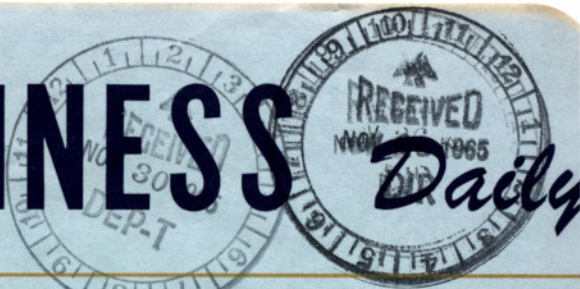


SPACE BUSINESS



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DIRECT BROADCAST SATELLITE RFPS ISSUED. As first reported by SPACE Daily, (Nov. 12, 15 & 16), NASA last week began issuing requests for proposals for a Direct Broadcast Satellite (DBS) capable of transmissions directly to conventional FM home radio sets and/or short-wave radios. The contracts to be awarded will specify a six-month detailed mission study of two alternatives: an HF band transmitter (DBS-HF); and an FM band transmitter (DBS-FM).

It is expected that the DBS will stay within the state of the art using large solar arrays instead of a nuclear power source (SPACE Daily, Nov. 15). Employing this approach the DBS will probably be a synchronous and equatorial orbit satellite system. Also the DBS-FM might use a large antenna of 100 feet in diameter or larger. The technology is expressed by industry as well within hand awaiting only funding and boosters.

Applications for the DBS system would include network broadcasting, educational radio broadcasting and computer communications (SPACE Daily, Nov. 16). Dr. Homer Newell, associate administrator of NASA's space sciences, says such a system is within four years of a reality while a direct TV Direct Broadcast Satellite (DBS-TV) could be possible within 5-6 years. There is \$800,000 remaining in NASA's advanced studies money for FY '65 for the DBS, the Standardized EXPLORER (SPACE Daily, Nov. 8) and the new ATS-4 concept (SPACE Daily, Sept. 20), in addition to monies that could be available in FY '66 funding. The legal complications of a DBS system have still to be tried on the FCC.

The industry proposals which must be returned to NASA by about the first of the year (45 days) will be used to chart the next course and evaluate the possibilities for a development and flight test program by NASA. RCA's David Sarnoff wants the DBS satellites to be placed on the competitive market (SPACE Daily, May 28).

MOL SUBSYSTEMS CONTRACT AWARDS IMMINENT. Douglas, the prime space station contractor for the Air Force MOL, is finalizing the plans for the negotiations for several of the subsystems contracts in anticipation of making the awards within days. All of the six major subsystems contracts are expected to be awarded by the second week in December. Twenty-two companies were invited to submit proposals on the subsystems (SPACE Daily, Oct. 4) which include communications, data management, navigation, attitude control, fuel cell power supply, and the environmental control and life support system.

SPACE-GENERAL AWARDED NEW S-6 MOL CONTRACT.

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exploratory development of the MOL (Manned Orbiting Laboratory) S-6 experiment will be continued under a contract to be negotiated with Wright-Patterson.

ALSEP STILL PLAGUED WITH INDECISION. **ALSEP** (APOLLO Lunar Surface Experiments Package) (SPACE Daily, May 14 & Aug. 5), a concept for depositing long-stay scientific experiments in protective packages on the lunar surface by APOLLO astronauts is still far from a well-defined program.

Recently (SPACE Daily, Oct. 15), General Electric was awarded about \$700,000 to initiate development of the ALSEP's SNAP-27, 50-watt isotope power source. Further, NASA-Houston, when awarding the \$500,000, six-month package design development contracts to Bendix, Space-General and TRW Systems (SPACE Daily, June 11 & Aug. 5), specified that the experiments must be mated with the SNAP-27 power system. To meet required schedules, the design of the SNAP-27 flight qualification units will be frozen at the same time that the development test system becomes available.

NASA officials are, however, in disagreement over the development approach. Some say it would be more desirable if system development testing could be accomplished in advance of commitment of the flight qualification units to full fabrication. Also, the lack of decision on details of mission requirements are affecting the design of the SNAP-27 power system. For instance, a decision must still be made on whether to install the fuel capsules in the power system at launch or carry the capsules in the APOLLO spacecraft and install them in the experiments packages on the lunar surface. This is a major consideration for it involves the methods of handling the isotope fuel throughout the mission to the Moon.

BLUE BIRD CONTRACT OFFICIALLY AWARDED. ComSat's contract with Hughes for the four APOLLO-support BLUE BIRD satellites (SPACE Daily, Aug. 16 and Oct. 1) has been formally awarded. The Interim Committee that represents the satellite system's international owners approved the contract early this month (SPACE Daily, Nov. 3) and the FCC followed suit the following week (SPACE Daily, Nov. 12), thus clearing the way for the formal presentation. The Commission's OK was the only requirement left to be satisfied before production could begin, since the contract had been finalized and filed last month (SPACE Daily, Oct. 19 & 21).

BOEING TO STUDY EXTENDED RADIATION EXPOSURE. The effects on crews of missions of very long durations beginning with the APOLLO Applications (AA) program 45-day missions, of radiation encountered in the space environment will be the subject of a study to be awarded by NASA-Washington to Boeing's Aerospace division. Boeing will attempt to measure by analysis the amount of radiation to be expected.

COLLINS AWARDED RAE CONTRACT. Collins Radio of Dallas will study antenna patterns for the RADIO ASTRONOMY EXPLORER (RAE) under a \$67,000 NASA-Goddard contract. Recently, (SPACE Daily, Nov. 17) Goddard contracted Astro Research Corporation for a structural design development of the RAE antenna, an area also under investigation by Avco/RAD (SPACE Daily, June 24).

ITT REPROPOSES PUERTO RICO COMSAT TERMINAL

Because its initial application to the FCC for authority to own and operate a ComSat-support ground station in Puerto Rico (SPACE Daily, Apr. 1) was "technically imperfect," ITT Cable and Radio has revised the petition and resubmitted it. The station would be located in the Quebrada Arenas Ward of Yabucoa (San Lorenzo Municipality) and would support ComSat's operational satellite system for commercial communications (SPACE Daily, Aug. 18 and Oct. 28). It would provide the Caribbean and related areas with telephone, television, telegraph, and other services and could handle government and military communications as well. The company jointly owns and operates with AT&T the present communications cables between the American continent and Puerto Rico.

ITT FILES FOR OK OF LIVE GEMINI RECOVERY COVERAGE

ITT has filed with the FCC as expected (SPACE Daily, Nov. 24) for permission to operate its mobile ground station aboard the USS Wasp to help provide live television coverage of the **GEMINI VII** and **VI** recovery activities. CBS, the downrange pool agency for the TV networks, will be the customer--i.e. the user of the service the station offers--and ComSat, manager of the **EARLY BIRD** satellite, will be the other communications carrier involved, with ITT as its customer. ComSat will file with the Commission the rates it intends to charge ITT. CBS may be involved in the processing of ITT's application, but it does not have to file a separate statement. The transmissions from the station will go by way of the satellite for relay to the Andover terminal whence they will travel by cable to New York for distribution.

NASA ASSOCIATION DINNER GUIDELINES

A recent NASA directive, signed by Deputy Administrator Hugh L. Dryden, has provided NASA guidelines for participation in annual dinners honoring aerospace pioneers, such as the National Space Club's Goddard Dinner and the Wright Brothers Dinner. The directive states that "NASA does not prevent acceptance of an invitation from a company to attend such affairs, provided the expense borne by the company is limited to the cost of tickets. Lodging or travel expenses may not be accepted."

NASA feels that these events contribute to a broadened understanding of public policy and programs in the fields of space and aviation and provide occasions for professional representatives of government and industry to meet together for the purpose of exchanging ideas and honoring recognized achievements in these fields.

GEMINI ON SCHEDULE

The preparations for the tandem **GEMINI VII/VI** mission on December 4 are still on schedule after last week's four day strike by the Cape Kennedy contingent of McDonnell IAM workers (SPACE Daily, Nov. 22, 23, & 24). The launch vehicle was fueled last Wednesday in preparation for the simulated flight held on Saturday. Astronauts Lt. Col. Frank Borman and Cmdr. James A. Lovell, Jr. are now in special astronaut quarters at Merritt Island undergoing physical examinations.

DE GAULLE'S ICBM FORCE DE DISSUASION RE-ENTRY VEHICLE



The re-entry vehicle for President Charles de Gaulle's ICBM Force de Dissuasion test rocket, the **SAPHIR**, is shown shortly after recovery after the most recent flight of the vehicle on October 9 (SPACE Daily, Oct. 8, 14 & 19). The SAPHIR is being used as a test vehicle for the **MINUTEMAN**-(SSBS) and **POLARIS**-type (MSBS) ballistic missiles which France is hope-

ful of having fully operational by 1970 (SPACE Daily, Oct. 7).

SPACE Daily-France has learned that the re-entry vehicle for the **SAPHIR** is identical in shape, size, and possibly weight (1350 pounds) to what has recently been identified as the **SUPER ERIDAN** sounding rocket development by Sud Aviation. The recovery system for the **SUPER ERIDAN** is produced by Northrop (SPACE Daily, June 11) who is developing the **GEMINI** and **APOLLO** recovery systems. Officials explain, however, that the **SUPER ERIDAN** is no more than a concept, what with the **ERIDAN** sounding rocket still on paper (design) and unfunded. When, and if, **ERIDAN** is approved it will be the fifth member of a sounding rocket family.

Due to the highly classified nature of the ICBM Force de Dissuasion **SAPHIR** development program, reports leak out that perhaps the **SUPER ERIDAN** identification may have been used as a cover for the development of the **SAPHIR** re-entry vehicle and recovery system, hence a development for the ICBM Force de Dissuasion instead of for scientific sounding rockets. In addition to a contract with Sud Aviation for the **SUPER ERIDAN**, Northrop is also under technical assistance agreement with the Aerazur Construction Aeronautiques for the development of space re-entry systems, including the research, and production of complete systems.

HUMPHREY TO ADDRESS INTERNATIONAL COOPERATION CONFERENCE

Vice President Hubert H. Humphrey, chairman of the National Aeronautics and Space Council, will address the International Cooperation Conference's space panel meeting this afternoon in Washington (SPACE Daily, Nov. 12).

Members of the panel, which will be chaired by Joseph V. Charyk, president of ComSat, will be J. L. Atwood, president, North American Aviation; Arnold W. Frutkin, assistant administrator for international affairs, NASA; Homer E. Newell, associate administrator for space science and applications, NASA; Courtland D. Perkins, Princeton University; and Richard W. Porter, General Electric.

Jack L. Stempler has been appointed assistant to the Secretary of Defense for Legislative Affairs. Stempler replaces David E. McGiffert, who is to become Under Secretary of the Army.

NASA DEVELOPS ITS OWN AMU

NASA is completing qualification vacuum tests on its new Extravehicular GEMINI Mobility Unit (EGMU) to be used on GEMINI VIII and X missions. The EGMU has already completed thermal qualification tests. The EGMU consists of the Extravehicular Life Support System (ELSS), the chest pack developed by NASA for use with an umbilical cord and with the Air Force AMU; the Extravehicular Support Pack (ESP), a back-pack developed by NASA to use with the ELSS instead of the AMU; and the Hand Held Maneuvering Unit, used on GEMINI IV mission.

Originally NASA had no plans for independent extravehicular activity or for mobility on GEMINI missions, intending to rely on an umbilical for oxygen supply, and communications. It therefore contracted for development of the ELSS chest pack by AiResearch to provide circulation, cooling, and a 30-minute emergency oxygen supply, and to run the power, main oxygen supply, and communications from the spacecraft umbilical.

The Air Force, mainly interested in a mobile, independent life support system, contracted for development of the AMU (Astronaut Mobility Unit) from Ling-Temco-Vought. The AMU was designed to be used in conjunction with the ELSS. The AMU would provide a stabilized mobility system, a main oxygen supply, the power supply, and communications. The ELSS would provide circulation and cooling, the emergency oxygen supply, and controls for the AMU systems.

VOSKHOD II Instilled Decision

After the Soviet demonstration of extravehicular activity, NASA-Houston rushed into an in-house development of the hand-held maneuvering unit, a simple gas-operated unit which could give the United States a first through astronaut maneuvering. But this successful unit had a very brief fuel supply, so after the test of the ELSS-umbilical system, on GEMINI IV, NASA began work on a back-pack which would provide power, communications, an independent oxygen supply (83 minutes) and fuel for the maneuvering unit which will be used to provide mobility for the astronaut. The purpose of the combined EGMU unit--Extravehicular Life Support System (ELSS), Extravehicular Support Pack (ESP), and Hand Held Maneuvering Unit--is to allow a longer test of the maneuvering unit and thereby to study tether dynamics.

NASA Bypasses AF AMU

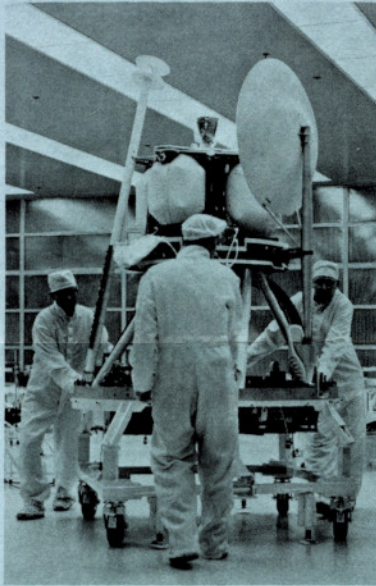
A third system, the Extravehicular APOLLO Mobility Unit (EAMU), is presently going through a series of studies and NASA spokesmen say that the "stop-gap" EGMU is not being considered for the EAMU. The EGMU will be tested out on the GEMINI VIII mission early in 1966, even though the Air Force AMU is already tested out, but will not be flown until the later GEMINI IX mission. The EGMU will also be flown on GEMINI X and the AMU on the later GEMINI XII.

AS&E SALES/EARNINGS UP FOR FISCAL YEAR

American Science & Engineering of Cambridge, Mass., had sales of \$4.2 million for FY 1965, up 40 per cent from last year's \$3 million. Earnings were also up from 1964's \$96,000.

The company's existing backlog is approximately \$4.9 million, including a NASA contract for further investigation of stellar x-ray sources in connection with the APOLLO program.

FIRST LUNAR ORBITER TAKING SHAPE AT BOEING



This is the first of the three ground-test models of Boeing's **LUNAR ORBITER** as it was recently moved from its clean room assembly site to go to a vacuum chamber for environmental testing. Built to flight specifications, it adheres to the configuration finalized last summer (SPACE Daily, June 29) and is complete except for the camera system, which would go in the middle section (hidden by the technician in the center) beneath the propulsion sector (visible above his head).

In addition to the three test models, Boeing's Aerospace Group is fabricating five flight models, the first of which will probably be orbited next June (SPACE Daily, Sept. 10) by an **ATLAS AGENA**. The first of the **ORBITER** shrouds--also made by Boeing--was delivered early in the fall to NASA-Lewis for testing (SPACE Daily, Sept. 10). Three months earlier the shroud was fitted around the **ORBITER** to check their compatibility (SPACE Daily, June 23).

FIRST SURVEYOR DROP TEST SUCCESSFUL

The first very limited test of the **SURVEYOR** vernier engines and radar altimeter and doppler velocity sensor (RADVS) systems has been accomplished successfully by Hughes at Holloman AFB, New Mexico. A previous drop test series earlier in the year was a failure which resulted in the destruction of the drop test articles (SPACE Daily, Oct. 28).

The final **SURVEYOR** configuration calls for the spacecraft to be slowed from its 600-mile-per-hour lunar approach speed by a solid propellant retro-rocket. The retro-rocket is then jettisoned and the spacecraft is slowed further by the liquid vernier engines. As it approaches the surface the radar altimeter and doppler velocity sensor provide guidance to the vernier engines to allow them to maintain the correct rate of descent and spacecraft orientation. At a height of 13 feet the engines cut off and the spacecraft drops to the surface.

The recent test, the first of an eight-test series, consisted of suspending the **SURVEYOR** model from a balloon at 1400 feet, then starting the vernier engines and the RADVS systems. With the two major systems operating successfully, the test article was released from the balloon and descended under the vernier engine power to 500 feet where a parachute was deployed, ending the test. All systems apparently functioned as designed.

Both the vernier engines and the RADVS have been a major problem in the **SURVEYOR** development program. The vernier engines will also act as the mid-course correction motor for **SURVEYOR** and their development problems have been one reason for the repeated delays in the first **ATLAS CENTAUR/SURVEYOR** flight from October 1965 to February 1966 to March and most recently to May (SPACE Daily, Nov. 24).

NASA TO TRY SPACE SURVEILLANCE TEST AGAIN

NASA will attempt once again to test the visual acuity of astronauts in orbit and to determine whether weightlessness improves space-to-Earth vision. The upcoming **GEMINI VII** 14-day mission will include a repeat of the **GEMINI V** visual acuity experiment in which the astronauts will attempt to find and identify patterns on the ground formed by large white panels laid out on a plowed field near Laredo, Texas.

Interest in how well an orbiting astronaut can see was aroused by astronaut Lt. Col. L. Gordon Cooper, Jr.'s reports of seeing roads and motor vehicles during his May 1963 **MERCURY** flight. Since such sightings were earlier believed beyond the capability of the human eye, scientists prepared the visual acuity experiment for **GEMINI V**. Because of the failure of the fuel cell system in **GEMINI V**, the spacecraft was subject to considerable tumbling. Because of this the astronauts were able to spot the panels but their reports were "inconclusive".

MCDONNELL STRIKE OVER

In a 6,087 to 2,841 vote the McDonnell members of the International Association of Machinists approved a new three-year contract with McDonnell Aircraft which had been worked out by McDonnell, the Union, and the Federal Mediation Service in order to end the six-day walk-out of the 17,000 workers. The decision cleared the way to resume work on two **GEMINI** spacecraft and some 50 Phantom jet fighters at the St. Louis plant. The strike had only lasted four days for the 200 members of the IAM at Cape Kennedy who had been allowed to return to work Monday on preparations for the December 4 **GEMINI VII/VI** launch.

COMSAT NAMES BREWSTER CONSTRUCTOR

As expected (SPACE Daily, Nov. 17 & 23), ComSat identified last week the contractor who will prepare the site and build the facilities for the Corporation's ground station near Brewster, Wash. Under a \$909,382 award that was filed with the FCC last week, Vern W. Johnson & Sons Inc. will grade, road, and construct at the site, with work to end late next June. Johnson & Sons is headquartered at Spokane.

MOSKOWITZ SWORN IN AS DOD DEPUTY ASSISTANT SECRETARY

Jack Moskowitz, formerly counsel for the Senate Subcommittee on Anti-Trust and Monopoly, has been sworn in as deputy assistant secretary for civil rights and industrial relations in the office of the assistant secretary of defense for manpower. Moskowitz will be responsible for developing Department-wide civil rights policy and for developing and coordinating policy in industrial relations and in maintaining liaison with both industry and labor organizations.

ISIS SCRUBBED TILL 27TH. **ISIS-X**, the joint US-Canadian ionospheric launch project, has been scrubbed again until Nov. 27th due to extremely high winds in the upper atmosphere.

NASA-HOUSTON FY '65 PROCUREMENTS UP 3 PER CENT

NASA-Houston let contracts totaling approximately \$1,487,400,000 during FY 1965, up three per cent over procurements in 1964. Approximately 86 per cent of the total was placed with business firms, 1.4 per cent with educational and other nonprofit institutions and 12.5 per cent with, or through, other government agencies.

Small businesses received about two per cent of the total awarded to business. Excluding the 10 largest awards, small business received about 15 per cent of the remaining business dollar.

78 Per Cent in Competitive Contracts

Contracts awarded through competitive procedures increased from 69 per cent of the total business in FY 1964 to 78 per cent with an additional 13 per cent representing awards on follow-on contracts placed with companies that had previously been selected on a competitive basis.

Cost-plus-fixed-fee contracts represented nearly 73 per cent of the awards to business in excess of \$25,000. This was attributed to the fact that Houston's procurements are primarily for research and development. Eighty-seven per cent or \$1,290,000,000 of contracting represented negotiated efforts with over 95 per cent of this amount going for research and development.

Houston continued its emphasis on incentive contracting during the year by converting McDonnell's **GEMINI** contract and AC Electronics' contract for the guidance computer subsystem for the **APOLLO** Command and Service Module to incentive contracts. Eleven CPIF and three fixed price incentive contracts were in effect for a combined total of \$250.9 million or approximately 19 per cent of the business awards in excess of \$25,000.

45 States Participated in Contracting Actions

California, New York, Missouri, Wisconsin, Texas, Massachusetts, Florida, Maryland, Washington, D. C., and Connecticut led the Center's list of 45 states in FY '65 contracting to businesses while educational and other nonprofit institutions in 26 states participated in Houston procurement.

NASA-Houston's Top Ten

The ten largest awards to business in terms of aggregate value are as follows:

North American Aviation, Downey, Calif.--FY '65 obligations \$581.6 million; cumulative obligations \$1,452,000,000 for design, development and testing of the three-man Earth-to-Moon-and-return **APOLLO** spacecraft;

Grumman--FY '65 obligation \$242.6 million; cumulative obligations \$392.1 million for Lunar Excursion Module development;

McDonnell--FY '65 obligations \$166.8 million; cumulative obligations \$657.6 million for design and development of the **GEMINI** spacecraft;

General Motors, AC Electronics Division--FY '65 obligations \$64.5 million; cumulative obligations \$112.4 million for guidance computer subsystem for **APOLLO** Command Module;

Philco--FY '65 obligations \$21.2 million; cumulative obligations \$63.7 million for implementation of the Mission Control Center;

IBM--FY '65 obligations \$14.0 million; cumulative obligations \$36.1 million for real time computer complex;

TRW Systems Group--FY '65 obligations \$6.4 million (new contract) for mission trajectory control program;

MORE

NASA-HOUSTON FY '65 PROCUREMENTS UP 3 PER CENT-Contd.

General Dynamics/Convair--FY '65 obligations \$5.7 million; cumulative obligations \$18.0 million for solid suborbital vehicle; and

United Aircraft, Hamilton Standard Division--FY '65 obligations \$5.2 million (new contract) for development of APOLLO prototype space suits and portable life support systems.

FIRST SPAN FACILITY AT NASA-HOUSTON

A Solar Particle Alert Network (SPAN), the first in a series of three telescopes to study radiation coming from the Sun, is now in operation at NASA-Houston. Early next year the Houston station will be joined by monitoring points at Grand Canary Island in the Atlantic and Canarvon, Australia.

The network will be used to develop a warning system for radiation flares from the Sun which might endanger the lives of astronauts on a lunar mission. The SPAN is designed to detect radiation flares several hours before they reach the vicinity of the Moon, thereby enabling the astronauts on the lunar surfact to return to the safety of the APOLLO Command Module.

The Houston facility has two monitoring telescopes, one of which is a hydrogen alpha solar patrol instrument fitted with special filters which can provide an optical image of the Sun's surface. The lens, which is four inches in diameter, has three magnifications from 20 to 80 power. A 35mm camera is mounted in the telescope for use in time lapse photography of the development of solar flares. The instrument is also equipped with an occulting cone which creates an artificial eclipse of the Sun, blocking out the Sun's disc to enable an observer to see the corona on the Sun's rim. An alternate lens also has a raster or grid to enable scientists at different stations to correlate their findings. NASA-Houston's SPAN also has a spectrograph which can make such measurements as the temperatures of the Sun in active regions and the force of the solar magnetic field.

Razdow Inc. (Newark, N.J.) assembled the solar telescope. The building and tower were built by Evans Construction Co. of Houston, and the heliostat was furnished by Geotech Inc. of Dallas. Jarrell Ash Co. (Waltham, Mass.) furnished the spectrograph and instrumentation. Peter Higgins, Radiation and Fields Branch of Advanced Spacecraft Technology Division, is project manager for the facility which is valued at \$171,000.

AGENCIES TO PARTICIPATE IN INDIANA PROCUREMENT CONFERENCE

The Department of Defense, Department of Commerce, Small Business Administration, NASA, AEC, Veterans' Administration, General Services Administration, Indiana Departments, and representatives of space and defense contractors will participate in a one-day procurement conference December 15 in Indianapolis to assist in developing that state's resources for government prime and subcontracting. The conference is being coordinated for the DOD by C. F. Cinquegrana, special assistant for economic utilization to the Director, Defense Supply Agency, and by Robert M. Kerr, Department of Commerce, for other government agencies.

TOP 100 DOD CONTRACTORS--FY 1965

Rank	Companies	Millions of Dollars	Per cent of U.S. Total	Rank	Companies	Millions of Dollars	Per cent of U.S. Total
1	Lockheed	\$1,715.0	7.1%	51	Republic Aviation	\$70.1	0.3%
2	General Dynamics	1,178.6	4.9	52	Signal Oil and Gas	69.1	0.3
3	McDonnell	855.8	3.5	53	Magnavox Co.	60.4	0.3
4	General Electric	824.3	3.4	54	Asiatic Petroleum	57.8	0.3
5	NAA	745.8	3.1	55	Western Union	51.8	0.2
6	United Aircraft Corp.	632.1	2.6	56	Eastman Kodak Co.	50.8	0.2
7	AT&T	587.6	2.4	57	Lear-Siegler, Inc.	49.5	0.2
8	Boeing Co.	583.3	2.4	58	Olin Mathieson	49.4	0.2
9	Grumman	353.4	1.5	59	Curtiss-Wright	49.3	0.2
10	Sperry Rand Corp.	318.4	1.3	60	System Dev.	48.9	0.2
11	Martin-Marietta	315.6	1.3	61	Johns Hopkins U.	48.5	0.2
12	Ford (Philco)	312.0	1.3	62	Bath Iron Works	47.9	0.2
13	Gen. Tire & Rubber	302.0	1.2	63	Bethlehem Steel	47.9	0.2
14	Raytheon	293.4	1.2	64	Sverdrup & Parcel	47.0	0.2
15	Hughes Aircraft Co.	278.3	1.2	65	M-K, UC, Perini & CHL	46.6	0.2
16	LTV	264.7	1.1	66	Texas Instruments	43.8	0.2
17	Westinghouse	260.9	1.1	67	Gyrodyne Co.	39.3	0.2
18	Northrop Corp.	255.9	1.1	68	Continental Oil Co.	39.2	0.2
19	General Motors Corp.	254.4	1.0	69	Control Data Corp.	39.1	0.2
20	Bendix Corp.	234.9	1.0	70	Mitre Corp.	38.5	0.2
21	AVCO Corp.	234.2	1.0	71	Vitro Corp.	36.4	0.2
22	GT&E	222.5	0.9	72	International Harvester	35.8	0.2
23	Kaiser Industries	218.8	0.9	73	Union Carbide	35.2	0.2
24	RCA	213.9	0.9	74	Kaman Aircraft	35.1	0.1
25	ITT	206.7	0.8	75	Cutler-Hammer	34.5	0.1
26	Todd Shipyards	196.6	0.8	76	Standard Oil of Ind.	33.2	0.1
27	Textron, Inc.	195.7	0.8	77	Norris-Thermador	31.4	0.1
28	Litton Industries, Inc.	189.9	0.8	78	Hayes International	31.2	0.1
29	IBM	186.2	0.8	79	Teledyne, Inc.	30.7	0.1
30	Newport News S & D	184.8	0.8	80	Stanford Research	30.7	0.1
31	Douglas Aircraft Co.	170.1	0.7	81	Burroughs Corp.	30.4	0.1
32	Standard Oil of N. J.	164.0	0.7	82	Gulf Oil Corp.	30.3	0.1
33	Pan Am	157.7	0.6	83	Cities Service Co.	30.0	0.1
34	Collins Radio Co.	141.1	0.6	84	Flying Tiger Line	29.9	0.1
35	Thiokol Chemical Corp.	136.2	0.6	85	Richfield Oil Corp.	29.3	0.1
36	Texaco, Inc.	124.2	0.5	86	Firestone	28.8	0.1
37	F M C Corp.	124.0	0.5	87	White Motor Corp.	28.6	0.1
38	MIT	123.7	0.5	88	Ryan Aeronautical	26.9	0.1
39	Standard Oil of Calif.	114.8	0.5	89	Standard Kollsman	26.9	0.1
40	Hercules Powder	101.3	0.4	90	Atlantic Research	26.7	0.1
41	General Precision	100.5	0.4	91	Motorola, Inc.	26.7	0.1
42	Socony Mobil Oil Co.	85.5	0.4	92	Condec Corp.	26.3	0.1
43	Goodyear	82.5	0.4	93	Chamberlain Corp.	25.9	0.1
44	Honeywell, Inc.	82.5	0.4	94	Koppers Co., Inc.	25.9	0.1
45	Ogden Corp.	82.2	0.3	95	Union Oil of Calif.	25.4	0.1
46	Chrysler Corp.	80.9	0.3	96	Dynalelectron Corp.	24.9	0.1
47	T R W, Inc.	79.6	0.3	97	Rich Co.	24.8	0.1
48	Aerospace Corp.	77.5	0.3	98	M-Knudsen	24.7	0.1
49	Continental Motors	77.4	0.3	99	Webb Corp.	24.3	0.1
50	Du Pont	70.6	0.3	100	Day & Zimmerman	24.3	0.1

Future Space Business**EXTINGUISHABLE SOLID PROPELLANTS STUDY**

The Air Force Flight Test Center is planning to fund a combustion instability study of extinguishable solid propellants. This is an applied research program to investigate experimentally and analytically the relationship between combustion instability and ease of extinguishment. Characteristics of both instability categories of propellants optimized for extinguishability and propellants with poor extinguishment characteristics will be correlated with respect to each other.

Contact: Air Force Flight Test Center, Directorate of Procurement, Edwards Air Force Base, Calif., Attn: FTMKB. Reference: PR 3059607. Due date: Dec. 4.

VHF-UHF COMMUNICATION SURVEILLANCE HIGH POWER TRANSISTORS

The Army Electronics Command is requesting quotations for the fabrication of three exploratory development/engineering design models of high power transistors for VHF-UHF communication surveillance. Two of these transistors are for single sideband communications systems application and one for surveillance system application.

Contact: Fort Monmouth Procurement Division, Procurement and Production Directorate, U.S. Army Electronics Command, Fort Monmouth, N.J. 07703, Attn: Miss C. Musto, AMSEL-PP-CM-EC/K-9. Reference: RFQ AMC(E) 28-043-66-00488 (N). Due date: Dec. 29.

DIRECT CURRENT ACCELERATOR INVESTIGATION

NASA-Lewis is funding an experimental and analytical investigation of a direct current accelerator--the magnetoplasmadynamic arc. The objective of this procurement is to analyze and evaluate experimentally the factors contributing to the efficiency and understanding of the MPD Arc Thruster with the goal of obtaining overall efficiency of greater than 50 per cent at a specific impulse of 3000 to 5000 seconds.

RFPs have been sent to the following firms: GE, Westinghouse, Indiana General Corp., Giannini Scientific Corp., Electro-Optical Systems, Avco, MHD Research, Bendix, Space Sciences, Lockheed, Philco, Aerojet-General, General Dynamics, Advanced Kinetics, Vidya Division of Itek Corp., Polarad Electronics Corp., Fundamental Methods Associates, McDonnell, North American Aviation, United Aircraft, Space Dynamics Corp., Northrop, Hughes Research Laboratories, and TRW Systems Group.

Contact: Lewis Research Center, 21000 Brookpark Rd., Cleveland, Ohio 44135. Reference: RFP 202863. Due date: Dec. 3.

HYDROGEN "SLUSH" AND/OR GEL PROPELLANT UTILIZATION

NASA-Marshall is planning to initiate a study of hydrogen "slush" and/or gel propellant utilization.

Contact: Purchasing Office, Marshall Space Flight Center, Huntsville, Ala. 35812. Reference: RFQ DCN 1-6-52-01080. Due date: Dec. 17.

DOD NEGOTIATIONS

Stanford Research Institute--with Bureau of Naval Weapons for research and development on the application of advanced technologies to missile guidance problems.

Sperry Rand Corp., Sperry Gyroscope Co.--with Bureau of Naval Weapons for engineering effort required to perform research and development changes on **TALOS** weapon control system equipment.

Philco Corp.--with Air Force Systems Engineering Group for research on ablative plastic characterization in simulated rocket motor exhaust.

United Aircraft Corp., Pratt and Whitney Aircraft Division--with Army Engineer Research and Development Laboratories for studies of low-cost screen type electrodes for fuel cells.

DOD CONTRACTS

Air Force

Sperry Gyroscope Co.--\$1.2 million increment to an existing contract for a flight test program for electronic countermeasure equipment.

Lockheed Missiles and Space Co.--\$6.5 million increment to a previously awarded contract for launch services for **AGENA-D** program.

Sperry Rand Corp.--\$1.5 million for production of components for gyroscopic compass systems.

NASA CONTRACTS

Houston

J. A. Maurer, Long Island City, N.Y.--\$52,660 for sequence cameras and space modules.

Bell Aerospace Corp.--\$92,392 for aluminum ring stiffened **APOLLO** configuration RCS propellant shell.

International Latex Corp., Government and Industrial Division--\$219,965 for **APOLLO** pressure garment assemblies.

Lewis

Union Carbide Corp., Linde Division--\$33,035 for research program to investigate the technological, economic and logistic factors related to manufacture and distribution of large scale quantities of slush hydrogen at nuclear rocket development station in Nevada.