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MARQUARDT TO DEMONSTRATE CLAM PROPULSION CONCEPTS. The AFSC Aeronautical Systems Division has awarded Marquardt an $11 million, two-year contract to design, develop, and fabricate a chemical propulsion system that can be used to flight demonstrate **CLAM** (Chemical Low-Altitude Missile) propulsion concepts. North American-Columbus will supply the supersonic ramjet demonstration vehicle, and Aerojet-General the vehicle's solid booster. The vehicle will be capable of "low-altitude flights of considerable range." North American has been involved with **CLAM** before under an Air Force study contract (SPACE Daily, Dec. 3, 1963).

AEROJET TO DEMONSTRATE SUBMERGED COOLED NOZZLE. Aerojet's Solid Rocket plant at Sacramento has been awarded a $750,000 contract by the Air Force Rocket Propulsion Laboratory of Edwards AFB for the demonstration of the submerged cooled nozzle for large solid propellant booster systems. The **TITAN III-D** two-segment 120-inch boosted vehicle (SPACE Daily, Sept. 29) as well as the **MOL** booster, the **TITAN III-C**, may be employing the submerged nozzle concept. If the development of the 156-inch is stretched out as is now promised (SPACE Daily, Sept. 29 & Oct. 21) any expansion of the **MOL** program including its growing weight will have to be taken care of by employment of seven-segment submerged-nozzle 120-inch strap-ons. In this configuration 30 per cent of the nozzle is within the case.

CLOTH NOZZLE TO BE DEMONSTRATED. Expanding the exit area of a rocket nozzle system by extension of a fabric skirt will be demonstrated for feasibility by Flow Technology Incorporated under a $95,000 contract with the Air Force. Flow will test the cloth extendable nozzle concept for the Edwards rocket center.

NASA WANTS AORL BEFORE LORL. NASA has turned down what might have amounted to an offer from Congress of approval "to the limit of fiscal constraints" for the undertaking of preliminary work on the **MORL** (Medium Orbital Research Laboratory) now rather than going the **Extended APOLLO (AA)** route, i.e., "bypass the **AES (AA)** proposals."

Without mentioning **MORL** (a six-to-nine-man capacity), which is what Congress seems to be willing to recognize, NASA speaks of **LORL** (sometimes thought of as

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the **NOSS**) as a "possible follow-on program...(to) its necessary precursor, the **AES**." And, as far as **LORL** is concerned, NASA says that "at this time, there is no firm development, cost, or launch schedule associated with the eventual option of such a large laboratory." There are working plans, however, which show the initiation of **LORL** sometime around late 1974 overlapping the end of the **MORL** program, if it can be worked into the approved plan around 1971 (SPACE Daily, March 10).

A-1-1 SET FOR LAUNCH NOV. 25. France's first satellite, the **A-1-1**, scheduled for launch late this month (SPACE Daily, Oct. 8 & yesterday), will probably be orbited the 25th, although the 24th or 26th are still possibilities. Its vehicle, the **DIAMANT**, has already been moved from its French assembly site to the Hammaguir (Algeria) launch range (earlier estimates did not expect the move until this weekend), and the checkout of its backup, **A-1-2**, is proceeding quickly.

The second **DIAMANT** is now complete at the SEREB Company's Saint Medard en Jalles (Gironde) plant (assembly building B-21) and could be made flight-ready before the close of this month to launch **A-1-2**. Whether it will be so readied and used, however, SEREB President Charles Cristofini has told SPACE Daily, "will depend on the success of the first flight." He notes that "Americans have not succeeded with their first trials," but that "we hope to be lucky."

Moving the first **DIAMANT** from Saint Medard to Hammaguir took 20 aircraft flights. **A-1-1** went down November 4 from the Merignac airport near Saint Medard after it had been tested with the **DIAMANT** in the vehicle's checkout stall (SPACE Daily, Nov. 2). SEREB builds the **DIAMANT** under contract to the Delegation Ministerielle pour l'Armement. It is a three-stage vehicle.

If **A-1-1** fails, there will still be ample opportunity to try again. As Cristofini says, "My contract schedules a launch for within the March 1965 to April 1966 period. This is to be done, but I cannot say I will do it with the first, or even the second, **DIAMANT**. What I promised is to do it within the fourth vehicle."

If the **A-1** flights are sucessful, the **DIAMANT** will probably be considered qualified for further employment, with its first job the launching of the **D-1** satellites next year (SPACE Daily, Oct. 8 and Nov. 2). Cristofini feels "there is a good chance we can qualify the rocket quickly for its use to orbit the CNES **D-1**" (CNES is the French space agency). He adds that plans are already underway to improve the **DIAMANT** as well as develop far bigger vehicles.

MANNED MARS FLYBY IN MID-70'S STUDIES. The NASA office of Space Sciences and Applications has studied and NASA is devoting serious consideration to a manned Mars flyby in the mid-1970s. Identified by Dr. Homer E. Newell as one of "the options to be maintained," the flyby mission would be made with **APOLLO** hardware. A prerequisite to the flight will be the presently approved program for extensive Earth orbital operations within the scope of the **AA** program, the development of planetary spacecraft modules and the identification of the mission "as a principal national objective."

ECONOMY OF REUSABLE LAUNCH VEHICLES QUESTIONED. Studies by NASA

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and the Air Force, through industry contracts, are said to have left "considerable doubt" that reuseable launch vehicles can be justified economically for "projected traffic levels" unless a fundamental new idea makes them cost competitive. Air Force Secretary Harold Brown explains that in order to be "cost competitive" traffic levels must be found that are high enough to offset the estimated $2 to $5 billion research and development cost needed for recoverable boosters that can orbit payloads at $100 to $300 per pound. This type of booster would be competing with the present expendable booster which has recurring costs of $500 to $3000 per pound of payload orbited.

HARD START BLAMED FOR AGENA TARGET FAILURE. The Air Force, Aerospace Corporation, Lockheed and NASA have concurred that a hard start of the AGENA Target Vehicle's engine resulted in an explosion which destroyed the vehicle. The failure came as a direct result of modifications made to the flow and firing sequence of the AGENA system for the GEMINI mission. A change in the propellant flow sequence was integrated into the system to economize on propellant losses during the extra starts in space. An excess of fuel in the chamber and the space vacuum created conditions other than had been experienced in ground testing, resulting in a shock ignition which terminated the burning and mission. It is still not known what modifications will be necessary for the future flights.

SPACE-GENERAL TO STUDY SPACE MONITOR SATELLITE. NASA-Ames has selected Space-General (El Monte, Calif.) for the study of the large orbiting antenna-satellite (deep space monitoring system) conceived by Ames's George Clemens and Alfred Mascy of the Mission Analysis Division (SPACE Daily, May 3 & June 15). Such a satellite would be used primarily to relay communications between Earth and deep-space probes (unmanned and manned). It would have few structural problems, could use the higher frequencies needed for wide bandwidth transmissions and small antenna reception, and would offer relative economy of operation.

The 11-month study will consider the overall concept, the related technological requirements and problems, and the satellite's feasibility. The antenna is seen as potentially useful because of the expected loads on ground antennae, which are structurally and technically limited and are not geared to the envisioned demands of interplanetary missions and equipment.

EIGHT RETURN ATS-4 PROPOSALS. Proposals are in from eight companies for the fourth Applications Technology Satellite (ATS) configuration (SPACE Daily, Sept. 20). The companies are Fairchild Hiller, General Electric, Hughes, Lockheed, Philco, RCA, TRW Systems, and Westinghouse. Hughes is the present ATS prime contractor.

NASA PROFILES GTA-9. The ninth GEMINI mission will be a two- or three-day flight that will include a rendezvous and docking of the spacecraft and AGENA Target Vehicle and will see a test of the Air Force's MMU (Modular Maneuvering Unit) by an astronaut who will use it to transfer from the spacecraft to the AGENA to install there a micrometeorite collection experiment (the S-10). Also called for is a maneuver by the joined GEMINI-AGENA. The crew will be Elliot See and Capt. Charles Bassett.

LOCKHEED SRAM BIDDER PULSED SOLID HOT FIRED

Lockheed Propulsion has successfully hot-fired its three-pulse solid propellant rocket motor (SPACE Daily, Jan. 18 & Mar. 15) which is one of the contenders for the **SRAM** (Short Range Attack Missile) power system. The Contract Definition phase on the **SRAM** has been awarded to Martin-Marietta and Boeing (SPACE Daily, Nov. 4).

The Lockheed full-scale motor was fired at a motor temperature of nearly 200 degrees F following many days of cycling between a low of minus 75 degrees and the 200 degree level. This simulated the stresses caused by repeated expansion and contraction of solid propellant grains, adhesive bonding materials and the motor chamber such as they might encounter in an air launched missile application. The motor was fired three times, demonstrating its varied thrust in a start-pulse, a sustain-pulse and a dash-pulse. Both Lockheed and Curtiss-Wright are working under Air Force contracts to study pulse motor applications (SPACE Daily, Feb. 9 & 15). Both Aerojet (SPACE Daily, May 5) and Thiokol (SPACE Daily, May 10) are also developing pulse motor technology.

AVCO GETS APOLLO HEAT SHIELD FOLLOW-ON

North American's Space and Information Systems Division has awarded AVCO/RAD a $22 million add-on contract for production of ablative heat shielding for 13 **APOLLO** Command Modules that will be put in lunar orbits on "test missions." RAD is presently completing its heat shielding work on the Earth-orbital Command Modules that will ride **SATURN IB**s beginning next year.

GEOS SUCCESSFULLY LAUNCHED

GEODETIC EXPLORER XXIX, the first NASA gravity gradient stabilized spacecraft, (SPACE Daily, Nov. 1), after two delays, was placed into a 692/1414-mile orbit Saturday, an apogee 412 miles higher than planned, by an **Improved TAT DELTA** rocket from NASA-Kennedy. The satellite has been yo-yo despun and the telemetry and command systems have been satisfactorily tested. Project scientists are presently awaiting the proper time to extend the gravity gradient extendable boom. When this boom has dampened the oscillations in the satellite's attitude and it is oriented properly toward the Earth, the remaining experiments can be checked out.

LUCAS WINS OBERTH AWARD

Dr. William R. Lucas, chief of the Materials Division of the Propulsion and Engineering Laboratory at NASA-Marshall, has received the Hermann Oberth Award for 1965 from the Alabama Section of the AIAA for his outstanding individual achievements in the field of astronautics.

Allan E. Matlick has been appointed manager, Defense Electronics and Space Operation, for the GE Technical Services Co. Matlick was previously counsel for GE's Radio Guidance Operation and for the former Military Communications Department.

EIA PREDICTS GOVERNMENT ELECTRONICS MARKET WILL RISE 36%

The Electronic Industries Association predicts that within the next five years the government market for electronics products will rise 36 per cent, while the total market will increase 40 per cent. Dr. Harper Q. North, EIA president and vice president-research and development of TRW, said that the government market should expand from this year's $9.19 billion to $12.48 billion in 1970.

The consumer market is expected to advance 31 per cent from $3.34 billion to $4.38 billion. The EIA's five-year projection predicts that electronic components business in the United States will expand 28 per cent from $4.30 billion during 1965 to $5.49 billion during 1970, while annual sales of components for replacement purposes are expected to increase by 20 per cent during the balance of the 1960s, from $630 million in 1965 to $755 million in 1970.

NASA Purchases to Reach $2 Billion by 1970

The EIA analysis attributes the expansion of the government market primarily to the increasing electronics content of equipment and systems. Annual sales to NASA are expected to increase from about $1.6 billion during the current fiscal year to more than $2 billion by 1970, while DOD purchases are expected to rise from less than $8 billion to approximately $10 billion. Annual purchases of electronics by the Federal Aviation Agency are expected to remain essentially unchanged during the next few years, at about the $100 million level.

The government market is expected to be enhanced by federal programs such as depressed area rehabilitation, aid to education, weather analysis and modification, urban and inter-urban transportation, pollution and flood control, desalinization, post office automation, and other planned activities directly affording market opportunities to electronics manufacturers.

The anticipated upward movement of total electronic component sales during the next five years has been primarily attributed to sharp rises in integral circuit packages, semiconductors and color TV picture tubes.

CCP PROPRIETARY PRODUCT SALES RISE TO 90 PER CENT

California Computer Products of Anaheim, Calif., had sales of $1,007,405 for the first quarter of FY 1966, compared with last year's $830,507. Although sales were up, earnings dropped 84 per cent from $107,307 to $57,739.

Lester L. Kilpatrick, president, attributed the drop to the fact that R&D expenditures of $159,648 were written off in this quarter, while no research and development expenses were written off in the first quarter of FY '65.

Sales of the company's digital plotters and plotting systems during the quarter increased 50 per cent over a year ago, bringing proprietary product sales to about 90 per cent of the total, compared to last year's 73 per cent. Current backlog includes NASA contracts totaling more than $600,000 for the continuation of research and development work on the NIMBUS program.

Stanley M. Little Jr., former director of industrial relations and administration for Boeing's Military Airplane Division, has been named to the newly established post of director of industrial relations in the company's headquarters office.

NASA advanced study program summary, 1963–65

	Fiscal year 1963	Fiscal year 1964	Fiscal year 1965	Total, 1963–65
Earth orbital	$2,090,000	$10,185,000	$15,050,000	$27,325,000
AES (including lunar)		3,330,000	3,700,000	7,030,000
AES experiments			8,900,000	8,900,000
MORL	1,600,000	5,780,000	1,200,000	8,580,000
LORL	490,000	300,000		790,000
Various		775,000	1,250,000	2,025,000
Lunar	1,335,000	3,760,000	8,400,000	13,495,000
Planetary/interplanetary	1,903,000	4,711,000	2,320,000	8,934,000
Launch vehicle	7,601,801	6,779,000	3,167,000	17,547,801
Aeronautics			900,000	900,000
General		1,178,000	500,000	1,678,000
Total study program	12,929,801	26,613,000	30,337,000	69,879,801

NASA advanced study program summary

EARTH ORBITAL STUDIES

Area/item	Title/objective	Fiscal year	Contractor	Completion date
MORL	Operations and logistics study of manned orbiting space stations.	1963	Lockheed	November 1963.
MORL	Electrical power systems design for manned orbital space station.	1963	Lockheed	October 1963.
MORL	Preliminary design and program definition of a 5- to 6-man modified APOLLO resupply spacecraft for space station support.	1963	NAA	January 1964.
MORL	Program definition and conceptual design of advanced logistic spacecraft for support of a manned orbital spacecraft.	1963	Boeing, Lockheed	Do.
MORL	Biomedical human factors requirements for a manned orbiting station.	1963	NAA, Republic	October 1963.
MORL	Comparative studies and preliminary design of a manned orbital research laboratory concept.	1963	Boeing, Douglas	December 1963.
MORL	Feasibility and conceptual design of a modified GEMINI ferry. Total funds, $1,600,000.	1963	McDonnell	November 1963.
LORL	Environmental control and life support system for a large manned orbital space station.	1963	Hamilton-Standard.	Do.
LORL	Large, manned, rotating, orbital space station.	1963	Lockheed	January 1964.
LORL	Large, zero-gravity, manned, orbital space station. Total funds, $490,000.	1963	Douglas	Do.

LUNAR STUDIES

Lunar	Advanced lunar transportation system	1963	Chance Vought	March 1964.
Do	Earth Orbital Operations Manual and Lunar Flight Handbook.	1963	Martin	December 1963.
Do	The research effort required to establish a U.S. lunar construction capability.	1963	Corps of Engineers.	May 1963.
Do	Experimental determination of soil constants under vacuum conditions.	1963	Bendix	Do.
Do	Power system studies for lunar base and associated mobile equipment.	1963	Corps of Engineers, Westinghouse.	May 1964.
Do	Initial concept of a manned lunar base	1963	Boeing	November 1963.
Do	Multipurpose engine and regenerative fuel system for the manned lunar base.	1963	Corps of Engineers, Westinghouse.	May 1964.
Do	Lunar reconnaissance probe study. Total funds, $1,335,000.	1963	Space-General	February 1964.

(This special report to be continued tomorrow)

Future Space Business

TRAJECTORIES COMPUTER SIMULATION PROGRAM

The Rome Air Development Center is planning to fund a program of engineering services for a study of a computer simulation program of orbital and suborbital trajectories based on non-linear extension of the Kalman filtering system.

The objective of the simulation program is to determine the metric data accuracies of ground sensors needed to estimate the trajectories and the ballistic coefficients of nonmaneuvering, single vehicles in those trajectories.

Contact: Procurement Division, Rome Air Development Center, Attn: EMKS, Griffiss Air Force Base, N.Y. 13442. Reference: Code A-6-1622. Due date: Nov. 18.

SPACE RFP LOG

This is a reference of the government requests for proposals which are coming due. For additional information see SPACE Daily issues as noted.

Advanced satellite tracking instrumentation study to include investigations dealing with geometric and dynamic satellite reductions, RFQ AMC(T)-44-009-66-G161-B, Army Engineer Research and Development Laboratories, due Nov. 10 (SPACE Daily--Nov. 2).

SPACE R&D LOG

This is a reference of the government requests for letters of interest which are coming due. For additional information see SPACE Daily issues as noted.

Study program of applied research aimed at developing multiprocessing techniques for meeting the total spaceborne computational requirements of advanced space missions, ERC/R&D 66-92, NASA-Cambridge, due Nov. 10 (SPACE Daily--Nov. 2).

Improvement and fabrication of a liquid or solid propellant sounding rocket vehicle for scientific payloads and auxiliary equipment similar in purpose and application to present sounding rockets having a minimum payload capability of 100 pounds to 200 miles and 300 pounds to 115 miles when launched from the White Sands Missile Range, N.M., Synopsis No. 179, Naval Research Laboratory, due Nov. 12 (Daily--Nov. 3).

Program of trade-off studies to identify the opportunities and problems in guidance and control systems of the horizontal landing class of re-entry space vehicles in the terminal phase of Earth re-entry, from approximately 100,000 feet until touchdown, under adverse flight conditions, ERC/R&D 66-54, NASA-Cambridge, due Nov. 22 (Daily--Oct. 28).

DOD NEGOTIATIONS

Block Engineering--with Air Force for further research in the design and fabrication of a measurement system to be flown on **GEMINI** spacecraft.

ARDE-Portland Inc., Paramus, N.J.--with Bureau of Naval Weapons to perform a research and development program on the investigation and optimization of high strength alloys suitable for cryogenic stretch forming into high performance rocket motor cases and liquid propellant tankage.

Magnavox Co.--with Army for fabrication of 4659 XM 804E2 fuzes for the **REDEYE** missile.

NASA NEGOTIATIONS

General Dynamics/Convair--with Langley for services to provide instruction and technical support for the operation, maintenance and repair of the integrated life support system.

Space Ordnance Systems, El Segundo, Calif.--with Houston for special test non-flight versions of the **APOLLO** standard initiator.

DOD CONTRACTS

Army

LTV Electrosystems--$1.2 million for classified electronics equipment. The Army Electronics Command issued the contract.

Air Force

University of Kentucky--$64,392 for research to provide basic information and procedures related to the physiology of space flight.

Lockheed Aircraft Corp., Lockheed Missiles & Space Co.--$66,200 for a program to obtain data on thermal ablation.

AVCO Corp., Research and Advanced Development Division--$300,000 to develop and improve a process for producing boron filaments by the chemical vapor deposition of boron onto a tungsten process.

Lockheed Aircraft Corp., Lockheed Propulsion Co.--$153,400 for preparation and delivery of uncured solid propellants.

Control Data Corp., La Jolla, Calif.--$722,318 for bioastronautics laboratory research tool.

Atlantic Research Corp.--$61,461 for research on deflagration of high-energy oxidizers.