

35 Years Ago at MSC

Grumman Aircraft Engineering Corp. builds LEM which will one day touch down on the Moon's surface

Excerpts reprinted from the May 1, 1963, issue of the Space News Roundup.

When Grumman Aircraft Engineering Corporation was founded in 1929, its first business was repairing Loening amphibians. Today the Long Island company is developing the vehicle under a NASA contract administered by the Manned Spacecraft Center, which will land the first American astronauts on the moon.

Since the company was selected as the prime contractor for the LEM program, it has completed preliminary analysis of equipment that might be considered for common usage for the command and service modules and LEM in a joint investigation with MSC; presented to MSC a preliminary configuration aimed at an early freeze of the LEM design; established permanent representation at MSC and Atlantic missile range, as well as technical liaison in Los Angeles for California subcontractors; begun development of plans for propulsion system testing at the White Sands missile range; and selected four major sub contractors for negotiations.

As of the month of April, approximately 1,000 personnel had been assigned to the LEM program. It is currently anticipated that the staff complement on the LEM program would more than double by the end of 1963.

Grumman is now completing a funded study for NASA designed to investigate the supplies necessary for support of the astronauts during an extended stay on the moon. Begun in September, the \$79,095 study was completed in February.

As an addendum to this lunar logistic study, Grumman's preliminary design department analyzed the basic LEM vehicle for its suitability to carry several payloads. Recently presented to NASA, the study indicates that the descent stage of the lunar excursion module could be stocked with the necessary provisions to extend a lunar

mission another 70 days.

In addition to carrying staples (food, water, oxygen, spare space suits and backpacks, a power supply and other life support items), the LEM descent stage, or "truck," as Grumman calls it could also accommodate a 10-foot diameter, pre-assembled shelter which would protect the astronauts from the lunar hazards of micrometeorite showers, and solar flares. The shelter could also contain enough life support, power supply and communications equipment to sustain astronauts for as long as three months.

Another possibility would be the inclusion of a lunar roving vehicle which could be used by the astronauts for cargo carrying purposes.

The LEM-truck would be capable of carrying a total payload of about 7,500 pounds. The concept, should NASA decide to employ it, could be accomplished with minimum modification to the basic LEM design and maximum development efficiency.

Another related facet of the logistic problem—the locomotion and control of lunar vehicles—was first investigated by Grumman under a company-funded study in preparation for the prospector program.

The company's advanced development department continues to correlate optical, thermal and radiometric measurements of these samples for further comparison to "signatures" provided by the actual surface.

Consequently, engineers at Grumman have developed a type of wheel which is thought to be suitable to locomote a lunar vehicle because of its characteristics. Called a "metalastic" (metal-elastic) wheel, tests conducted in unconsolidated sandy type substances indicate the wheel has the properties of large footprints for weak soil, low unsprung weight to accommodate the dynamics of reduced lunar gravity and invulnerability to micrometeorites and low temperatures.

The company has already prepared

several alternative preliminary designs of lunar roving vehicles utilizing metalastic wheels.

A great deal of effort is expended in Grumman's research and advanced development departments on study programs which are associated with manned space flight but not necessarily with the lunar program. Among these studies is one designed to investigate whether it is possible for astronauts to live comfortably in space stations rotating faster than four revolutions per minute, possibly as high as eight revolutions per minute.

Only the first half of this program has been completed, but trends detected in the study of test subjects indicate that it may be possible for humans to perform space station functions at approximately 8 rpm for extended periods, if the radius from the hub is about 50 feet. The increased rotation, however, is not without its penalty of limiting the normal head motions a man might make.

Experiments are being conducted in an enclosed environment, a 10-foot by eight-foot by eight-foot tilting room located on the company's 46-foot-diameter centrifuge. Further experiments with the tilting room and the centrifuge will be performed to confirm results already indicated about the effects of a rotating environment in the regions about 8 rpm upon man.

Some other study work Grumman is performing in the research and advanced development departments include a simplified guidance scheme for re-entering spacecraft; the direct use of human balance and reflexes for vehicle control; remote control of an unmanned lunar vehicle from Earth; thermal control and dynamic control of a rotating space station; and manned simulator studies of Earth entry and orbital rendezvous.

In addition to these studies, the company has just begun advanced design work on a vehicle which could be used to carry astronauts to Mars.



Top: Examining a one-eighth scale model of the lunar excursion module are (left to right) Rep. George Miller, chairman of the House Science and Astronautics Committee; Joseph Gavin, Grumman vice president, and Joseph Mullaney, program director at Grumman for the lunar landing vehicle. Bottom: Astronauts Jim Lovell and Elliot See operate the lunar landing simulator at Grumman Aircraft.



Gilruth Center News

Hours: The Gilruth Center is open from 6:30 a.m.-10 p.m. Monday-Thursday, 6:30 a.m.-9 p.m. Friday, and 9 a.m.-2 p.m. Saturday.

Sign up policy: All classes and athletic activities are on a first come, first served basis. Sign up in person at the Gilruth Center and show a yellow Gilruth or weight room badge. Classes tend to fill up two weeks in advance. Payment must be made in full, in exact change or by check, at the time of registration. No registration will be taken by telephone. For more information, call x30304.

Gilruth badges: Required for use of the Gilruth Center. Employees, spouses, eligible dependents, NASA retirees and spouses may apply for photo identification badges from 7:30 a.m.-9 p.m. Monday-Friday; and 9 a.m.-2 p.m. Saturdays. Cost is \$10. Dependents must be between 16 and 23 years old.

Nutrition intervention program: Learn more about the role diet and nutrition play in your health. This six-week program includes lectures, a private consultation with the dietitian and blood analysis to chart your progress. The program is open to all employees, contractors and spouses. For more information call Tammie at x32980.

Defensive driving: One-day course is offered once a month at the Gilruth Center. Pre-registration required. Cost is \$25. Call for next available class.

Stamp club: Meets at 7 p.m. every second and fourth Monday in Rm. 216.

Weight safety: Required course for employees wishing to use the Gilruth weight room. The next classes are scheduled for at 8 p.m. May 14 and 28 (must be on time to receive credit for class). Pre-registration is required. Cost is \$5. Annual weight room use fee is \$90. Additional family members are \$50.

Exercise: Low-impact class meets from 5:15-6:15 p.m. Mondays and Wednesdays. Cost is \$24 for eight weeks.

Aikido: Introductory martial arts class meets from 5:15-6:15 p.m. Tuesday and Wednesday. New classes begin the first of each month. Instruction is by a fourth-degree black belt. Learn to defend yourself and get a great aerobic workout. Cost is \$35 per month.

Step/bench aerobics: Low impact cardiovascular workout. Classes meet from 5:15-6:15 p.m. Mondays, Tuesdays and Thursdays. Cost is \$32 for eight weeks. For more information, call Kristen at x36891.

Yoga: Stretching Class. Low impact exercises expertly designed for people of all ages and abilities in a Westernized format 5-6 p.m. Thursdays. Cost is \$32 for eight weeks.

Ballroom dancing: Beginning and advanced students meet from 7-10 p.m. Thursdays. Cost is \$60 per couple.

Country and western dancing: Beginner class meets 7-8:30 p.m. Monday. Advanced class (must know basic steps to all dances) meets 8:30-10 p.m. Monday. Cost is \$20 per couple.

Fitness program: Health Related Fitness Program includes a medical screening examination and a 12-week individually prescribed exercise program. For more information call Larry Wier at x30301.

Gilruth Home Page: Check out all activities at the Gilruth online at: <http://www4.jsc.nasa.gov/ah/exceaa/Gilruth/Gilruth.htm>

Ticket Window

Bldg. 3 Exchange Store hours are 7 a.m.-4 p.m. Monday-Friday.
Bldg. 11 Exchange Store hours are 9 a.m.-3 p.m. Monday-Friday.
For more information, please call x35350.

The following discount tickets are available at the Exchange Stores:

General Cinema Theaters	.....	\$ 5.50
Sony Loew's Theaters	.....	\$ 5.00
AMC Theaters	.....	\$ 4.75
Astroworld Early Bird Tickets (valid thru 5/31)	.....	\$18.50
Astroworld One Day Admission	.....	\$24.25
(valid at all Texas Six Flags Theme Parks)		
Astroworld Season Pass	.....	\$57.75
(valid at all Texas Six Flags Theme Parks and Water World)		
Moody Gardens (2 of 6 events)	.....	\$ 9.75
Sea World	.....adult \$27.25	.....child (3-11) \$18.25
Schiltebahn	.....adult \$20.75	.....child (3-11) \$17.50
Space Center Houston	.....adult \$10.25	.....child (4-11) \$ 7.00

Metro Tokens and value cards available.
Coming Soon: Splashtown Water Park and Houston Comets Tickets.
Mark your calendar for the Book Fair - May 5-7.

Roundup Deadlines

The Space News Roundup is published every other Friday. Story ideas should be submitted as far in advance as possible, but no later than two weeks prior to the date of publication.

The deadline for Dates & Data calendar items is three weeks prior to the date of publication. Stories and ideas should be submitted to Editor Kelly Humphries in Bldg. 2, Rm. 180, or via e-mail to kelly.o.humphries1@jsc.nasa.gov.

Retirees should submit change of address notices to the distribution group at Mail Code BT552 or call Ignacia Ramirez at 281-483-6161.