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LABOUR GOVERNMENT THREATENS SPACE DEVELOPMENT. SPACE Daily-London has learned that several traditional government-owned research and development centers--such as the Royal Aircraft Establishment, the Rocket Propulsion Establishment and the Spadeadam Rocket Establishment--may be revamped or closed down by the Labour Government. A shutdown of Spadeadam would mean that Britain's **BLUE STREAK** booster, which will be the first stage of **ELDO's EUROPA 1**, will have to be static fired at Lake Hart (pad 6) near Woomera, Australia.

TRW AWARDED SPARTA CONTRACT. TRW Systems Group has been awarded a \$6.5 million contract by the Army Missile Command for a 20-month test program to demonstrate the feasibility of a new anti-ICBM discrimination technique. The test program will be a part of the **SPARTA** program for Project **DEFENDER**, the Advanced Research Projects Agency missile defense and penetration program. Negotiations for TRW's participation in the **SPARTA** discrimination program were begun in October (SPACE Daily, Oct. 6) although studies have been conducted in this area by TRW for some time (SPACE Daily, Aug. 2).

ALOTS USED FOR GT-7/SET FOR GT-6. Northrop's **ALOTS** (Airborne Lightweight Optical Tracking System) was used as planned (SPACE Daily, Nov. 23) to track and photograph the **TITAN II** vehicle that carried the seventh **GEMINI** spacecraft aloft last Saturday afternoon, and it will be employed again in like fashion next Monday for the launch of the sixth payload. The system was delivered to Patrick AFB in mid November (SPACE Daily, Oct. 14) for mounting on a KC-135 aircraft for qualification flights. Those flights include the ones for the two present **GEMINI** missions.

PIONEER MAY GO DECEMBER 15. The first of the new **PIONEER** interplanetary spacecraft series (SPACE Daily, Dec. 6) is intended for launch from Cape Kennedy on the 15th of December. The launch date is constrained by the **GEMINI VI** mission however, since **GEMINI VI** is now scheduled for launch on the 13th and recovery on the 15th. Range tracking facilities cannot handle both tasks.

APOLLO ABORT-6 SCRUBBED. The December 8 **APOLLO** Abort-6 test launch (SPACE Daily, Dec. 3) has been postponed due to a malfunction in the **LITTLE JOE II** booster rocket guidance system. The new date for the test of the **APOLLO** Command Module and launch escape system has not yet been set.

The Leader in Missile/Space Reporting

LUNIK VIII LANDS ON LURAIN. The eight Soviet lunar probe and what is believed to be the fifth attempt to soft land on the lurain came to an end at 4:51:32 PM EST yesterday. Jodrell Bank informed SPACE Daily that the signals from the probe ceased one minute and 32 seconds later than the time announced as the landing time by the Soviets earlier. It was Jodrell Bank's earliest conclusion that a hard landing was encountered. The four attempts this year are convincing proof that if **LUNIK VIII** was a failure it will be followed in a short time with **LUNIK IX** in an effort to move their manned lunar landing program back on schedule and to fade out any attempts by our **SURVEYOR** now scheduled for about the middle of next year.

FR-1 LAUNCH APPARENTLY SUCCESSFUL. **FR-1**, the French satellite designed for an American vehicle (SPACE Daily, Sept. 15), was lifted off a Vandenberg pad at 4:05 PM EST yesterday and carried into an apparently successful orbit by its **SCOUT** vehicle. The launch came within the expected window (SPACE Daily, Nov. 17 & 30). The satellite is designated **FR-1A** and has a three-month lifetime.

BLACK ARROW GO-AHEAD SEEN NEARER. The recent successful space launch by France with its **DIAMANT** booster may well prove to be the catalyst needed by the British government to give final, definite approval to **BLACK ARROW** as the country's national launch vehicle, British space officials confide. This may come despite the several recent cuts in space funding by the government. The outstanding objections to the **BLACK ARROW** as the national space booster were eliminated earlier this year (SPACE Daily, Oct. 19).

GEMINI VI MAY GO SUNDAY. NASA has officially decided to go for a Sunday launch of **GEMINI VI**, one day ahead of schedule. (See page 204.) A decision will be made tomorrow whether to change the orbit of **GEMINI VII** so that it would be in a position over Cape Kennedy Sunday at two times appropriate for **GEMINI VI**'s blastoff.

THE LOG OF GEMINI VII

December 4, 1965--2:30 PM (EST): **TITAN II** booster lifts **GEMINI VII** spacecraft, with command pilot Frank Borman and co-pilot James Lovell aboard, from Launch Pad 19 at Cape Kennedy.

2:37 PM--**GEMINI VII** goes into orbit. Apogee: 205 miles; perigee: 100 miles.

2:57 PM--Drop in liquid oxygen pressure, feeding fuel cells, corrected by use of cross-feed valve.

During First Revolution: Borman maneuvers capsule to move in formation with burned-out booster casing.

4:06 PM--Spacecraft completes first revolution.

December 6, 1965--29th Revolution: Lovell removes his space suit.

2:26 PM--Astronautsight a **POLARIS** missile fired from a U.S. Navy submarine off Cape Kennedy.

M-1 TO BE PHASED OUT

FY 1967 is the year of the phase-out of the **M-1** 1.5-million-pound, liquid-hydrogen engine program. The \$2 million "apportionment" granted to NASA by the Bureau of the Budget from the \$7.5 million authorized by Congress for the **M-1** (SPACE Daily, Dec. 3) is the amount needed to complete the running of tests on all major components of the large liquid hydrogen engine development project.

FY 1965 funds for the project were some \$24 million but early last year, when NASA decided to cancel and phase out the project, the engineering effort was cut down and slowed up so that some funds were reprogrammed to FY'1966. In addition, \$3 million, which had been appropriated for FY'65 of Construction of Facilities funds for the building of a test firing stand, was reprogrammed into the phase-out effort.

The \$2 million released by the Bureau of the Budget allows NASA to finish this phase-out program. Specifically it is hoped that it will pay for conducting tests on the full scale thrust chamber. Tests have been completed or are now in progress for the oxygen turbopump, the hydrogen turbopump and the gas generator which drives the turbopumps.

When the thrust chamber tests are completed, the **M-1** project will be dead. Project officials had requested sufficient funds for FY 66 to keep the project going and hopefully to fund test firings of a full-scale engine. Under BOB and Presidential pressure, however, NASA cancelled the program because it did not have a specific mission along with the Large Solid Program (**260**), the only other follow-on propulsion development program. The House of Representatives authorized \$15 million for the **M-1**, the Senate nothing. The final authorization provided \$7.5 million.

The other two cancelled projects, the **260** solid and the **SNAP-8** project, which also received Congressional authorizations after being cancelled by NASA, are still awaiting apportionment by BOB of the funds appropriated. It now appears that these funds will be released only if a decision is made to reinstitute the program in the FY '67 budget.

GEMINI VI SUNDAY LAUNCHING PROTESTED

Rep. Walter H. Moeller (D-Ohio), an ordained Lutheran minister and a member of the House Space Committee, has protested the possible launching of **GEMINI VI** next Sunday, one day ahead of schedule. Moeller, who has contacted President Johnson, Vice President Humphrey, NASA Administrator Webb, Launch Director Christopher Craft, and NASA-Houston Director Robert Gilruth, said that Sunday is America's traditional worship day and that "in these days of crisis, we need all the moral and spiritual resources we can muster."

MCNAMARA CLAIMS \$410 MILLION BASE CLOSING SAVING

An estimated annual saving of \$410 million will be the result of a shutdown of military bases announced yesterday by Defense Secretary McNamara. A total of 126 domestic and 23 overseas bases will be closed or reduced under the new directive. More than 55,000 military and civilian jobs will be eliminated under the new order and an additional 29,000 personnel relocated.

CITIBANK WARNS OF INFLATION/"TIGHTER MONEY" ORDERED

In the wake of the Federal Reserve Board's weekend decision to raise its discount rate from 4 to 4.5 per cent comes the advocacy by the First National City Bank of New York (Citibank) of a tighter monetary policy.

The discount rate, which is the rate banks have to pay on loans from the Reserve, is expected to be passed along by the banks to their borrowers. In addition to the discount rate, the Board also raised the maximum rate banks pay on time deposits from 4 to 5.5 per cent.

Citibank points out that the wholesale price index has jumped 2.7 per cent since January, the first appreciable movement in seven years. Most of the increase was spurred by higher prices for farm products over which there has been less publicity than aluminum and copper. "This demonstrates that attempts at fine tuning the economy with moral suasion cannot be successful when inflationary pressures become strong enough. The more the government uses its power to prevent or roll back price increases, the more apparent becomes the need for fiscal restraint and a less-easy monetary policy.

Vietnam and Great Society Change Fiscal Outlook

The bank, which believes that further tax cuts or higher government spending could create strong inflationary pressures, warns that in the face of near-capacity production, business needs little Federal help beyond what is already coming to sustain its growth. As a result of the Vietnam build-up and the "Great Society" programs which have been enacted into law, "it is obvious that fiscal restraint must get top priority."

Johnson Asks for Further Curbs in Overseas Investments

In a weekend action, the President has asked that U.S. business voluntarily cut back its foreign expenditures by approximately \$2 billion and has proposed a formula to enable each company to set its own dollar limit. Half is supposed to come from reduced outflows of dollars for direct investment in new factories and machinery abroad. Johnson said that while the tighter curbs on business would mean "some pain and sacrifice...the stakes are great. What is at issue is whether we can meet our critical responsibilities abroad, and maintain the expanding prosperity of the past four years at home."

Citibank counters with the theory that such dollar accumulations are not a passive consequence of our balance-of-payments deficit. Rather, they are the result of active decisions by foreign banks, firms and investors, motivated by considerations of interest yields or for other business reasons. "What matters for the time being is that privately held dollars are doing a useful--and, indeed, indispensable--job in the world money market."

SPACE COMPANIES SEEK UNLISTED TRADING

Fairchild Camera and Thiokol have applied to the Securities and Exchange Commission for unlisted trading of their common stock. Interested persons have until December 17 to request a hearing on these applications.

TOTAL R&D EXPECTED TO REACH \$23 BILLION IN 1966

According to a forecast by Battelle Memorial Institute economists, total United States research and development expenditures are expected to reach a record \$23 billion in 1966. Although this figure represents a new high, it will also be the smallest relative annual gain for R&D outlays in the past decade with final 1965 expenditure figures expected to approximate \$22.2 billion.

Federal Spending To Continue Dominant Role

The Battelle report forecasts that government spending will total \$15.8 billion--a \$400 million increase over 1965's estimated \$15.4 billion. Industry will account for about \$6.7 billion; colleges and universities, approximately \$340 million; and other nonprofit institutions, about \$235 million.

Ralph L. Craig of the Columbus Laboratories points out that although federal R&D spending is expected to rise only moderately, it will continue its dominant role in the total effort. Craig further explains that the shifting nature of government programs is expected to result in a somewhat greater emphasis on basic research and a wider geographic distribution of R&D endeavor. In addition industry investment in R&D is expected to experience continued growth. The small government increase, according to the report, reflects primarily a reduction in the rate of new obligational authority and a reduction in the rate of expenditures by the DOD and NASA. The report emphasizes that this current reduction is not expected to deter the continued growth in total output of the economy. Rather, the growing emphasis on basic research shown in the FY '66 budget should prove to be a sustaining influence on the continued growth of productivity.

Industry R&D to Grow at Slower Rate

Prior to 1958 industry financing of R&D averaged around 20 per cent of cash flow, and estimates for 1965 show a return to this relationship. Between 1958 and 1965, industry R&D financing as a per cent flow climbed to a peak of 26 per cent in 1961 before returning to the 20 per cent level in 1965.

In both 1953 and 1964 industry accounted for seven-tenths of total performance, with federal financing of industry performance growing from 39 per cent in 1953 to 57 per cent in 1964. Total industry performance of R&D, which grew at an annual rate of 12.5 per cent from 1953 to 1964, is expected to grow at a slower rate in 1966, reflecting the reduction in the rate of federal financing.

Nonprofits Reflect Greatest Gain

R&D performance by colleges and universities and other nonprofit institutions is expected to display relatively the greatest gain in 1966 as government programs directed at improving the natural environment gain momentum. This represents a continuation of the trend over the past decade on the part of these institutions in increasing their share of total performance while the federal performance share has declined. The Battelle report goes on to point out that nonprofit institutions show a long-term trend of rising rates of expenditure from their own funds. However, the rate of growth in academic spending was greater in the pre-SPUTNIK era than it has been since 1958, largely because of the rise in federal financing of academic research. Battelle expects the shift in government programs, particularly those relating to health, education and welfare, to have its greatest impact on the academic sector, and therefore, academic performance will continue to derive an increasing share of support from the federal sector.

MINUTEMAN II USING AVCO MARK 11A NOSE

Avco-Lycoming is producing its Mark 11A re-entry vehicle ("needle nose") for use on the Air Force's **MINUTEMAN II** missile. The ablatively protected nose was demonstrated on the first flight-configured **II** shot made late last summer (SPACE Daily, Aug. 19) when the missile was arced from Vandenberg to the Eniwetok lagoon over 5000 miles away.

Described as completely successful by the Air Force, the flight was made from an operational silo on August 18. Apogee was over 400,000 feet, and the maximum speed attained, about 15,000 mph, came at about 300,000 feet during the re-entry. The nose was heated to over 12,000 degrees F.

Avco's Mark 4 was used on the **TITAN I** and **ATLAS** missiles, with the Mark 5 being employed along with the Mark 11 for the **MINUTEMAN I**. Avco and GE studied a Mark 17 configuration earlier in the fall for possible use with the **II** and other ICBM (SPACE Daily, Aug. 4).

ORBIT RADAR ALTIMETER PROPOSED

Use of a radar altimeter to aid in accurate satellite position determination has been proposed by General Precision's Aerospace Systems Division. The proposal was made by division program manager Jacques S. Gansler at the Sixth International Symposium on Space Technology and Science held in Tokyo. Gansler said the self-contained radar altimeter would improve position determination in low Earth orbits and would be of major value in reducing the uncertainty of position prior to re-entry.

CUBIC TO SUPPLY SECOR GROUND EQUIPMENT

The Army's R&D Agency at Fort Belvoir, Va., will negotiate with Cubic Corp. for the fabrication and testing of two ground support systems for the Army's **SECOR** satellites. Cubic is the prime **SECOR** contractor and is presently building four new satellites (SPACE Daily, June 14 and Sept. 28), with the first to be delivered next February. These craft will have high-altitude transponders. Cubic provided the ground-support equipment currently in use with **SECOR**.

S-IVB BATTLESHIP STAGE/EQUIPMENT ENROUTE TO ARNOLD

Douglas' **SATURN S-IVB** battleship stage and associated vehicle equipment are en route from San Francisco to the Air Force's Arnold Engineering Development Center in Tullahoma, Tenn., for use in high altitude tests of Rocketdyne's J-2 engine.

The battleship stage, which was recently used at the Douglas Test Center (Sacramento, Calif.) to provide the operation capability of **S-IVB** systems, will be mounted together with the J-2 engine in a test cell in which high altitude conditions can be simulated. The Arnold test cell, which is the largest of its type with an underground exhaust chamber, 250 feet deep and 100 feet in diameter, will fire the 200,000-pound-thrust engine at an "altitude" of 125,000 feet. The test will also simulate the Sun and shade environment encountered by a space vehicle.

KAMAN PROPOSES TO STUDY MARS 'COPTER (ROMAR) FOR NASA

Kaman Aircraft has offered to make a ten-month study for NASA of a manned helicopter for exploration of Mars and for use as a high-altitude platform in the Earth's atmosphere. Named **ROMAR** (ROtorcraft for MARs), the craft would carry two men and weigh (fueled) approximately a ton. It would have expanded-plastic rotors at least a 100 feet in diameter and could move at 100 mph with an operational range of 25 miles and a hover time of 15 minutes. The rotors would be powered by small rockets at their tips. Kaman suggests testing a prototype by dropping it from a balloon or rocket at 100,000 feet.

NASA GRANTS \$3 MILLION

NASA has awarded 21 new or supplementary grants and contracts totaling \$3,011,222 to some 15 universities, colleges and private research institutions. The awards include:

IIT Research Institute, \$450,000, to continue studies and analyses of space science problems related to the planning and directing of NASA's lunar and planetary programs, and \$94,856, to continue a study to determine the advantages of graphite-metal alloys; University of Illinois, \$21,013, to continue theoretical research on the periodic motion and stability of a small mass under the gravitational attraction of two heavy bodies; Ohio State University, \$40,000, for new theoretical and experimental studies of antennas for reflectometer application; University of Chicago, \$70,591, for a reduction and preliminary analysis of **PIONEER** spacecraft experimental data; MIT, \$1,173,000, for new radar and radiometric studies of the lunar surface, and \$100,000, for new programs for the development of microwave imaging and spectral systems, and \$49,375, for a theoretical investigation of the processes of energy and momentum exchange at a gas-solid boundary;

New York University, \$20,000, to continue investigation of cosmic rays, neutrons, and interplanetary plasma in the solar system; University of Maryland, \$84,000, for investigations on equilibrium and non-equilibrium systems in pre-biological atmospheres; Woodstock College, \$40,000, to continue theoretical and experimental studies in planetary and atmospheric physics; Harvard University, \$30,000, to study human performance in adverse environments; University of Arizona, \$49,980, to continue the research to develop and test a prototype photopolarimeter suitable for use with balloons and space vehicles; University of California, \$37,500, for additional reduction and analysis on **RELAY** satellite radiation data, and \$152,526, to continue clinical nutritional study of minimal protein and caloric requirements; and \$17,800, for the development of low noise photomultiplier tubes for astronomical applications; University of California, La Jolla, \$11,109, to continue analysis of the organic and inorganic constituents of carbonaceous and other selected stony meteorites; University of Hawaii, \$484,000, to continue research in coronal and chromospheric physics; University of Florida, \$36,008, for continued support of a receiver for low-frequency radio energy from the planet Jupiter; Georgia Institute of Technology, \$30,000, to continue studies of heat transfer to a gas containing a cloud of particles, and \$19,864, for a study of differential equations related to the response of shells of revolution to blast loading.

DOD NEGOTIATIONS

General Electric Co., Missile and Space Division--with Army Missile Command for a calibration and measurements program for an extended dynamic range orthicon television system.

North American Aviation--with Air Force Systems Engineering Group for infrared target and background studies.

Electro-International, Annapolis, Md.--with Navy Bureau of Ships for test and evaluation of electronic countermeasures (ECM) intercept equipment.

International Business Machines Corp., Federal Systems Division--with Air Force Ballistic Systems Division for **ABRES** special computer programming.

Planning Research Corp.--with Army Missile Command for research and development effort for **SHILLELAGH** missile system supplemental reliability and quality assurance investigations.

NASA NEGOTIATIONS

The Mitre Corp., Bedford, Mass.--with Houston for a mission control systems effectiveness analysis and an applications study of computerized tools for flight operations.

General Electric Co., Malta Test Station of Balston Spa., N.Y.--with Langley for the testing of two government-furnished nose cones.

Douglas Aircraft Co., Missile and Space Systems Division--with Washington for research relative to airborne observations of the comet Akeya-Seki (1965).

DOD CONTRACTS

- Army

Radio Corporation of America, Electronic Components and Devices--\$121,000 for research and development on improvement of infrared image tubes.

Air Force

Hughes Aircraft Co.--\$195,820 for additional facilities to support production of the **AIM-4D** missile F4 aircraft airborne missile control subsystem.

NASA CONTRACTS

Ames

Textron Electronics, Spectrolab Division--\$121,250 for high intensity radiative heating system for advanced entry heating simulator.