

# LEWIS NEWS

National Aeronautics and Space Administration  
Lewis Research Center

Cleveland, Ohio

Vol. 4, No. 24

November 24, 1967

## Surveyor, ATS Successful

Surveyor 6 and ATS-3, launched two weeks ago aboard Lewis managed rocket vehicles are proving to be exceptionally successful spacecraft.

The Applications Technology Satellite has produced excellent color photographs of the earth from its station in synchronous orbit near the mouth of the Amazon River. Other experiments are also working well.

Surveyor 6, which finds the lunar night falling on it today (November 24), literally took a giant

step on the moon. On November 17 its three vernier engines were ignited for two and a half seconds, lifting it to an altitude of  
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## Lewis Launch Record Is Near Perfect

When Lewis assumed responsibility for the Centaur program in the fall of 1962 and for the Agena in the spring of 1963, no



ATS-3 launched with a Lewis-managed Atlas-Agena is now transmitting excellent color pictures of the western semi-sphere. The most visible land mass is South America. The outline of North America is just barely visible near the top left with the northern portion of Africa easily seen at the right.

one would venture to predict the future successes of these launch vehicles.

The Atlas/Agena, previously used in the first five Ranger unsuccessful shots, and having contributed its share of these failures, looked like a problem-ridden vehicle to space flight technicians and program managers. Nor had the Centaur, the first rocket to use liquid hydrogen and liquid oxygen for fuel, yet been proven in space. Its first, and only test flight at the time, had been a dramatic failure.

But since those early days both vehicles have chalked up an impressive series of successful launches. To date, Lewis' Agenas have achieved a record of 25 out of 27 successful operational launches (or 92.5 per cent), while Centaur has a perfect six for six score for Surveyor missions.

"If one looks at NASA's accomplishments during the past four years, it is seen that the success of the Lewis-managed launch vehicles has been a major contribution," Dr. Seymour C. Himmel,  
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### It's Later Than You Think!



Santa Claus has marked Sunday, December 17 on his public appearances calendar to visit Lewis-Cleveland and Plum Brook employees' children.

**AT CLEVELAND** Ol' Saint Nick, along with Jack Frost and his friends, will bring his bagful of goodies to the DEB auditorium to meet with children up through ten years old between 12:30 and 4:30 p.m.

LeSAC, sponsoring the Children's Christmas Party, is expecting the usual large crowd and has set the following schedule of attendance to minimize confusion: last name S-Z, 12:30 p.m.; O-R, 1:30 p.m.; K-N, 2:30 p.m.; E-J, 3:30 p.m.; and A-D, 4:30 p.m.

Tickets for the party are 75 cents per person and will be on sale in the main cafeteria and

DEB cafeteria from December 4 through 8 only.

**AT PLUM BROOK** the Annual Employees' Children Christmas Party will be held in the Engineering Building Auditorium from 1 p.m. to 5 p.m.

Featured entertainment will be two movies, "The Littlest Angel" and the "Candlemaker." A local magician will be on hand with his bag of tricks if necessary arrangements can be made.

Children from ages one through 11 will receive presents from Santa's Work Shop. Refreshments and cookies will be served, with coffee available for adults. Tickets at 50 cents per child will be available from PACER members and other listed ticket sellers.

Christmas, and the Children's Christmas Party, is sooner than you think!

## 11 More Flights Are Scheduled for Apollo

Eleven more Saturn flights are scheduled — six in 1968 and five in 1969 — in the Apollo mission to achieve a manned lunar landing.

In the revised Apollo schedule, Command, Service and Lunar Modules will be tested and qualified on concurrent unmanned flights of the Uprated Saturn and Saturn 5 launch vehicles. (Apollo/Uprated Saturn flights are identified with a two-hundred series number, i.e., Apollo/Saturn 204. Saturn 5 flights are identified with a five-hundred series number, i.e., Apollo/Saturn 502.)

The schedule for 1968 includes: Apollo/Saturn 204, the first unmanned test of the Lunar Module in earth orbit;

Apollo/Saturn 502, second unmanned flight test of the Saturn 5 launch vehicle and Apollo Command and Service Module;

Apollo/Saturn 503, third unmanned test of the Saturn 5 and Command and Service Module.

Apollo/Saturn 206, second un-

manned flight test of the Lunar Module in earth orbit;

Apollo/Saturn 205, first Apollo manned flight, a 10-day mission qualifying the Command and Service Modules for further manned operations.

Apollo/Saturn 504, first manned Apollo flight on the Saturn 5 launch vehicle. This mission will provide the first manned operation in space with both the Command and Service and Lunar Module, including crew transfer from the C&SM to the LM and rendezvous and docking.

These flights will be flown in the above order and as rapidly as all necessary preparations can be completed. As they proceed, all opportunities to accelerate progress toward manned flights and a rapid accumulation of manned experience with the Apollo/Saturn system will be sought.

# Lewis Launch Record Is Near Perfect

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assistant director for launch vehicles, said proudly.

In reviewing the history of the launch program here, Dr. Himmel, who was Lewis' first Agena project manager, explained that the Agena has had a very successful career as a space vehicle. Agenas, with Atlas and Thor boosters, have been used to launch spacecraft and satellites for diverse missions, including those to study Earth-Sun interplanetary relationships (OGO), geodesy (PAGEOS), Earth's ionosphere (Explorer XX), lunar photography (Ranger and Lunar Orbiter), and flights to Venus and Mars (Mariner).

While Thor-Agena will continue to be used on the Western Test Range, only one Cape Kennedy Atlas-Agena launch remains, OGO-E, scheduled for early next year. For upcoming missions such as OAO, ATS, and Mariner during the next two years, Centaur's greater payload and performance capability is required.

The successful development of Centaur was a tremendous challenge to Lewis, Dr. Himmel recalled. "When the project came to us it was pushing the limits of technology and had not succeeded," he stated. Although Lewis had pioneered research on high-energy propellants such as liquid hydrogen and liquid oxygen, they had not been tested in space flight until the Centaur's first success-

ful flight in November 1963.

Seven developmental test flights of Centaur proved the new propellant combination for the first time in the free world. Then an Atlas-Centaur launched the first Surveyor in May 1966, placing it on the Moon to photograph possible landing sites for future Apollo missions. Centaur thus became the world's first vehicle to use hydrogen fuel in space, the first to achieve a coast and restart of hydrogen fueled engines in space, and the first to use hydrogen fuel for an operational space flight mission.

Five more Surveyors were

launched by Centaurs, each with tremendous accuracy. To illustrate, without midcourse corrections the spacecraft landing distances from their target areas would have been: Surveyor 1 — 250 nautical miles; 2 — 25 miles; 3 — 225 miles; 4 — 93 miles; 5 — 26 miles; and 6 — 65 miles.

All of Lewis' lunar launches, according to Dr. Himmel, "have been perfect in placing the spacecraft on the required trajectory — all threading the "needle's eye."

The near perfect record of Lewis launches has required that all the NASA and contractor personnel involved perform their jobs

in a superior way. At Lewis, individuals in the Centaur Project Office, headed by Ed Jonash, the Agena Office, headed by H. Warren Plohr, and the Atlas Office, headed by Ed Baehr, must attend to thousands of different tasks before a "bird" ever gets to the launch pad.

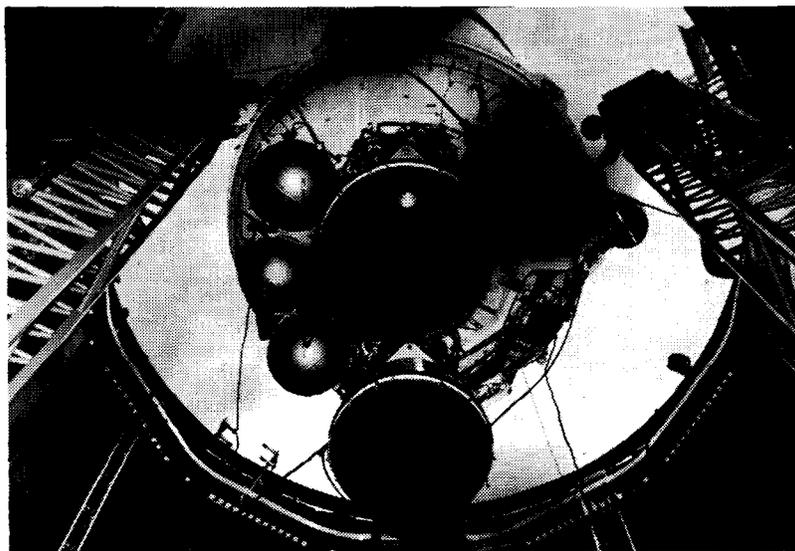
To provide a sound vehicle, Lewis engineers must develop specifications for each new mission, see them carried out by the contractors, and integrate all of the components into the vehicle.

After the vehicle arrives at the Cape, it is erected and checked out by a team from Kennedy Space Center's Unmanned Launch Operations, under the direction of Robert Gray. Lewis engineers are also on hand to help conduct the launch, especially if "glitches" (problems) develop.

Dr. Himmel emphasizes the team effort involved in developing a vehicle and preparing it for launch. As the countdown proceeds to T-O, "it takes everyone to say 'yes', although it's easier to say 'no'," Dr. Himmel said.

The launch crews have all developed the attitude of perfection, Dr. Himmel added. "It takes people to make it work. We're all part of one team with the same objective, and it is a harmonious relationship born of mutual respect."

It's the kind of team work which gives you a near perfect launch record.

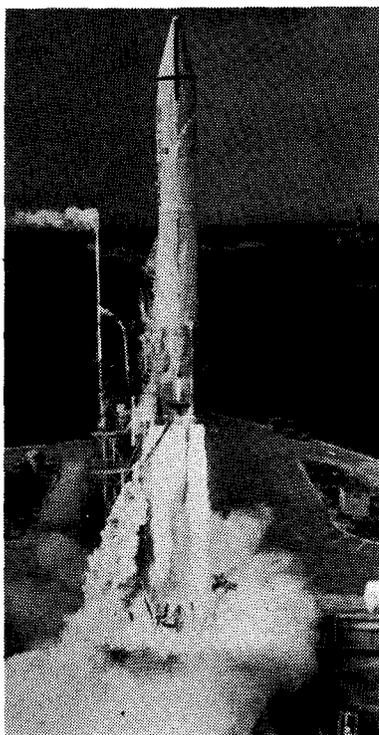


A Centaur vehicle is shown as it was lowered into a space power chamber at Lewis for a series of environmental tests. Auxiliary propulsion, hydraulic, pneumatic, and electrical systems were tested in this environment simulating the vacuum of space at an altitude of about 100 miles.

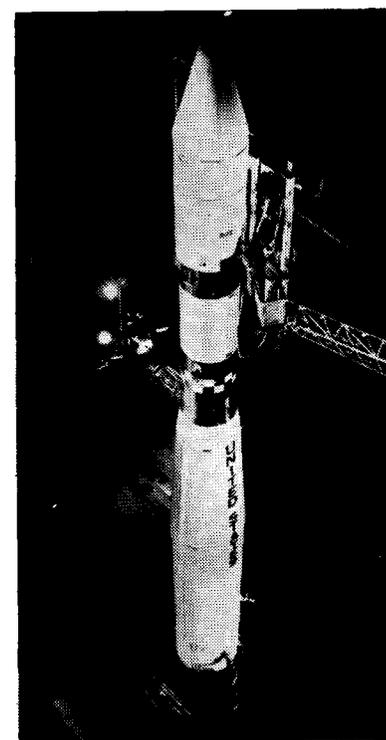
## Record of Lewis Launches

| SPACERAFT         | LAUNCH     | VEHICLE        | MISSION                         |
|-------------------|------------|----------------|---------------------------------|
| Surveyor VI       | Nov. 1967  | Atlas-Centaur  | Lunar Exploration               |
| ATS III           | Nov. 1967  | Atlas-Agena    | Applications and Technology     |
| Surveyor V        | Sept. 1967 | Atlas-Centaur  | Lunar Exploration               |
| Lunar Orbiter V   | Aug. 1967  | Atlas-Agena    | Lunar Photography               |
| OGO IV            | July 1967  | TAT-Agena      | Earth-Sun Studies               |
| Surveyor IV       | July 1967  | Atlas-Centaur* | Lunar Exploration               |
| Mariner V         | June 1967  | Atlas-Agena    | Venus Probe                     |
| Lunar Orbiter IV  | May 1967   | Atlas-Agena    | Lunar Photography               |
| Surveyor III      | April 1967 | Atlas-Centaur  | Lunar Photography               |
| ATS II            | April 1967 | Atlas-Agena**  | Applications and Technology     |
| Lunar Orbiter III | Feb. 1967  | Atlas-Agena    | Lunar Photography               |
| ATS I             | Dec. 1966  | Atlas-Agena    | Applications and Technology     |
| Lunar Orbiter II  | Nov. 1966  | Atlas-Agena    | Lunar Photography               |
| Surveyor II       | Sept. 1966 | Atlas-Centaur* | Lunar Exploration               |
| Lunar Orbiter I   | Aug. 1966  | Atlas-Agena    | Lunar Photography               |
| Pageos I          | June 1966  | TAT-Agena      | Geodesy                         |
| OGO III           | June 1966  | Atlas-Agena    | Earth-Sun Studies               |
| Surveyor I        | May 1966   | Atlas-Centaur  | Lunar Exploration               |
| Nimbus II         | May 1966   | TAT-Agena      | Meteorology                     |
| OAO I             | April 1965 | Atlas-Agena*   | Astronomy                       |
| ISIS X            | Nov. 1965  | Thor-Agena     | Dual Launch, Ionosphere Studies |
| Explorer XXXI     |            |                |                                 |
| OGO II            | Oct. 1965  | TAT-Agena      | Earth-Sun Studies, Polar Orbit  |
| FTRE II           | May 1965   | Atlas          | Reentry Test                    |
| Ranger IX         | March 1965 | Atlas-Agena    | Lunar Photography               |
| Ranger VIII       | Feb. 1965  | Atlas-Agena    | Lunar Photography               |
| Mariner IV        | Nov. 1964  | Atlas-Agena    | Mars Probe                      |
| Mariner III       | Nov. 1964  | Atlas-Agena**  | Mars Probe                      |
| OGO I             | Sept. 1964 | Atlas-Agena    | Earth-Sun Studies               |
| Nimbus I          | Aug. 1964  | Thor-Agena     | Meteorology                     |
| Ranger VII        | July 1964  | Atlas-Agena    | Lunar Photography               |
| FIRE I            | April 1964 | Atlas          | Reentry Test                    |
| Ranger VI         | Jan. 1964  | Atlas-Agena*   | Lunar Photography               |
| Echo II           | Jan. 1964  | Thor-Agena     | Communications                  |

\* Spacecraft Failure  
\*\*Launch Vehicle Failure



This Atlas-Centaur (AC-10) blasted off in May 1966 to carry the first Surveyor spacecraft to the Moon.



A Thor-Agena vehicle is shown on the pad prior to the successful launch of OGO-II from the Western Test Range in Oct. 1965.