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NASA SEEKS EXPANDABLE AIR LOCK. NASA-Langley is negotiating a contract with Whittaker Corporation's Narmco Research and Development division for the design and construction of an expandable air lock. It has been analyzed that **VOSKHOD II** used such a device to provide egress and ingress for cosmonaut Leonov during his extravehicular mission (See **VOSTOK/VOSKHOD** Evolution Special Report-II, **SPACE Daily**, Sept. 15). The Air Force has long been searching for an expandable transfer system as a passage for **MOL** astronauts moving from the **GEMINI B** into the canister. Goodyear Aerospace is under contract with Wright-Patterson's Research and Technology Division (**SPACE Daily**, Dec. 30, '64) for the development of a "transfer tunnel."

SPACE-OCEANOGRAPHY FEASIBILITY STUDY PLANNED. The Naval Oceanographic Office is planning to undertake a program to develop the feasibility of using Earth orbiting spacecraft for oceanographic applications as a part of NASA's "natural cultural resources" portion of the **AA (APOLLO Applications)** program. Areas to be studied include types of spacecraft, oceanography experimentation and instrumentation and sensors. The experiments and supporting studies will be oriented toward but not limited to participation in the **NASA AA** program. The Naval Oceanographic Office has set January 10 as the deadline for companies interested in participating in the program.

ARM-1 CONTRACT DEFINITION. A \$98,675 contract has been signed by the Navy Planning Research Corporation for the Contract Definition Phase of the **ARM-1 (Anti-Radiation Missile)**. The **ARM-1**, successor to the **SHRIKE** which has been plagued with antenna structure problems, is funded in FY '66 at \$5.6 million. A Naval Ordnance program of study and tests to alleviate the antenna problems (**SPACE Daily**, Oct. 12) was cancelled in what was believed to be an easing of the performance requirements of the **SHRIKE** until the **ARM-1** can enter the arsenal (**SPACE Daily**, Oct. 26). Sperry Farragut is currently under BuWeps contract for the modification of the **SHRIKE** for both Navy and Air Force deployment (**SPACE Daily**, Nov. 2).

FAA TO ORDER SATCOM ANTENNA. On Jan. 14, the Federal Aviation Agency will hold a bidders conference at its headquarters in Washington, D. C., for a program to test and install an antenna system for use in satellite communications.

SPACE CRAFT TO STUDY SATURN IB PAYLOAD. Integration of standard payload modules on the **SATURN IB** launch vehicle will be studied by Space Craft Inc., under a NASA-Marshall contract. *The Leader in Missile/Space Reporting*

BIDDERS SOUGHT ON 416N DISPLAY SUBSYSTEM.

The AF Electronic Systems Division is seeking sources for a Ballistic Missile Early Warning System/Sea Launched Ballistic Missile Display Subsystem.

The system sought must be capable of receiving parallel digital data from interface buffers; scan and serially transmit this data at 75 bits/second; receive the serial data stream; decode; and display for three land and two ship sites. The major contractor furnished components will consist of a scanner/transmitter telemetry line unit; a scanner/receiver telemetry line unit; data/numeric decoders; code/numeric transducers; illuminated data display panel; and telemetry to teletype converter.

The Ballistic Missile Early Warning System (System 416N) is being developed to provide NORAD and SAC with a detection, identification and warning of a submarine missile attack on continental North America.

APOLLO SPACE SUIT COMMUNICATIONS AWARDED.

Hamilton Standard Division of United Aircraft, prime contractor for the **APOLLO** portable life support system, has awarded a \$1 million contract to ITT to produce the space suit communication system for the manned lunar landing program. The system was designed and developed by ITT Federal Laboratories under an earlier contract from Hamilton Standard. The ITT radio unit measures only 1.25 x 6 x 12 inches and will provide for voice communications plus seven telemetry channels between the astronaut on the lunar lander and the Lunar Excursion Module. One of the telemetry channels will transmit physiological data; the rest will transmit data on the life support system, such as suit pressure or oxygen quantity. Similar radio equipment for **GEMINI** is being developed for ITT by LTV Aerospace (SPACE Daily, Jan. 3).

RAE RELIABILITY STUDY AWARDED.

Planning Research Corporation has been awarded a reliability assessment study contract for the **RADIO ASTRONOMY EXPLORER (RAE)** by NASA. The award calls for numerical reliability assessment; apportioning reliability goals; analyzing failure modes, effects, and criticality; and developing the reliability program for the **RAE-V** antenna. Recently, (SPACE Daily, Dec. 2) NASA-Goddard contracted Collins Radio for a study of the **RAE** antenna patterns. Avco/RAD (SPACE Daily, June 24) and Astro Research Corporation (SPACE Daily, Nov. 17) are also under contract for **RAE** antenna R&D.

NASA-CNES TALKS ON EOLE TO END THIS MONTH.

The discussions between NASA and CNES, the French space agency, over **EOLE**, the French weather satellite (SPACE Daily, Oct. 4), are expected to end this month in an agreement to designate it **FR-2** and launch it from Wallops Island on a **SCOUT** as anticipated (SPACE Daily, Nov. 2). The payload was originally called **D-3** because it was intended for launch by the CNES vehicle **DIAMANT**, but the two space agencies favor a joint meteorological program that will draw on data from **NIMBUS** and the **TOSS** satellites. Like the upcoming **NIMBUS (B)**, which is set for launch in the second quarter of this year, **FR-2** will be supported by bouys and balloons (Project **GHOST**).

PHILCO AWARDED \$86.7 MILLION FOR SHILLELAGH

Philco's Aeronutronic Division has received three awards totalling \$86.74 million from the Army for engineering, production and modification of the **SHILLELAGH** gun-launched anti-tank missile.

A \$7.75 million add-on to the existing \$20.6 million contract for industry engineering support was awarded and a \$71.39 million contract was awarded for FY 1966 production of the guided missiles and related guidance and control equipment. In addition a \$3.3 million first increment to a total \$7.6 million contract was awarded for adaptation of the **SHILLELAGH** to the joint U.S.-German Main Battle Tank for the 1970's.

Using the **SHILLELAGH** 152 mm gun launcher as its main armament the tank will be able to fire either regular rounds or guided anti-tank missiles. The **SHILLELAGH** follows a line-of-sight from the gun to either a stationary or moving target--the gunner merely keeps the target in his sight and the missile corrects to the changing target position.

SPACE GENERAL TEAMS WITH USC

Space-General and the University of Southern California's School of Engineering have entered into an "industrial associateship" agreement designed to enhance technological research. As part of the effort, Space-General has established a research and education center near the USC campus.

Under terms of the agreement, the staff of Space-General will present special seminars at USC; confer with USC faculty; and have access to USC's science and engineering libraries. Conversely, USC faculty and students will use experimental facilities in the company's center. Research in the new center will be initially conducted in the synthesis of new carboranes and in artificial bio-systems which will simulate processes that occur in living matter. Space General's Dr. Samuel Sensiper will direct the research and education center.

The industrial associateship with Space-General is the second such agreement into which USC has entered. Earlier the university, through its School of Engineering, entered into a similar commitment with Hughes, though Hughes did not establish a special facility for the effort.

AVCO TO MEASURE IONS IN FREE ATMOSPHERE

A program to take the first measurements of the behavioral characteristics of ions at altitudes between 10 and 80 kilometers will be carried out by Avco/RAD under a one-year contract from the Army Ballistic Research Laboratories. Measurements will be taken in the free atmosphere by means of instrumentation attached to a descending parachute. In the past, measurements have been taken in a low density continuous operation wind tunnel. Hans Dolezalek will direct the Avco study.

LINK AWARDED F-111A CONTRACT

General Precision's Link Group has been awarded a \$2 million follow-on contract for three production units of the F-111A flight and mission simulator from the Air Force. The Link simulator will be used for on-the-ground training of Air Force pilots.

RCA BUILDING SUN-POWERED LASER FOR NASA

A laboratory test of a Sun-powered laser designed for communications between the vicinity of Mars and Earth has been successfully conducted by RCA's Applied Research Organization. The experiment, consisting of the transmission of television pictures over the laser system, is believed to be the first wideband communications via a Sun-pumped laser. The next step in the systems's development will be transmission from RCA's Camden laboratories to a receiver at RCA's Cherry Hill facility, a distance of six miles.

The experimental Sun-pumped laser system, built for NASA-Houston, consists of a 31-inch parabolic mirror, the laser, the modulator and associated electronics, optical elements and an optical receiver. This is all emplaced on an equatorial mount which automatically keeps the Sun's rays reflected from the mirror onto the laser. William J. Hannan, is RCA's project engineer for the program.

NASA TO DEMONSTRATE NEW HYDRAZINE ENGINE CATALYST

Discovery by Shell Oil of a new catalyst which spontaneously decomposes liquid hydrazine monopropellant into a mixture of nitrogen, hydrogen and ammonia has prompted NASA to award a \$95,278 addition to Rocket Research's hydrazine technology contract to provide for the demonstration of a five pound thrust lightweight hydrazine rocket engine using the new catalyst.

Hydrazine monopropellant has already been successfully used for the mid-course correction motors for the **RANGER** and **MARINER** spacecraft but the catalyst employed required heating for use. The new catalyst, which acts spontaneously on contact, opens up the possibilities of much greater use of hydrazine monopropellants in small attitude control and stabilization motors.

Rocket Research has already received 16 other contracts in the hydrazine technology program which is investigating motors between the one-half pound and 50-pound thrust range. The five pound thrust demonstration motor will be designed for fast starts and shut-downs and the ability to deliver very reproducible thrust pulses over a throttlable 10 to 1 thrust range.

The thrust of the monopropellant is produced as a result of the expansion of gases produced by the hydrazine's rapid decomposition upon contact with the catalyst. The simplicity of a monopropellant engine gives it great weight advantages over space-storable bi-propellants. This advantage becomes even greater when such an engine is used on a manned space craft where the maintenance of an Earth environment makes it easier to store the hydrazine.

The hydrazine technology therefore has potential for rechargeable stabilization engines for an Air Force **MOL**, NASA space stations, and such vehicles as the **LUNAR HOPPER**. In addition to the simplicity of such systems, the lower operating temperature of the propellant eliminates much of the materials problems associated with liquid bipropellants and increases the reliability of the systems.

Page Communications will build and install one of its 42-foot Casshorn antennas, plus related ground station equipment, at Carnarvon, Australia, as part of the global support network for the **APOLLO** flights. The contract for the station was awarded by the Overseas Telecommunications Commission of Australia.

BENDIX CITES COMMERCIAL SALES GROWTH

An increase in commercial sales for the fiscal year ended Sept. 30, 1965, has been reported to Bendix stockholders by company Chairman A. P. Fontaine, who noted the company's objective of a "better balance of our military and commercial-industrial product sales." He said the company intends to maintain the balance by acquiring supplementary units. Commercial sales rose to \$331,024,000 from \$282,659,000 a year earlier.

Missile Sales Down/Space Sales Up

Bendix sales volume in missile systems, subsystems and components for the fiscal year totaled \$94,177,000 compared with \$124,745,000 in the previous year. "Our decline in sales reflects the maturing of the government's missile programs and lowered procurement rates...Nevertheless, our total missile business remains at a high level and is making significant contributions to our profits and technology," Fontaine said.

Company sales in the space business amounted to \$80,728,000 for the year as compared with \$77,557,000 for the previous year. The report cited company efforts in operating world-wide **GEMINI** tracking stations.

The company's backlog of funded unfilled orders at Sept. 30, 1965, was up to \$477 million from \$382 million a year earlier. The backlog of unfunded orders at year-end was \$120 million against \$89 million on Sept. 30, 1964.

ITT INCREASES SALES/SEES \$2 BILLION MARK FOR 1966

Sales and revenue of ITT totaled \$1.8 billion in 1965, up 15 per cent over the company's previous high in 1964. "We have equal confidence today that our sales in 1966 will exceed \$2 billion," said company President Harold S. Geneen. Orders on hand at year's end rose to \$1.1 billion, another all-time high.

He said the company had made significant progress towards its goal of achieving a balance between domestic and foreign operations, with domestic earnings rising to approximately 40 per cent of total system earnings, compared with 30 per cent in 1964 and 16 per cent in 1959.

GENERAL CHAPMAN TO OPERATE LTV AEROSPACE-EUROPE

Brig. Gen. Willis F. Chapman (USAF-Ret.) has joined LTV Aerospace as director for aerospace programs in Europe. He will make his headquarters in Paris, where he formerly served in such positions as senior Air Force member of the Mutual Weapons Development Team, charged with contracting for joint military R&D efforts with NATO countries. General Chapman retired from the Air Force in 1965.

Earl E. Honeywell has been named manager of advanced studies and analyses at Fairchild Space and Defense Systems. He will be responsible for new product planning of the firm's systems management and engineering department.

COMSAT EARLY BIRD REVENUE TOTALS \$966,000

ComSat realized revenues of \$966,000 from the operation of the **EARLY BIRD** communications satellite from June 28 (when the satellite began commercial operation) to Sept. 30, the corporation has reported in its first quarterly report to stockholders. Revenues from **EARLY BIRD** have been placed in a deferred account in accordance with an FCC order. Total cash and temporary cash investments of the corporation as of Sept. 30, amounted to \$187,767,000.

BELL EXECUTIVE VICE PRESIDENT APPOINTED

Dr. Richard M. Hurst has been appointed as executive vice president of Textron's Bell Aerosystems Company. The post has been filled up to now by William G. Gisel in addition to his duties as president of Bell. Hurst will be responsible for administering all the Bell operating departments.

BOMBER CUTBACK DRAWS NEW CRITICISM

Rep. Craig Hosmer (R-Calif.), chairman of a House Republican task force on nuclear affairs, says the Administration has failed to provide adequate reasons for its decision to reduce the U.S. strategic bomber force (SPACE Daily, December 9). He said the move must be vigorously opposed until the Administration can support its position. Hosmer said the cutback in manned B-52 and B-58 bombers--to be replaced partially by the new FB-111--would mean that U.S. nuclear power would be reduced by between 29 and 58 per cent. He said this would leave the U.S. with a force too low to deter the Soviet Union from launching a surprise nuclear attack.

AVNET TO SELL FAIRCHILD EQUIPMENT

Avnet Electronics will market Fairchild Semiconductor's complete line of silicon transistors, diodes, and integrated microcircuits in the Southern California area.

SCHIRRA/SLAYTON RECEIVE AWARDS

Astronaut Captain Walter M. Schirra, Jr., USN, command pilot for the **GEMINI VI** mission, has been awarded his second NASA Distinguished Service Medal for his "courage and judgment in the face of great personal danger" during the first attempt to launch the **GEMINI** this December. Schirra received his first DSM for his **MERCURY MA-8** flight in October of 1962.

Former astronaut Donald K. Slayton was awarded his first Distinguished Service Medal for his "outstanding performance in directing NASA flight operations". Slayton, one of the original seven **MERCURY** astronauts, is now Assistant Director for Flight Crew Operations.

NASA Exceptional Service Medals were awarded to Schirra, **GT-6** pilot Major Thomas P. Stafford, **GT-7** command pilot Lt. Col. Frank Borman, **GT-7** pilot Commander James A. Lovell, Jr., **GEMINI** Mission Operations Deputy Director William C. Schneider, and Tracking Network Assistant Director John T. Mengel.

DOD NEGOTIATIONS

Sperry Utah Company, Salt Lake City, Utah--with Army Missile Command for design and development directed toward improvement of the **SERGEANT** ground electronics.

Martin Co., Baltimore, Md.--with Air Force Systems Engineering Group for analysis of D-16 space power tool experiment.

Dynetics Inc.--with Bureau of Naval Weapons to conduct an R&D program on plug and reverse flow rocket-motor nozzles.

General Dynamics Corp., General Dynamics/Convair--with Air Force Ballistic Systems Division for integration and launch of a dual **OV 1** (Orbital Vehicle) with a scientific passenger pod.

General Dynamics Corp., General Dynamics/Convair--with Air Force Ballistic Systems Division for supplies and services for integration and launch of **OV1-8** (satellite).

Bendix Field Engineering Corp., Owins Mills, Md.--with Army Electronics Command to continue work in the field of satellite communications.

General Electric Co., Space Technology Center--with Air Proving Ground Center, Eglin Air Force Base, Fla., for theoretical terminal ballistic study.

Astrosystems International Inc., Fairfield, N.J.--with Army Missile Command for a research study pertaining to the development of a self-pumping rocket (air-cycle).

Fluidyne Engineering Corp., Minneapolis, Minn.--with Arnold Engineering Development Center, Arnold Air Force Station, Tenn., for a continuation of research study on storage heaters for a true temperature hypersonic wind tunnel.

United Research Services, Inc.--with Air Force Flight Test Center for USAF/NASA blast hazards program.

Raytheon Co.--with Naval Air Station for development, fabrication, captive flight and demonstration, test firing program for the **SPARROW III MCS**.

General Electric Co., Re-entry Systems Department--with Air Force Ballistic Systems Division for advanced re-entry program.

Hercules Powder Co., Allegany Ballistics Lab.--with Bureau of Naval Weapons for **TALOS** booster, guided missile **MK II** and **MODs**.

The Physics International Co.--with Air Force Ballistic Systems Division for research and operational nuclear radiation effects tests on advanced guidance systems and components.

NASA NEGOTIATIONS

Hayes International Corp.--with Marshall for a study of guidance and space flight theory.

Dynamic Science Corp.--with Western Operations Office for effect of additives on the ignition delay time of hypergolic propellants.

Northrop Space Laboratories--with Headquarters for research relative to continuation of studies on perognathus as an experimental organism for research in space biology.

System Sciences Corp.--with Headquarters for additional areas of work relative to technical operations planning for the National Geodetic Satellite Program.

Fundamental Research Associates, Inc., New York, N.Y.--with Headquarters, Contracts Division for a study of dust technology for structural applications on space.

Brown Engineering Co.--with Kennedy for launch support equipment for **SATURN V** programs.

Chrysler Corp.--with Kennedy for four cooling units for the Lunar Excursion Module (**LEM**) crew compartment.

North American Aviation, Inc.--with Kennedy for four cooling units for the Lunar Excursion Module (**LEM**) crew compartment.

American Air Filter Co., Inc.--with Kennedy for four cooling units for the Lunar Excursion Module (**LEM**) crew compartment.

Environmental Controls System Div.--with Kennedy for four cooling units for the Lunar Excursion Module (**LEM**) crew compartment.

Keco Industries, Inc.--with Kennedy for four cooling units for the Lunar Excursion Module (**LEM**) crew compartment.

Engineered Devices, Inc.--with Kennedy for four cooling units for the Lunar Excursion Module (**LEM**) crew compartment.

Carrier Air Conditioning Co.--with Kennedy for four cooling units for the Lunar Excursion Module (**LEM**) crew compartment.

Boeing Co.--with Michoud Assembly Facility to design, manufacture and assemble miscellaneous ground support equipment required for Merritt Island launch area.