



Martin Company

**WINGLESS SPACECRAFT**—The artist's concept shows a manned spacecraft of the future designed by Martin Company which will have no wings but still be maneuverable within the earth's atmosphere. The lifting body spacecraft is shown in the foreground with an engine for maneuvering in space and in the background a spacecraft is rendezvousing with an orbiting space station.

## ASTRONOMY

## Huge Galactic Explosion

Light from the universe's biggest explosion that started one and a half million years ago has just reached the earth and was photographed by the world's largest telescope.

### See Front Cover

► THE MOST GIGANTIC explosion ever known in the universe, the tremendous detonation of the heart of a distant galaxy of millions of stars, has been discovered.

The galaxy, known to astronomers as M-82, is still in the process of explosion, with material rushing out at velocities up to 20 million miles per hour. Matter equal to five million suns is involved in the cataclysm.

The explosion started 1.5 million years ago, about when the Ice Age existed here on earth. Light has just reached earth, for the galaxy is 60 billion billion miles (10 million light years) away.

Captured on a special photograph taken with the world's largest telescope, the 200-inch Hale telescope on Mt. Palomar, Calif., the evidence is that tremendous jets of matter, stretching out 60 million billion miles (10,000 light years), are streaming from the galaxy's nucleus above and below the flattened galactic disk, which is about 20,000 light years across.

The photograph, shown on this week's front cover, was taken by Dr. Allan R. Sandage of the Mt. Wilson and Palomar staff and the spectral work on the galaxy was done at Lick Observatory by Dr. C. R. Lynds of the Kitt Peak National Observa-

tory. The 200-inch Hale reflector at Palomar is part of the Mt. Wilson and Palomar observatories which are operated jointly by the Carnegie Institution of Washington and the California Institute of Technology.

Explosions of this magnitude may well be the prime source of cosmic rays. Cosmic rays are chiefly composed of the nuclei of atoms that have been energized to tremendous speeds by events such as explosions in stars and galaxies. Until recently, exploding stars were thought to be the principal source of these high energy cosmic rays.

Earlier photographs of M-82 indicated only that something chaotic was going on. In obtaining the new photograph, all the light from the galaxy except that emitted by excited hydrogen was filtered out. The astronomers believed that this is the material that would be most affected by the explosion and that a photograph only of the hydrogen would best show the explosion's configuration. While the photograph does show only the turbulent hydrogen, it is assumed that other material also is affected by the blast.

The astronomers said that M-82 no doubt contains a great many stars, although none shows in the picture. In any event, they are so far apart and the exploding gases are so tenuous that the stars probably would not be affected at all by the large outburst.

Additional evidence has been obtained recently of explosions on a galactic scale. Astronomers at the Caltech Radio Observatory have discovered enormous, turbulent, invisible clouds that apparently have been ejected from galaxies by huge detonations. Radio and optical astronomers have identified five very bright galaxies that very likely are in the early stages of great explosions.

Until all this evidence became available, most astronomers did not think it likely that explosions could occur on such a tremendous scale.

• Science News Letter, 84:215 Oct. 5, 1963

## SPACE

## Orbital Laboratories Will Ride "Piggyback"

► FIVE ORBITAL laboratories which will hitchhike their way into space aboard Atlas missiles and then go into orbit on their own power will be built by General Dynamics/Astronautics for the U.S. Air Force.

Designed to ride on Atlas missiles being launched for other purposes, Satellite-Aerospace Research (SATAR) will provide a means of conducting a wide range of scientific experiments in orbit at a fraction of what they would cost otherwise, Sam L. Ackerman, vice president and director of electronic programs at General Dynamics, said.

SATAR will be a pod attached "piggyback" to the side of Atlas just above the booster's propulsion section.

"Once in space, the SATAR vehicle will separate from the Atlas and coast for about 15 minutes before its own engine ignites to send it into orbit," Mr. Ackerman said.

SATAR will be capable of circular or highly eccentric orbits, high-altitude probes, and high-velocity reentry into the atmosphere.

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## ASTRONOMY

## Venus Surface Seems Weak and Flat

► VENUS appears to have a relatively flat landscape and temperatures too hot to support such familiar earth materials as metallic iron, free carbon and magnesium carbonates.

The planet's crust is probably weak with a dusty topside, Dr. R. F. Mueller of the department of geophysical sciences, University of Chicago, reported in Science, 141:1046, 1963.

Judging from readings taken by the Mariner II space probe, the temperature of Venus' atmosphere is about 1300 degrees Fahrenheit. That, Dr. Mueller said, indicates surface rocks would be still hotter—enough to cause "significant differences" in their composition.

He said Venus' surface could be made up of calcium carbonate, iron oxides and some hydrous silicates.

The atmosphere of Venus probably contains a high degree of gaseous minerals, since the mass and density of the planet do not differ greatly from those of the earth.

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