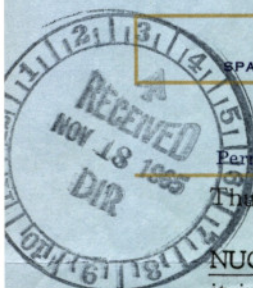
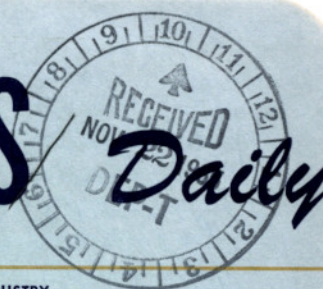


SPACE BUSINESS



FIRST DAILY MANAGEMENT NEWS SERVICE FOR THE MISSILE / SPACE INDUSTRY

SPACE PUBLICATIONS

WASHINGTON, D. C.

NORMAN L. BAKER — Publisher & Editor

Published five times a week by Space Publications at 1426 G St., N.W., Washington, D. C. 20005

Subscription rates: \$175.00 for one year, \$110.00 for six months, \$20.00 for one month.

Permission for reproduction of this publication should be obtained from the editors. ME. 8-0500 Cable: SPACE

Thursday, November 18, 1965

Vol. 23, No. 13

NUCLEAR SPACECRAFT URGED FOR 1984 MANNED MARS MISSION.

If it is begun now and a nuclear-powered spacecraft is developed, a program to land men on Mars in 1984 will cost this country \$34 billion, with the annual expenditure rate never exceeding \$3 billion over the 18 years between now and '84. This cost estimate, which includes all scientific probes and orbiting labs necessary to prepare for the actual mission as well as the interplanetary spacecraft itself, is based on the assumption the spacecraft can be assembled in Earth-orbit by men and materials that are carried aloft by SATURN Vs rather than a new vehicle.

This proposal and estimate was submitted by Raymond Hallet yesterday to the Atomic Industrial Forum in Washington. Director of R&D for Douglas Missile & Space Systems, Hallet stressed the need for immediate initiation of such a program and the savings that can be realized if the nuclear engine and the SATURN V are used.

Hallet said he would discourage a manned Mars mission in the late 1970s because the lead time would be too short and solar conditions would be unfavorable. Having to use chemical propulsion, the mission would last three years as opposed to a 460-day trip in '84, and the astronauts might find three years difficult to endure, he added. Also, time is needed for VOYAGER-type probes to lay the groundwork.

260/SNAP-8 STILL IN DOUBT.

Dr. Robert Seamans, in very broad, very general and seemingly elusive terms, told the National Space Club yesterday that he believed in the R&D of both the 260 and the SNAP-8. However, the degree of his support is still very much in doubt. There is a very limited budget request in the FY '67 funding plan, only enough to keep the programs in extended but restricted development, but the requests are outside items, lying out in the fringe areas where the Bureau of the Budget could trim them into non-existence when it trims the overall NASA request.

The funds provided by Congress, against the Administration's desires, in FY '66 for both programs are being held in abeyance by NASA while awaiting the outcome of BOB's work. Unless at least an equal amount is approved for both in the FY '67 budget NASA is reluctant to continue with the programs. Dr. Harold Finger, on the other side of Washington and at about the same time, was admitting that a firm decision for the continuation for SNAP-8 still had not been made. That decision he said awaits the action on NASA's request for FY '67.

{ There seems to be one definite orphan in the FY '67 budget, the M-1, a program not supported by NASA, the Congress or the DOD (SPACE Daily, Nov. 15).

The Leader in Missile/Space Reporting

ABANDONMENT OF NATO NUCLEAR FORCE URGED. A member of the Atomic Energy Commission, John G. Palfrey, says the plans for a NATO nuclear force which prohibits West Germany from being armed with nuclear intermediate missiles should be abandoned. Addressing the Atomic Industrial Forum and expressing what he described as his personal opinion, Palfrey emphasized that the Germans should have access to nuclear intermediate missiles to offset the disadvantage of the medium range Russian missiles targeted on them which is beyond their present capability to counteract.

NASA STUDIES NEW RE-ENTRY BLACKOUT SOLUTION. NASA, still far from a solution to the problem of communications blackout during the crucial re-entry phase of manned spaceflight, is awarding a contract to Aerochem Research Laboratories of Princeton, N.J., for a study of the feasibility of penetrating and offsetting the re-entry plasma sheath with an atomized liquid jet technique. The contract will be awarded by NASA-Langley. On the **RAM** (Radio Attenuation Measurements) experiment which was conducted this past year as a part of **GT-3** (SPACE Daily, April 19) it was found that jets of water injected into the ionized sheath could provide a radio avenue for brief periods but the amount of water needed is believed prohibitive. The search continues with NASA-Goddard also engaged in a program to seek **APOLLO** re-entry communications (SPACE Daily, April 20).

ARABIA CONSIDERING BRITISH THUNDERBIRD. The British Aircraft Corporation's **THUNDERBIRD** surface-to-air missile is among those under discussion by Saudi Arabia's King Faisal and his military advisors. John Stonehouse, parliamentary secretary to Britain's Ministry of Aviation, was recently in Saudi Arabia negotiating with the King over a 80-100-million-Pound integrated air-defense system that would include **THUNDERBIRDS**, BAC Lightning interceptor aircraft, and radar facilities.

The King is also considering Raytheon's **HAWK** surface-to-air missile, which has already been bought by Israel and some European countries. The **THUNDERBIRD** is available in two versions, but Saudi Arabia is interested in only the latest, **Mark 2**, the improved version. It is 30 feet long, under 2 feet in diameter, and solid-fueled.

SEAMANS CITES/DEFENDS NASA'S CHANGE TO "SUCCESS PLANNING"

NASA's general manager has confirmed the agency's shift from its conservative mode of planning and scheduling to "plans for success" with the recognition that this may sometimes result in more spectacular failures.

Dr. Robert C. Seamans, Jr., told the National Space Club yesterday that "We cannot afford the luxury--in time and in cost--of step-by-step development and flight test of each element, stage, and module." Therefore, he said, each flight is intended as an integrated whole. This "all-up" systems approach to flights has greater risks, Seamans admitted, but also offers the possibility of greater progress. Addressing the criticism that the **AGENA** rendezvous target vehicle which failed on the **GEMINI VI** flight should have been flight-tested, Seamans gave this as an example of the "success planning" which failed. He warned that this type of planning "requires

MORE

understanding" on the part of the public when failures occur if the program is going to continue to be a fast-paced, vigorous program.

He warned also that although every possible precaution is taken in our manned space flights, there may eventually be some fatalities on one of the manned flights. It is realized, he indicated, that to some extent the astronauts are in the public domain, or even the world domain, as far as public opinion is concerned. But he hoped that if such a tragedy occurred the program could still continue at the same pace.

A common example cited as an "all-up systems testing" is the first flight of the **SATURN IB** in January, scheduled to be the first flight test of each stage of the vehicle.

NUCLEAR ROCKET PROGRAM BURDENED BY INDECISION

Dr. Harold B. Finger, manager of the AEC-NASA Space Nuclear Propulsion Office, told a conference at the Atomic Industrial Forum in Washington yesterday that lack of a firm go-ahead on nuclear rocket development is a "burden" in trying to maintain a good program.

The country has to determine where it's going to go, Finger said. Without defining needs or particular missions, development cannot begin. We will just have to "wait to see the budget." As for the current work under SNPO, Finger said "everything looks good."

He said if go-ahead was given now, development of an engine could be completed in 7-10 years--"actually more like seven" (SPACE Daily, Nov. 17). He stated that if go-ahead on engine development were given in the FY '67 budget, then by FY'69 we would need to begin development on the complete nuclear propulsion module--"assuming the country wants it."

Nuclear Go-Ahead in FY '67 Not Foreseen

Finger said he did not expect go-ahead for the program in the President's State-of-the-Union Message.

As one step toward in-house cutting of the nuclear rocket program, Finger said Reactor Test Cell A at the Nuclear Rocket Development Station will be closed after tests of the **NERVA** reactor (NRX-A5) next spring. All reactor operations will then be conducted at Test Cell C.

"This will indeed complicate our scheduling," Finger said. "However, we believe that we will be able to cope with that problem, and (that) the reduction in cost...justifies the added complication of conducting operations in a single cell."

The SNPO chief also noted that ways of trimming various projects from the nuclear reactor program are underway. He said as of now "paper calculations are not sufficiently factual to justify narrowing down to one" reactor concept.

"It is necessary to work on several of these concepts but studies are underway to try to develop a factual comparison that may provide a basis for some further narrowing of the concepts being investigated," he said.

Finger directly implied that SNPO will get far less funds in FY '67 than it deems adequate for realistic early mission planning.

Dr. James E. Shepherd, general manager of the Sperry Rand Research Center, has been elected chairman of the Boston Research Directors' Club.

MOL DEVELOPMENT/INFORMATION POLICY DELAYED TILL JUNE

The basic decision still has not been made whether to select an open or semi-open information policy for the **MOL** program or whether to follow in the footsteps of the **SAMOS** and **MIDAS** projects and bury it in military secrecy (SPACE Daily, August 27). It now appears that this decision may not be made until the Design Definition Phase of the program, still in progress (SPACE Daily, Oct. 25), has been completed and the final contracts let--perhaps May or June.

Presently, the controversy is at the Administration cabinet level, around the President. The various participants in the controversy now seem to be lining up on sides. Backing at least a semi-open information policy is part of the Air Force, including some personnel in Systems Command, the DOD, and the National Space Council; in favor of trying to hide the military space effort is another part of the Air Force, the CIA, and most of the State Department.

The State Department is apparently worried about the effects on our foreign relations of openly discussing spying on other countries. DOD, on the other hand, has at least partially recognized that political realities will demand a certain amount of public information on the program. The crucial opinion of course is that of President Johnson, but the question of which view is the strongest may depend simply on which of the many contenders is the strongest at the time the decision is made.

Industry observers emphasize that it will be very difficult to keep this project under wraps if that is the decision. The very spectacular launchings of the **TITAN III-C** will have to be made from one of two very visible launching areas--Cape Kennedy or the Western Test Range. Some of the firms engaged in the project will be organizing **MOL** departments that are expected to employ thousands. The fact that it is a manned program living under a constant pressure for news from the public and from Capitol Hill will make it very difficult to hide anything but experiment missions, modes, and equipment.

MOL GROWTH TO \$3 BILLION SEEN

Some industry observers now feel that the first unofficial estimate of the cost of the five-mission **MOL** program at \$2 billion, (SPACE Daily, Oct. 13) may have been too conservative and that final costs may approach nearer to \$2.5 or \$3 billion. The official estimates still adhere to the figure of \$1.5 billion.

III-C-3 SLIPS TO DEC. 21

Proximity to **GEMINI** has pushed the third launch of a **TITAN III-C** vehicle from December 2 (SPACE Daily, Nov. 4) to the 21st. Preparing the tracking and support network for the December-4th **GT-7** launch would interfere with its use for a December-2nd **III-C** shot, so the Air Force mission gave way to NASA's. The payload for **III-C-3** will be four satellites (SPACE Daily, Nov. 5), and the liftoff time is now set at 7 AM EST.

Charles T. Ireland Jr., president and director of Alleghany Corp., has been elected a member of the board of directors of ITT.

BOEING PROPOSES WATER-IMPACT FOR S-IC RECOVERY

The most feasible method of recovering **SATURN V S-IC** booster stages is to use a water-impact system, according to a \$200,000 Boeing study. If such a system were employed, a 10-year, 60-launch schedule, with a launch every other month, would require only 14 boosters, not 60, and most of those 14 could be used four times. The estimated savings would exceed \$500,000,000, or about 40 per cent of **S-IC** costs for such a schedule.

The water-impact system proposed by the study weighs 48,700 pounds; includes four enlarged fins, a reaction control system, and four parachute systems; and requires "minimal changes" in the **S-IC** design. The study assumed the booster would remain in the ocean no more than 15 hours and would be exposed to salt water no more than 15 days. It also assumed most booster components could be refurbished rather than replaced.

The system would take over immediately after the **S-IC** burnt out and separated at 40 miles. At that time the reaction control units would fire to provide a nose-first re-entry attitude, dive brakes would open to provide increased drag and improved stability, the oxygen-tank pressure would be intensified to provide further rigidity, and the forward skirt would be jettisoned. (The "nose"-i.e. the domed top of the upper fuel tank--would be fitted with heat shielding for the hypersonic re-entry.)

At 32,000 feet, the booster will have decelerated to a sonic velocity, and 1000 feet later, at 928 feet per second, four six-foot pilot chutes would deploy. At 29,600 feet the pilots would activate four 45-foot drogue chutes, and finally, at 15,000 feet, the four master chutes, each 120 feet in diameter, would assume control of the descent.

At 500 feet the domed nose would be jettisoned, exposing the upper tank's interior, and vent holes would be blown in the tank's bottom, thereby creating a sort of pneumatic shock absorber. The impact velocity would be about 100 feet per second, and the booster would pop into an upright position after entering the water.

APOLLO ANTENNA STRUCTURE COMPLETED

Solar has completed the test structure for the **APOLLO** deep space antenna which will track Earth and act as primary voice, video and telemetry link during the **APOLLO** missions. The test model of the space antenna consists of four large parabolic reflectors surrounding one small reflector, the structural frame and insulation. Total weight is 16 pounds.

AF PRESENTS R&D AWARDS

The Air Force has presented its Research and Development Award to five officers for outstanding scientific achievement. The awards were presented by General Bernard Schriever, commander of the AF Systems Command, to Lt. Col. Melvin R. Keller of the Office of Aerospace Research, Dr. (Maj.) John J. McPhaul, Jr., Major Donald L. Lamberson, Capt. Julio L. Torres, Jr., and 1st Lt. Francis J. Mason, all of Systems Command.

Donald A. Graham, formerly controller and treasurer of Sperry Rand's UNIVAC Data Processing Division, has been named vice president and controller of UNIVAC.

GNP UP FOR 18TH CONSECUTIVE QUARTER

The Gross National Product for the third quarter of the current calendar year rose to a seasonally adjusted rate of \$677.5 billion, up \$11.5 billion from the second quarter. This marks the 18th consecutive quarter of economic expansion, the longest period of sustained rise since World War II. On a year-to-year basis, the GNP was 6.75 per cent above last year's third quarter, while the rise was almost 4.75 per cent in physical volume.

Fixed business investment increased \$2 billion to a rate of \$96 billion for the quarter, while net exports increased by \$500 million. Total government purchases for the quarter rose more than \$2 billion to an annual rate of more than \$135 billion for the third quarter. Defense expenditures continued to rise with the uptrend in state and local government spending being maintained.

BAIFIELD SALES/EARNINGS SET NEW NINE-MONTH RECORD

Baifield Industries' sales for the first nine months of 1965 reached a new high of \$9, - 610,000, up 73 per cent from last year's \$5,549,000. Earnings, which also set a new record, rose 59 per cent from \$377,000 to \$599,000. The current record backlog of \$47,992,000 compares with \$23,162,000 recorded at the same time last year.

Fred W. Bailey, chairman of the board, predicts that sales approximating \$15 million for the current calendar year now appear probable.

APOLLO/SA-210²⁰¹ SM PROPULSION TEST DELAYED AGAIN

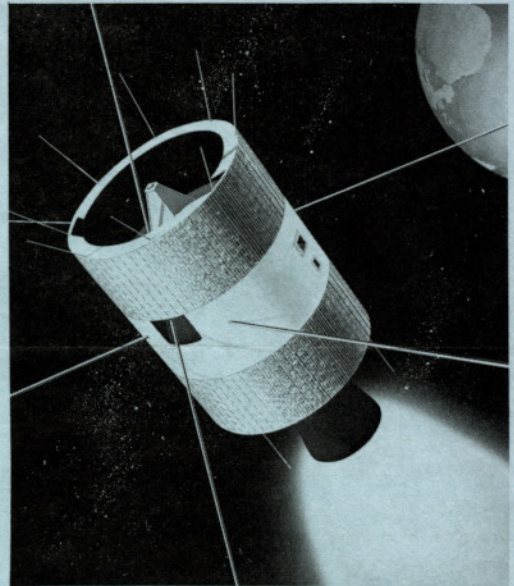
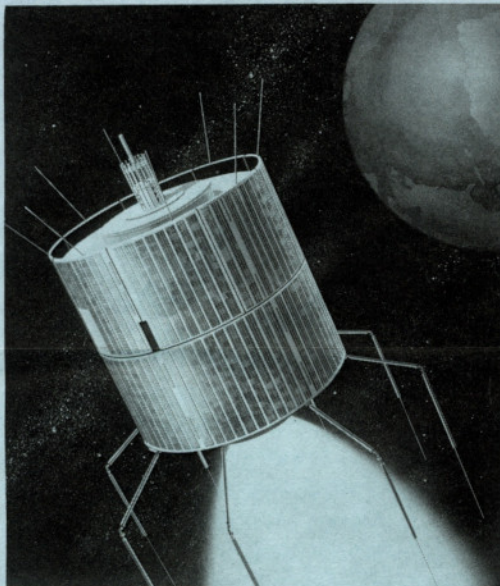
The ground test firing of the APOLLO/SA-201 Service Module propulsion system, first scheduled for last Friday, rescheduled for last Monday and then rescheduled again for Wednesday because of "minor" malfunctions (SPACE Daily, Nov. 15 & 17), has been postponed again for several days after detection of contamination in the propellant loading system. The 15-second firing is considered a key test, paving the way for the first SATURN IB launch in January.

The SM propulsion system is a 21,900 pound thrust, pressure-fed, ablatively-cooled, multiple-restartable, storable hypergolic liquid rocket engine designed to operate for up to 12.5 minutes total firing time in as many as 50 separate increments. The fuel is a 50-50 mixture of UDMH and hydrazine used with a nitrogen tetroxide oxidizer.

The 13-foot engine with its radiation-cooled extension skirt is called the AJ10-137. Simplicity and reliability were major design aims of the developer, Aerojet-General. This was accomplished by using only three moving parts--a bipropellant valve and two servo actuators for gimbaling. Propellants are fed to the thrust chamber by pressure, and cooling is accomplished by ablation. The engine has a high degree of control up to plus or minus 7.5 degrees in the yaw plane and plus or minus 6 degrees in the pitch plane because the engine movement originates at its center of gravity rather than at the top of the engine.

Dr. Harry J. Watters has been appointed to the newly created position of division vice president, defense engineering of RCA's Defense Electronic Products. Watters was formerly chief of defense engineering for the division.

THE MISSIONS OF THE APPLICATIONS TECHNOLOGY SATELLITES



Shown are the two basic configurations for the ATS (Applications Technology Satellite) program which is designed to test advanced new concepts and techniques in communications, meteorology, attitude stabilization, ion engine technology, and radiation damage (SPACE Daily, Sept. 20 & Nov. 15). The satellite at the left is the spin-stabilized configuration and the other is the configuration designed for gravity gradient stabilization.

There are three basic missions planned and a fourth under study (SPACE Daily, Sept. 20) for the general purpose test-bed satellite. The first mission is planned as a synchronous orbit, spin stabilized mission. The second mission is planned for a 6500-mile orbit, gravity-gradient stabilized mission. The third mission is planned for a synchronous orbit, gravity-gradient stabilized mission.

The first mission profile will be performed by the first satellite to be launched, **ATS-B**, scheduled for late 1966 (SPACE Daily, Nov. 15) and the third satellite to be launched, **ATS-C**, scheduled for early 1967. These two satellites will carry communications, meteorological, ion engine, and cloud-scan camera experiments.

The second mission profile will be used for the second satellite to be launched **ATS-A**, planned for early 1967, which will carry radiation damage and particle detection experiments and a high resolution cloud cover scanning camera experiment. The 6500-mile orbit is planned to put the satellite between the two Van Allen belts.

The third mission profile will be used on **ATS-D** and **ATS-E**, scheduled for early 1968 and late 1968. They will carry ion engine, meteorological and radiation experiments.

The spin stabilized satellites will weigh around 800 pounds and the gravity gradient configuration will weigh about 782 pounds as presently planned. Developed and produced by Hughes Aircraft, the five satellites in the present program will also carry experiments to test techniques such as color television transmission by satellite, voice communication between aircraft and ground stations via satellites, the possibilities of continuous coverage of developing cloud and storm patterns over a specific point on the Earth, and the test of a new phased-array electronically-despun antenna in order to concentrate a communications beam at the Earth.

The fourth mission, for which eight contractors have submitted proposals
MORE

THE MISSIONS OF THE APPLICATIONS TECHNOLOGY SATELLITES-Contd.

(SPACE Daily, Nov. 9), would test a high-gain, multibeam, electronically steered antenna array, and the demonstration of a precision radio interferometer as a sensor for spacecraft attitude and/or antenna pointing reference.

COLLINS EARNINGS UP 84 PER CENT FOR FIRST QUARTER

Collins Radio had sales of \$81 million for the first quarter of FY 1966, compared with the \$63 million recorded for the same period last year. Earnings for the period rose 84 per cent from \$780,000 to \$1,438,000. Backlog at the end of the quarter was \$302 million compared to \$288 million at the close of the last fiscal year and \$271 million at the same time last year.

E. A. Williams, vice president-control and finance, told the company's stockholders that "Based on our current analysis which reflects the results attained the first quarter and the improved marketing outlook, which has become apparent only very recently, we now feel that earnings for the year on a sales volume near \$350 million will be in the range of \$2.75 to \$3 per share on the number of shares presently outstanding." Subject to general economic conditions, Williams predicted "only a moderate further increase in sales" for FY '67. He cautioned against projecting the rate of increase in sales and earnings anticipated for 1966 into the future.

NASA HIGH TEMPERATURE ELECTRONICS STUDY

NASA-Cambridge has invited 16 firms to submit proposals for its planned high temperature materials study. The objective of the study is to provide knowledge useful in producing electronic devices with higher use temperatures than currently available. The devices should be useful in solar probes and in satellites where high density packing of devices makes heat dissipation a problem.

The following companies were on the Center's original invitation list for ERC/R&D 66-100: Autonetics; Battelle Memorial Institute; Dow Corning, Electronic Products Division; Electro-Optical Systems; Fairchild Semiconductor; General Telephone and Electronics Laboratories; Hewlett-Packard; Hughes Microelectronics; IIT Research Institute; ITT Federal Laboratories; Microwave Associates (South Burlington, Mass.); Motorola Semiconductor Products; National Research Corp. (Cambridge, Mass.); Stanford Research Institute; Tyco Laboratories (Waltham, Mass.); and Texas Instruments. Proposals are due December 13.

LOCKHEED SUPPLYING ATS REACTION CONTROL MOTORS

Lockheed Missiles & Space is building two types of subliming reaction-control engines for Hughes, prime contractor to NASA-Goddard for the Applications Technology Satellite (ATS). The first engine, an "inversion reactor," is a 2.5-pound unit with a fraction-of-a-pound thrust for maintaining the satellite's position in space, and the second is a 15-pound unit, also with a tiny thrust, for turning the craft. Coated with a thin film of gold for temperature control, the motors are expected to operate at least three years in orbit.