for the Future) will be issued during the next few weeks. They will deal with four branches of astronomy and special topics in physics and geophysics; and rocket and satellite research, university programs, physiology and medicine, biology, and man's role in space research. General chairman of the

MORE

**NAS RECOMMENDS POST-APOLLO SPACE PROGRAM (A Special Report) - Contd.**

study was Dr. George P. Woollard, Director, Hawaii Institute of Geophysics, University of Hawaii.

**NAS Priorities for Lunar and Planetary Exploration**

**Mars.** Because of its similarity to Earth and its relevance to all of the three central problems, both early probes and landers are recommended in order to efficiently explore the planet. Highest priority in Martian exploration is given to: the existence of life, the chemistry and geology of surface water, the presence and character of carbon chemistry, micrometeorology, and identification and classification of the surface environment. Of secondary importance is the overall broad-band exploration of Mars including photographic three-color reconnaissance of surface and clouds, the determination of atmospheric and surface composition, and the reconnaissance of thermal emissions from the surface in the infrared region.

**Moon.** The Moon and Venus are ranked almost evenly as second and third in importance in planetary exploration. The lunar exploration should concentrate on: the surface of the Moon and the processes modifying the surface; and the history or evolutionary sequence of events by which the Moon has arrived at its present configuration.

**Venus.** Because of our "lack of understanding" of the atmosphere, surface or interior of Venus, the totally different character of the atmosphere as compared with Mars and Earth, and the apparent paradoxes suggested by our present "limited knowledge", Venus is selected for the next priority. The Board recommended that "NASA support a program of exploration of the planet Venus over the next ten years on a level comparable to, but perhaps slightly below, that proposed for Mars." The program outlined for the study of Venus includes theoretical studies; ground-based observations; the use of balloons, rockets, and Earth-orbiting observatories; and space probes incorporating atmospheric probes.

**The Major Planets.** Jupiter, Saturn, Uranus, Neptune, and Pluto are ranked as fourth in importance. Because of the extremely large masses and small mean densities characterized by these planets they pose a number of extremely interesting scientific questions. An outline for exploration of these outer planets would include: ground-based observation; studies from balloons, rockets, and satellites; a fly-by mission; a general purpose orbiter; specialized orbiters such as low-altitude orbiters for geodetic purposes, eccentric orbiters for encountering satellites (of the planet) and close inclined orbiters for study of special areas like the Red Spot of Jupiter; and a planetary lander mission.

Assuming that one launch vehicle per year was available starting in 1975, the Board suggested that fly-bys could be sent to all four planets early in the period with Uranus as one of the earlier flights since a minimum energy orbit would require 14 years to encounter. This series could be followed by one or more orbiters. It was noted that data transmission from Jupiter, Saturn and Uranus would be 12, 40 and 160 times more difficult than from Mars.

**Comets/Asteroids.** Of fifth importance in a schedule of planetary exploration is the investigation of comets, the asteroids, the various satellites of the planets, and interplanetary dust.

**Mercury.** This planet is considered to be next since so little is known of its physical characteristics and it would provide an interesting object to study in comparison with our Moon.

MORE

**NAS RECOMMENDS POST-APOLLO SPACE PROGRAM (A Special Report) - Contd.****VOYAGER Program Change Recommendations**

Several specific recommendations of the Space Science Board have already been implemented by NASA. The Board called for a shift of the **VOYAGER** program from the **SATURN IB** vehicle to the **SATURN V** in order to improve the effectiveness and economy of the program.

In order to meet the requirements of the exobiology mission of **VOYAGER** the Board protested the delay in the program and called at the same time for an early planetary probe of Venus. All of these recommendations have been followed by NASA with the shift from the **SATURN IB/CENTAUR** vehicle to the **SATURN V** vehicle (SPACE Daily, Aug. 3, Oct. 4) and the reorientation of the program to provide for an early Venus probe and a Mars '69 **VOYAGER** mission (SPACE Daily, Dec. 23). "High priority" should be given, however, to a simple drop (lander) sonde, measuring at least temperature and pressure of the Venusian atmosphere, which, to date, has not been included in the Venus mission.

**Lunar Scientific Passengers**

Even though NASA has selected a number of scientists to undergo astronaut training, the Board indicated that this provision is not sufficient to produce the "fruitful observational work and sampling" in the lunar exploration program. It recommended that, as soon as possible, experienced observational scientists be transported to the Moon, as passengers, in addition to NASA's scientist astronauts.

**The Theoretical Science Program**

In the opinion of the Board the present theoretical effort in support of the space program is "inadequate", and the cause of this situation is placed on the shift of theoretical scientists away from the classical physics and mathematics area. To correct this situation, it was recommended that NASA attempt to develop both research and educational capabilities in the theoretical physical sciences which are required to support the practical program of solar system exploration.

(This Special Report to be continued tomorrow.)

**SECOND-STAGE 156-INCH TEST FIRING**

A test firing of Lockheed Propulsion's million-pound-thrust second-stage 156-inch-diameter prototype solid propellant rocket motor was set for Saturday.

The 33-foot-tall motor--156-6--is about half the size of earlier Lockheed motors capable of producing a million pounds of thrust. In addition, the motor has a one-piece case, which was cut and pieced from two motor cases used in previous firings. The case work, performed in large part by Rohr Corp. under sub-contract, will result in a cost savings of nearly 50 per cent in comparison with producing a new case. The motor also has a partially submerged nozzle, which allows a greater portion of its overall length to be filled with propellant. The nozzle, built by H. I. Thompson Co., was fitted with the thrust vector control components, and a system checkout conducted before it was positioned atop the motor.

A month ago, Lockheed successfully test fired the segmented 75-foot tall 156-5 motor. The motor delivered 3 million pounds of thrust (SPACE Daily, Dec. 16), but did encounter some vector control problems.

Lockheed, whose present contract with the AF covers only the two flight prototype motors, is expecting a follow-on AF 156-inch pact.

### LIFE SUPPORT PROBLEMS FOR 1-YEAR FLIGHT SEEN

Dr. John P. Foster of Battelle Memorial Institute's Columbus Laboratories says he believes that the current state-of-the-art on life support systems is not adequate to support manned space flights of a year or longer (such as the envisioned 420-day, six-man roundtrip to Mars). He said the problems arise in closing the "closed cycle" systems which replenish water, food and oxygen by reprocessing wastes. Of the three, "the most pressing problem" is in the renewal of oxygen, Dr. Foster said. However, he predicted that the country can develop a capability for long space trips within "two decades."

### 100,000 SNAKEYES PRODUCED FOR VIETNAM

Baifield Industries has completed its 100,000 production model of the Mark 15 **SNAKEYE** air-to-ground weapon system currently in use in Vietnam. Used with 500 pound bombs, the **SNAKEYE** improves accuracy and eliminates fragmentation danger to plane and pilot on low level bombing missions. The total of \$45 million in contracts presently calls for 500,000 more of the bomb-retarding systems to be produced.

### CEI HAS RECORD SALES/EARNINGS FOR '65

Communications Electronics Inc. of Rockville, Md., had sales of \$3.5 million and earnings of \$220,000 for 1965, up 18 per cent and 16 per cent respectively over 1964. Both sales and earnings established new records for the manufacturer of special-purpose RF receivers and auxiliary electronic equipment.

Ralph E. Grimm, CEI president, reports that there was a seven per cent increase in new business, with a year-end backlog of over \$1 million. At year-end the company had a net worth of \$1,250,000 of which \$1 million was in working capital and the remainder in property and equipment.

### MITRE ASSIGNED DEPARTMENTS TO COMMUNICATIONS DIVISION

MITRE Corp. has assigned three technical departments--Communications Systems, Range Instrumentation, and Communications Planning and Research--to its recently formed Communications Division in Bedford, Mass. All three departments will report to Paul G. Edwards, technical director of the division.

Personnel changes in the change-over have involved the naming of Lawrence R. Jeffery and John W. Lazur as associate technical director to Edwards. Jeffery was formerly associate technical director of MITRE's DCA Division and Lazur was director of marketing at Raytheon's Space and Information Systems Division. Lewis S. Billig, formerly associate head of Communications Systems, has been named head of Range Instrumentation. Edwin S. Rich, formerly on the division staff of the Applied Sciences Laboratories Division, replaces Billig as associate head of Communications Systems.

**George E. Griffin** has been promoted to the new post of director of financial planning and **Dan Burney** as chief legal counsel for Ling-Temco-Vought. Griffin was previously assistant treasurer, and Burney was formerly associate general counsel.

**DOD NEGOTIATIONS**

Northrop Corp., Nortronics Div.--with Air Force Proving Ground Center (PGMCK) for fabrication and test of additional 2.75-inch flechette rocket warheads.

Raytheon Co.--with Army Missile Command for the design and development work for improved **HAWK**.

Airesearch Mfg. Co.--with Air Force Flight Test Center for modification of IADS system.

Honeywell, Inc.--with Air Force Proving Ground Center (PGMCK) to prepare operations and maintenance manuals for equipment peculiar to the mobile launchers, mount mechanisms, flame deflectors, extensible columns, column handlers, hold-down arms, egress chutes, and accoustical shields located at launch complex 39.

United Nuclear Corp.--with Army Procurement Div. to develop, demonstrate, and provide the BRL with a technique for employing a geometrical target description to perform vulnerability analysis for both nuclear and conventional weapons.

Honeywell, Ordnance Div.--with Air Force Proving Ground Center (PGMCK) for research and development capabilities in the field of air-to-surface area denial weapons.

Westinghouse Electric Corp.--with Air Force Systems Engineering for hypervelocity interceptor radar feasibility study.

Melpar, Inc.--with Army **NIKE-X** Project Office for research and development study entitled "Frequency and Location Diversity."

Philco Corp.--with Army Missile Command for engineering services for the **CHAPARRAL** missile system.

Lockheed Propulsion Co.--with U. S. Naval Ordnance Lab. for the design, fabrication and test of a lockseal nozzle.

**NASA NEGOTIATIONS**

Avco-Everett Research Laboratory--with Marshall for experimental investigation of advanced superconducting magnets.

General Dynamics Corp., Convair Div.--with Marshall for work on mechanical analog of LPZID propellant in low and zero G fields.

General Electric Co.--with Marshall to develop a fuel-cell type hydrogen reinforced detector.

Harris Research Laboratories, Inc.--with Lewis for a continuation of a program of basic research on surface energy problems applicable to the field of zero-gravity fluid dynamics.

## DOD CONTRACTS

## Army

Admiral Corp. -- \$50,000 for IFF Interrogator Equipment.

Astro Space Laboratories, Inc. -- \$68,500 for the design of a multi-rail launcher and fabricate prototype component parts.

Thiokol Chemical Corp. -- \$451,695 to perform, test and evaluation program on sustainer motor case.

Raytheon Co. -- \$232,776 for the installation of Damwo kits and the repair and modification of rocket motor for the **HAWK** system.

## Navy

Veda, Inc., Ann Arbor, Mich. -- \$73,180 for evaluation of guidance concept.

General Atronics Corp., Philadelphia, Pa. -- \$94,133 for ionospheric propagation path simulator.

Tenney Engineering, Inc. -- \$26,050 for environmental test chamber.

## Air Force

The Garrett Corp., AiResearch Mfg. Co. of Arizona -- \$907,611 for experimental research and development work on **SNAP 50/SPUR** nuclear mechanical power unit concept.

Raytheon Co., Space and Information Systems Div. -- \$95,315 for measurement and filtering techniques for optimal orbit navigation.

Thiokol Chemical Corp., Reaction Motors Div. -- \$83,000 for research on elasomeric and compliant materials resistant to liquid rocket propellants.

Aerojet-General Corp., Solid Rocket Operations -- \$35,000 for propellant grains for use in the Bates motor.

## NASA CONTRACTS

## Edwards

Bell Aerosystems Co. -- \$57,963 for a study modification of a lunar landing research vehicle to a lunar landing training vehicle.

Honeywell, Inc. -- \$30,547 for yaw damping mode to be added to a two axis fluid flight path control system.

Leach Corp. -- \$38,465 for miniature airborne magnetic tape record/reproduce system.