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\$4 BILLION NASA '70 BUDGET UNLESS POST-APOLLO IS UNDERTAKEN. Industry studies have concluded that unless a vigorous effort toward initiation of post-APOLLO program missions is forthcoming the effects of the continuing war in Vietnam will keep the NASA budget curve dropping until an annual level of \$4 billion is reached by 1970.

The projection indicates that even if there is no direct confrontation with Red China, the Vietnam War will continue to hold the NASA budget at its presently declining rate until another \$1 billion annually is borrowed for War and Welfare. The total annual space deficit would then approach \$2 billion from the optimum \$6 billion annual capability.

The built-in reduction in expenditures as the APOLLO and SATURN programs pass their funding peaks may be reinforced by parallel continuing reductions in advanced research and technology and space sciences. Initiation of AA is the only present plan requested for softening and slowing the decline.

MORE OV1'S PLANNED/NEW OV3-1 LAUNCH DATE SET. The AFSC Space Systems Division will soon issue RFPs for four new OV1 satellites, the first two of which are tentatively intended for launch together on an ATLAS in May of next year, with the other two to go into orbit together on an ATLAS in the subsequent September.

The present OV1 program embraces ten satellites, with the dual-payload launch of OV1-4/-5 now set for March 3 (SPACE Daily, Feb. 11). The four new packages will be -11, -12, -13, and -14. OV1-6 will ride alone (SPACE Daily, Jan. 6), but -7/-8 and -9/-10 will be twin-package payloads. General Dynamics is the present OV1 contractor.

OV3-1, the first member of the third OV family, will now be launched on the 14th or 19th of April rather than the 7th as originally set (SPACE Daily, Feb. 11). It will ride a SCOUT from Vandenberg.

CALIFORNIA BACKS CALIFORNIA MOL BASE. To no one's surprise, the California Congressional delegation is leaping to the aid of the Air Force's decision to launch its MOLs (Manned Orbiting Laboratory) from California's Western Test Range. The Air Force has been under attack by the Florida Congressional delegation which doesn't see why the AF doesn't launch MOL from Cape Kennedy, which is in Florida. (See SPACE Daily, Feb. 14 & 17.)

California Representative Charles M. Teague (R) says he will "fight to the last ditch" to prevent Florida from getting the planned MOL flights. He added that he expected "solid

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support" from California Congressmen on the issue, and added that he may ask Governor Pat Brown to join in the battle. Teague singled out Florida's Sen. Spessard Holland (D) and Rep. Edward Gurney (R) as "leading the fight" against construction of **MOL** launch facilities at Vandenberg AFB, WTR.

DOD will get another chance to re-support its position on the matter next Thursday when the Senate Space Committee takes up **MOL** hearings. The AF explained its position to the Florida Congressional delegation at a special meeting called by Senator Holland last week (SPACE Daily, Feb. 17).

AGENA TEST FAILURE DUE TO FUEL CONTAMINATION.

The recent failure of the **AGENA** engine during high altitude tests at the Arnold Engineering Center, Tenn. (SPACE Daily, Feb. 15), was due to contamination in the fuel lines and was not due to defects in the basic design, NASA associate administrator for manned space flight George E. Mueller has told SPACE Daily. Therefore, NASA based its decision to proceed with the **AGENA** target vehicle on the forthcoming **GEMINI VIII** mission, which has been confirmed for March 15 (SPACE Daily, Feb. 18).

The series of tests which resulted in the explosion were being conducted to verify modifications in the **AGENA** ordered after the explosion of the vehicle during the first attempt to launch the **GEMINI VI** mission. Mueller said that further tests will be conducted with the **AGENA** engine but that NASA now trusts the design enough to proceed with the **GEMINI-AGENA** rendezvous experiment on **GEMINI VIII**.

GATX SUBMITS INSTRUMENT FOR LUNAR SURVEY PROBE.

General American Transportation Corp. (GATX) has delivered to NASA-Houston its version of an instrument designed to determine the bearing strength of the lunar surface. GATX's first contract with Houston for the system was initiated several months ago (SPACE Daily, Nov. 23, '64). Space-General and Philco's Aeronutronics are also engaged in lunar survey probe development (SPACE Daily, July 24 & Dec. 3, '64).

The instrument, a penetrometer, would be incased inside a gas-filled, doughnut-shaped plastic bag, which would provide for a soft landing plus built-in orientation with the lunar surface (since a doughnut must ordinarily come to rest on one side or the other). The penetrometer would determine if soil load-bearing conditions at a site were suitable for a **LEM** (Lunar Excursion Module) landing.

In operation, a Lunar Survey Probe (**LSP**) vehicle would be launched from an **APOLLO** vehicle orbiting the Moon. Just prior to impact the **LSP** would inject the 10-pound plastic (toroidal) bags, which would shed their containers (foot-long, six-inch cylinders) as they inflate to a diameter of six feet and a thickness of three feet. After the bags come to rest, a penetrometer rod, scaled to the load-bearing and surface contact dimensions of one of **LEM**'s four landing pads, is thrust into the soil at a speed comparable to the highest permissible landing velocity of **LEM**. Each unit then radios back to the orbiting **APOLLO** vehicle a go or no-go signal.

In its study, the company assumed: 1) That none of the **LEM** landing pads should penetrate more than 12 inches into the lunar surface when maximum impact velocity is 10 fps; and, 2) Messages are to be communicated to a spacecraft orbiting the Moon at an altitude of 80 nautical miles with an orbit velocity of 5000 fps. The development and

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study of the instrument, GATX said, showed that it could reliably predict the penetration threshold of the full-size **LEM** pad "with a high degree of confidence."

NASA HYPERSONIC (SCRAMJET) RAMJET REPORTS EXPECTED SOON. The preliminary design reports on an advanced hypersonic ramjet engine are expected to be submitted to NASA-Langley "within a month" by the three competing contractors on the program--Garrett, General Electric and Marquardt (SPACE Daily, April 6). Contractor selection is expected by late spring.

The program calls for the hypersonic ramjet to be flight tested on the X-15. The engine specifications called for a weight of 800 pounds and dimensions compatible with mounting the engine underneath the aft fuselage of the X-15 (SPACE Daily, July 2, '63). Liquid hydrogen fuel was specified for the engine which will be capable of operating at flight speeds between 2000 and 5000 mph. The hypersonic ramjet is envisioned for hypersonic transport aircraft, for boosters and for spacecraft flying within the atmosphere--**SPACE PLANE.**

NASA APOLLO BUDGET WILL NOT SUPPORT SINGLE FAILURE. NASA associate administrator for manned space flight George E. Mueller has presented the NASA FY 1967 budget to the House Manned Space Flight Subcommittee: a budget which he says will support the currently planned **APOLLO** program "assuming we have no major problems." For example he indicated that a major failure such as the loss of a stage would stretch out the program since the budget contains no funds to cover emergencies.

This echoes the opinion of NASA deputy administrator Robert C. Seamans Jr. that the budget provides no funds for major difficulties that might occur (SPACE Daily, Jan. 26) and the statement of NASA administrator James E. Webb that the "stringent" budget for FY 1967 endangers the plans for a manned lunar landing in this decade because it contains no funds for unforeseen emergencies.

SURVEYOR Still Required: Mueller confirmed that NASA still feels that the success of the **APOLLO** mission is partially dependent on **SURVEYOR** flights, even after the success of **LUNA IX**, and that NASA "is not planning to change the **SURVEYOR** program" at present. He said that the pictures of the lunar surface from **LUNA IX** were helpful but they constituted only "one data point" of the information needed for the **APOLLO** program.

The Subcommittee, meeting with Rep. Emilio Q. Daddario (D-Conn.) as chairman in the absence of Olin E. Teague (D-Tex.) (SPACE Daily, Feb. 4), complimented NASA on its performance in making up the 18-month schedule slip during 1965 in the **GEMINI** program.

WHO'S WHO IN SPACE--FIRST EDITION. The First Edition of Who's Who in Space, a reference of the nation's outstanding scientific, industry and government space leaders, has been published in Washington, D. C., by Space Publications, Inc. This is the first reference work devoted exclusively to biographies of scientists, engineers, executives, and management and government officials who are making significant contributions to the United States space program.

LOCKHEED PICKED FOR MIMOSA ADVANCED AA STUDY. Lockheed Missile & Space Co. has been selected by NASA-Marshall for a comprehensive study aimed at defining an evolutionary set of lunar exploration systems. The systems would be "more extensive" than that envisioned in the proposed **APOLLO** Applications (**AA**) missions currently being considered for use in the early 1970s following manned landing on the Moon. Maximum stay time for an **AA** mission would be about 14 days, while longer stay-time missions will be considered by Lockheed in its study.

Known as **MIMOSA** (Mission Modes and Systems Analysis for lunar exploration), the study is funded for \$897,000. The Lockheed effort will combine into a single definitive package information produced by more than 20 studies completed in the past: 1) Four studies made in developing the concept of a lunar mobile laboratory (**MOLAB**); 2) Seven studies done for **AA**; and, 3) Nine studies made for the Lunar Exploration System--**APOLLO** (**LESA**) project. Moreover, the **MIMOSA** effort will incorporate results of three other studies which NASA-Marshall has just awarded to:

- 1) North American, \$200,000 for a "scientific mission support study for extended lunar exploration."
- 2) Bendix Systems Division, \$499,888 for a lunar "mobility systems comparison and evolution study"(SPACE Daily, Feb. 7). The three-phase study, which was opened about February 1, is to be completed by December. Vehicles to be studied are Mobile Lunar Excursion Module (**MOLEM**), Mobile Command Module, and Mobile Extended **APOLLO** Laboratory Module.
- 3) AiResearch Manufacturing, \$200,000 for "early lunar shelter design and comparison study"(SPACE Daily, July 28).

Further MOLAB R&D Not Decided: "Information developed in the **MIMOSA** study will be available for use in the **MOLAB** effort, if it is pursued further, and in **APOLLO** Applications," NASA-Marshall said.

NASA NAMES INTERNATIONAL AFFAIRS CONSULTANT. Joseph C. Satterthwaite, former State Department foreign service officer, has joined NASA as a consultant to Administrator James Webb. He will advise the Administrator in the field of international affairs "in the general area of Western Europe." Satterthwaite joined the State Department in 1924 and retired last year. His last assignment was ambassador to the Republic of South Africa.

NSF BILL FORMULATED. The Science, Research, and Development Subcommittee of the House Space Committee, under the chairmanship of Rep. Emilio Q. Daddario (D-Conn.), has finished work on the form of a bill to amend the National Science Foundation legislation. The bill will be introduced by Daddario this week or next, and hearings will be held some time after Easter.

Dr. Lloyd N. Morrisett, vice president of the Carnegie Corporation of New York, has been elected to the board of trustees of System Development Corp.

Frank S. White has been appointed chief, industrial engineering, at United Aircraft's Pratt & Whitney division. White was formerly assistant chief, industrial engineering.

MARTIN/DOUGLAS VIE IN NEW LANGLEY SPACE SHUTTLE STUDY. Martin and Douglas are reported to be the finalists in NASA-Langley's program to determine the relationship of size and cost to the eventual development of manuverable lifting body space shuttle systems (SPACE Daily, Dec. 6). Seven companies submitted proposals on the contract (L-6411): Grumman, McDonnell, NAA, Northrop-Norair, General Dynamics-Convair and Martin and Douglas. The program will be designed to determine the optimum size of a manned space shuttle in relation to cost and research potential.

AVCO AWARDED FOLLOW-ON VOYAGER CONTRACTS. Two NASA follow-on contracts for development of probes to ride aboard **VOYAGER** spacecraft to Mars and Venus have been received by Avco's Research and Advanced Development Division. They are:

1) A \$116,000 contract from NASA-Ames to enlarge upon a recently completed study of the feasibility of a small Probe Vehicle to communicate data on the Martian atmosphere back to Earth (SPACE Daily, April 28). The probe is designed to deploy from **VOYAGER** which will remain in orbit around the planet. The new contract includes work to modify the existing Martian probe for use within the atmosphere of Venus, and work to increase the operational scope of the basic vehicle design. Spacecraft sterilization studies will be stepped up.

2) A \$284,000 contract from NASA-Langley to design a large probe to enter the Martian atmosphere and measure the terrain (marain) and atmosphere during descent. The vehicle will incorporate modifications indicated by the **MARINER IV** fly-by, and will include television cameras to transmit in-flight pictures back to Earth by way of the spacecraft. Sterilization techniques will be given a high priority. Work will also be conducted to study the value and extent of preliminary flight tests in the Earth's atmosphere, and to define procedures and facilities necessary for ground testing.

HOUSTON TO CONTRACT FOR APOLLO PHOTOGRAPHIC EQUIPMENT

NASA-Houston is issuing RFPs for the design, development and fabrication of APOLLO lunar photographic equipment.

The Center has invited the following companies to submit bids for the work: Georz Optical Co.; J. A. Maurer Inc.; Graphlex; Chicago Aerial Industries; Electro-Optical; Perkin-Elmer; Fairchild Camera; Itek Corp.; Bell & Howell; Polaroid; Charles Beseler Co.; Photogrammetry Inc.; Hycon Manufacturing; D. B. Milliken Co.; Revere Camera/Wollensak; Avco; Ehrenreich Photo-Optical Industries; E. Leitz Inc.; and Carl Zeiss Inc. Bids are due for RFP BG721-27-6-466P on March 21.

MARTIN SALES DOWN/EARNINGS UP

Martin-Marietta had sales of \$603,105,840 for 1965, down from last year's \$767,113,410. Earnings rose, however, from \$30,351,235 or \$1.35 per share to \$30,514,134 or \$1.49 per share.

Jackson S. Kolp has been appointed manager of the manufacturing plant of Sylvania Electric Products.

NRL PLANNING THREE SPACE SURVEILLANCE SUPPORT SATELLITES FOR '66

At least three satellites from the Naval Research Lab are due to be launched this year. **TEMSAT II**, **PORKYPINE III**, and **CALSPHERE V** will help continue NRL's research in support of the Naval Space Surveillance System. These and other NRL payloads designed for the same basic purpose are sometimes lumped together under the designation **SURCAL**, but in fact they are different systems and referred to in house by the above names.

TEMSAT I, **PORKYPINE II**, and **CALSPHERE IV** were part of a six-satellite payload launched August 13 last year by a **THOR-ABLESTAR** from Vandenberg (SPACE Daily, Oct. 8). The other three satellites were **SURCAL V** and **ROD I**, both NRL units, and **TRANSIT 05** (the fifth operational Navy navigational satellite).

TEMSAT (TEMperature SATellite) is a small sphere that returns data on the heat absorption of a black body in space. **I** is 14 inches in diameter, and **II** will probably be similar. **PORKYPINE** is a 12-sided sphere, with an antenna extending from each side, that serves as a radar test target. **I**, launched March 9, is eight inches in diameter with 25-foot-long antennas; **II** is nine inches across with 25-foot antennas; and **III** will be larger still with 50-foot antennas. **CALSPHERE** (CALibration SPHERE) is a globe painted white to allow optical tracking for radar evaluation. **I**, launched December 13, 1962 (along with **SURCAL II**), is six inches in diameter and "the first perfectly round satellite;" **II** and **III**, launched together October 6, 1964, are 14 inches across but 2 and 20 pounds respectively in weight; **IV** is also 14 inches wide; but **V** will probably be larger, perhaps up to 20 inches in diameter.

MLF PRESSURE DYING DOWN

One apparent result of the discussions of The Working Group for nuclear planning of NATO's Special Committee of Defense Ministers, which met in Washington last week (SPACE Daily, Feb. 11), is a lessening of pressure from the non-nuclear countries--Italy, Turkey, and West Germany--concerning the U.S.-proposed Multi-Lateral Force (MLF) plan for arming a NATO fleet with nuclear warheads.

Discussions evidently centered around the premise that having a share in NATO's nuclear arsenal is not as important as sharing the responsibility of making the decision to deploy nuclear warheads. It was said during the discussions that the non-nuclear powers have little knowledge about factors which must be considered in making a decision to deploy, or even the difference between strategic and tactical weapons.

The United Kingdom's plan for an Atlantic Nuclear Force (AMF), which offers non-nuclear powers the opportunity to participate in targeting and decision-making regarding the use of nuclear weapons, still is being considered seriously by the Defense Ministers. The AMF, unlike the MLF, does not require the participating countries to have a share in the nuclear hardware.

Secretary of Defense McNamara served as chairman of the meeting. Other Defense Ministers attending were Kai-Uwe von Hassel, West Germany; Giulio Andreotti, Italy; Ahmet Topaloglu, Turkey; and Denis Healey, United Kingdom. Manlio Brosio, Secretary General of NATO, also attended (SPACE Daily, Feb. 11).

Second French Satellite Goes Aloft. **D-1A**, the second French-built, French-launched satellite, was successfully orbited Thursday morning (SPACE Daily, Feb. 16). Liftoff came at 8:33 AM local time (9:33 AM Paris time and 3:33 AM EST) from Pad Brigitte at the Hammaguir, Algeria, range.

PAGE DIVISION CONTRACTED FOR PMR SUPPORT EQUIPMENT

Astro Technology, the West Coast division of Page Communications Engineers, has been awarded a \$240,000 contract by Dynatronics Inc. to deliver and install support equipment for Pacific Missile Range tracking antenna systems. Astro Technology has expanded its technical abilities in the design, manufacture and installation of antenna structural components by acquiring the assets and personnel of the Alpar Corp. of Palo Alto, Calif.

PMR RECEIVING CONTROL DATA COMPUTER

A Control Data 3100 computer is being installed at the Navy's Pacific Missile Range for use by the Geophysics Division of the Range's Operations Department. The 3100 system includes three data channels, four tape transports, a card reader, a tape punch/reader, a printer, and a console. It will reduce upper atmospheric data from rocket and balloon flights, process oceanographic and climatological data, and compute ballistic missile impacts. It will also be part of the data link system for the Fleet Numerical Weather Facility at Monterey, which also uses a Control Data computer system.

LTV AEROSPACE FILES STOCK REGISTRATION STATEMENT

LTV Aerospace has filed a statement with the Securities and Exchange Commission seeking registration of 500,000 shares of common stock to be offered for public sale through underwriters headed by Lehman Brothers (New York City). The public offering price (\$30 per share maximum) and underwriting terms will be supplied by amendment.

NORTHROP EARNINGS UP 11 PER CENT

Northrop had sales of \$155,752,000 for the first half of its current fiscal year, down from the \$160,276,000 recorded for the same period the year before. Although sales were down, earnings rose 11 per cent from \$4,020,000 to \$4,464,000. The company's backlog currently stands at \$398,000,000, up from last year's \$360,476,000.

HEWLETT-PACKARD FILES STOCK PLAN

Hewlett-Packard (Palo Alto, Calif.) has filed a statement with the Securities and Exchange Commission seeking registration of 100,000 shares of common stock to be offered in connection with its 1966 Incentive Stock Option Plan.

John H. Fisher has been appointed to Northrop's newly created position of administrator of Defense Systems Analysis. Fisher came to Northrop from System Development Corp. where he was on the staff of the vice president-Defense Systems Division.

TITAN II Launch From WTR. A TITAN II ICBM was successfully launched down the Western Test Range early Thursday to a pre-selected target area.

BEECH TO BUILD MORE MISSILE TARGETS

The Navy has awarded Beech Aircraft a \$2,078,500 contract for continued production of the AQM-37A supersonic missile target. The contract's final value is expected to exceed \$4 million. During the past three years, Beech has delivered over 1000 AQM-37As to the Navy. The target is air-launched, liquid-fueled, and nonrecoverable and is "the first missile target to match the performance of 'enemy' jets."

ARC SUPPLYING REDEYE ENGINEERING SERVICES

General Dynamics/Pomona has awarded Atlantic Research Corporation a \$500,000 contract for engineering services for the **REDEYE** missile. ARC is the propulsion sub-contractor for the **REDEYE**, which GD is developing for the Army and Marines.

GIANNINI EARNINGS UP 28 PER CENT

Giannini Controls had sales of \$34,093,261 for 1965, up 12 per cent from last year's \$30,463,650. Earnings climbed 28 per cent from \$1,217,102 to \$1,563,734, while the company's year-end backlog increased from \$17,389,000 in 1964 to \$25,473,000. President Donald H. Putnam says that "... the backlog mix indicates that 1966 sales will show a healthy balance of industrial, defense and space business. The application of our technologies and products expanded steadily; last year over \$20 million, 60 per cent of total shipments, went into markets untouched by this company 10 years ago."

3C SALES JUMP 24 PER CENT

Computer Control Co., the Massachusetts computer manufacturer, had sales of \$23,773,232 for FY '65, up 24 per cent from last year's \$19,049,683. As a result of expenses incurred by the introduction of a heavy concentration of new products in the early part of the year, earnings dropped from \$525,907 to \$388,123. Year-end backlog was approximately \$9.5 million, compared with about \$6.5 million a year earlier.

FOUR ELECTED TO GARRETT BOARD

The following have been elected to Garrett's board of directors: Raymond Azar, vice president-contracts and quotations; Gerald Bradley, vice president-industrial relations; James Crawford, group vice president (AiResearch-Los Angeles, AiResearch-Phoenix, Garrett Manufacturing Ltd. of Canada, and Garrett GmbH); and Wilton Parker, vice president-Air Cruisers Division and manager-AiResearch Industrial Division.

HOUSE ADDS \$50 MILLION TO VIETNAM SUPPLEMENTAL

The House Armed Services Committee has approved and added \$50 million to a \$4.8 billion request for the Vietnam War. The \$4.8 billion was added to a \$7.5 billion Southeast Asia supplemental, which is authorized by law. The bill adds \$49.7 million for the construction of Marine Corps and Navy facilities to the \$4.8 billion allotted for missiles, planes, ships and the construction of military facilities in South Vietnam.

Future Space Business**MAW WARHEAD DEVELOPMENT**

The Army's Picatinny Arsenal is planning to procure property and services for Phases I and II of the design and development of a warhead for the Medium Assault Weapon (MAW) system. A pre-proposal meeting is scheduled for Wednesday, March 23.

Contact: Commanding Officer, U.S. Army Picatinny Arsenal, Dover, N.J., Attn: SMUPA-PA11, C. Sipe, Telephone: (201) 328-3886. Reference: RFQ AMC(A)-28-017-66N480.

LEM ACTIVATION

The Corps of Engineers is requesting bids for Package I of the Lunar Excursion Module (LEM) activation of the Operations and Checkout Building at NASA-Kennedy.

Contact: U.S. Army Engineer District, Canaveral, P.O. Box 1042, Merritt Island, Fla. Reference: IFB ENG (NASA)-08-176-66-62 B. Due date: Mar. 31.

FREQUENCY STABILIZED GAS LASERS

NASA-Marshall is issuing RFQs for the design, fabrication, test and delivery of two frequency stabilized gas lasers.

Contact: Purchasing Office, Marshall Space Flight Center, Huntsville, Ala. Reference: RFQ 1-6-40-64622. Due date: Mar. 21.

VERTICAL OPTICAL TEST FACILITY FEASIBILITY STUDY

NASA-Cambridge is planning to fund a study to establish the feasibility of a vertical optical test facility for large optical apertures of long focal lengths and provide detailed equipment specifications, facility requirements and design information.

Contact: Procurement Division, Area Redevelopment Administration, NASA, Electronics Research Center, 575 Technology Square, Cambridge, Mass. 02139, Attn: Procurement Office. Reference: ERC/COF 66-82. Due date: Feb. 26.

HUMAN TEST PERFORMANCE EVALUATION SYSTEM

The Air Force Systems Engineering Group is initiating research to design, develop, fabricate and test a complex performance evaluation system consisting of two tasks for use in human test programs. The system must be capable of functioning in the vibration environments produced by the western gear vibration machine, AMRL vertical accelerator, the AMRL hydraulic vibration table and the AMRL sixmode.

Contact: Directorate of R&D Procurement, Systems Engineering Group, RTD, Wright-Patterson Air Force Base, Ohio 45433, Attn: SEKOC. Reference: PR AM 6-63282. Due date: Feb. 26.

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Future Space Business - Contd.

VOICE CONTROLLED COMPUTING DEVICES RFP

NASA-Cambridge is planning to fund the development of voice controlled computing devices which meet the function requirements of manned space missions. The results of the study are expected to provide a sound technological base for further development of man/machine speech exchange.

The following firms have been invited to bid on the proposed contract: Bolt, Beranek & Newman; Decision Sciences (San Diego, Calif.); Electronic Associates (West Long Branch, N.J.); GE; Information International (Cambridge, Mass.); Information Research Associates (Cambridge, Mass.); Litton Data Systems; National Cash Register; and Sperry Gyroscope. Due date for RFP R&D 66-255 is March 10.

DOD NEGOTIATIONS

Philco Corp., Aeronutronic Div.--with Army Missile Command for design effort for changing missile source cant angle for use on **SHILLELAGH** missile system hardware.

Astrosystems International--with Army Missile Command for testing support pertaining to the development of a self-pumping rocket (air-cycle).

Barnes Engineering--with **AGENA** Directorate SSVAK Space Systems Div. for horizon sensors.

Lockheed Missiles and Space Co.--with **AGENA** Directorate SSVAK Space Systems Div. for **AGENA** launch services.

Bendix Corp., Research Laboratories Div.--with Air Force Special Weapons Center for exploratory development of a radiation damage exposure measurement technique.

Union Carbide Corp.--with Air Force Special Weapons Center for continuation of x-ray transport and penetration study.

Adcole Corp.--with Hanscom Field for design, development and construction of electronic instrumentation for solar radiation measurement.

Thiokol Chemical Co.--with Bureau of Naval Weapons for research and development of high energy torpedo propellants.

NASA NEGOTIATIONS

Ion Physics Corp.--with Goddard for design, development and fabrication of an electron accelerator experiment capable of being flown on an **AEROBEE** sounding rocket.

G. T. Scheldahl Co.--with Langley for design and fabrication of DISC-GAP-band parachutes.

Physics Technology Laboratories--with Manned Spacecraft Center for investigation of lunar soil modification due to bombardment by simulated solar plasma wind.

NASA GRANTS

Northeastern University -- \$21,418 for theoretical study of antenna problems for radio astronomy.

MIT -- \$1,510,000 for multidisciplinary research in the space-related physical, engineering, social and life sciences.

Pennsylvania State University -- \$65,880 for ionospheric studies using beacon satellite transmissions.

Princeton University -- (new) \$15,071 for study of advanced communication techniques.

University of Maryland -- \$15,000 for the study of protein hydration in isolated cell surface structure.

U. S. Weather Bureau -- \$65,000 for partial support of the severe storms study program.

Office of Naval Research -- \$20,000 for partial support of the Advisory Center on Toxicology of the National Academy of Sciences.

Bureau of Naval Weapons -- \$100,000 to continue a study of advanced concepts for extra-vehicular protection operation.

AEC -- \$25,000 to continue feasibility studies for biosatellite experiments to determine the influence of space environment on mutation processes.

AEC -- \$15,706 to continue a biosatellite experiment feasibility study to determine the effect of the space environment on insect growth and development.

AEC -- \$215,000 to continue research and development in connection with two biological experiments for possible inclusion on biosatellite flights.

University of Michigan -- (new) \$14,460 for investigation of spectral response of various types of detectors in the extreme ultraviolet.

University of Michigan -- \$79,920 for theoretical and experimental investigations of plasma waves, space vehicle plasma sheaths, and ionospheric electron temperatures.

University of Michigan -- (new) \$100,000 to investigate the feasibility of a kilometer wave orbiting telescope.

University of Chicago -- \$68,346 for theoretical investigations of the effect of the solar wind in interplanetary space.

Kansas State University -- \$75,000 for multidisciplinary research on space-related sciences and engineering.

6570th Aerospace Medical Research Laboratories -- \$50,000 for providing a computerized data bank for manipulation and analysis of information related to space task descriptions.

NASA GRANTS-Contd.

University of Denver -- \$25,000 for bubble growth parameters in saturated and sub-cooled nucleate boiling.

University of Florida -- \$92,016 for gas solubilities and transport properties in fuel cell electrolytes.

Department of Navy -- \$40,000 to continue research on the effect of very strong magnetic fields and of magnetic-field-free environments on animals and man.

U. S. Naval Aerospace Medical Institute -- \$18,000 for assessing the biological effects of proton radiation exposure.

Graduate Research Center of the Southwest -- \$169,927 for rocket probe experiments and analysis for the upper F-region.

Air Force Systems Command -- \$73,000 to continue the development of a flight-qualified experiment on mice in long duration zero-G.

University of Toronto -- \$4,500 for investigation of atmospheric properties based upon evaluation of infrared radiation data obtained from **TIROS** satellites.

BOEING AEROSPACE SAVES \$131 MILLION IN '65

Boeing's Aerospace Group achieved cost savings of more than \$131 million during 1965 as a result of cost-reduction activities. The savings, which exceeded the group's goal for the year by 22 per cent, resulted from 3110 ideas submitted by Aerospace Group employees. Savings included \$2.4 million from using equipment that had been originally designed and procured for the **MINUTEMAN I** in the **Advanced MINUTEMAN** program and \$261,000 from revamping a method of processing **MINUTEMAN** flight-test data so that a computer bears most of the burden.

MARTIN SAVES \$50 MILLION ON DEFENSE WORK

Martin saved a total of \$50 million on its defense contracts during 1965, exceeding its original goal by \$21.8 million. Martin pioneered formal cost reduction programs in the aerospace industry six years ago. In that period, the company has recorded savings of \$350 million on government contracts.

Richard A. Foster has been appointed Eastern Regional manager for Interstate Electronics Corp. Foster previously served as project manager of Test Instrumentation Systems for the United Kingdom **POLARIS** program and field services manager of the Interstate Office at Cape Kennedy.

Irving Hirschberg has been promoted to manager of a new digital equipment section at Fairchild Space and Defense Systems.