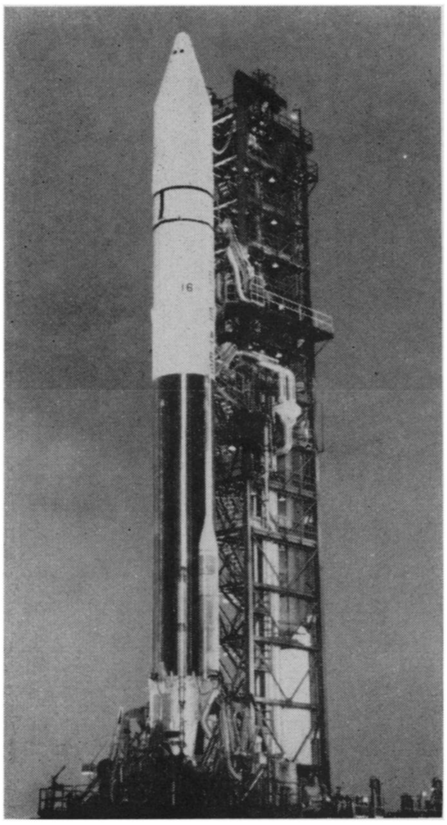
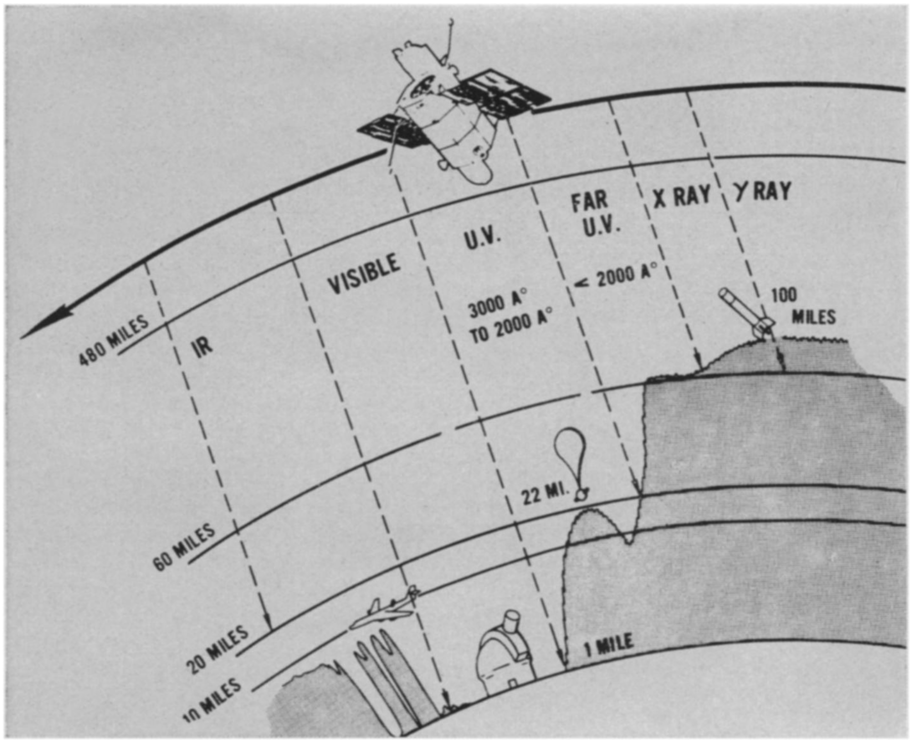


NASA
OAO on its booster at Cape Kennedy.



NASA
With OAO's eyes above the atmosphere astronomers will get a new view.

SATELLITE ASTRONOMY

Above the blanket

Astronomers are finally to get an unfettered look at the untraviolet sky

Few, if any, U.S. earth satellites have been so long and eagerly awaited as the Orbiting Astronomical Observatory. It is designed to free astronomers from the blanket of atmosphere that keeps most space radiations from reaching the earth at all, and distorts the few that do (SN: 8/24, p. 188).

The National Aeronautics and Space Administration began planning the OAO almost a decade ago. Grumman Aircraft Corp. was chosen to build it in 1960 and the first one was to fly late in 1963.

Trouble began almost immediately. Grumman engineers soon found that the satellite was vastly more complicated than they had expected—it ended up with some 328,000 parts, almost three times as many as the Surveyor moon landers. It was not until April 8, 1966, that elated officials and technicians watched OAO-A rocket into orbit.

Their high spirits lasted less than two days, when overheating destroyed the spacecraft's batteries. The failure, says Dr. John F. Clark, director of the space agency's Goddard Space Flight Center, "was a catastrophe felt throughout the scientific community." Engineers set about redesigning their second spacecraft, including avoidance of several malfunctions that had appeared before the power failed. The stabilization system was improved and the star trackers that keep the satellite's telescopes on target were redesigned to prevent electrical arcing. Widespread changes and additions were made to the already complex computer control system.

With the delays prior to the launch, and the redesigning afterward, the price-tag of the program skyrocketed. Originally, it was to have included five missions, extending through 1970, for an estimated $317 million. That was $63.4 million apiece. Tightening budgets forced the program back to four flights, but the projected bill went up anyway to some $378 million—$94.5 million each. The failure of the first mission brings the average cost of the remaining ones to some $126 million, twice what planners originally expected to pay.

With the first of these missions scheduled to go this week from Cape Kennedy's launch pad 36B, however, the anxious astronomers believe it will be worth every penny.

The giant spacecraft, 10 feet high and 21 feet wide with its solar panels open, carries 11 telescopes, all of them designed to look at stars not as the human eye sees them, but by ultraviolet light. This will be the first chance earthbound astronomers have had for extended ultraviolet observations, which, they feel, can reveal much about the age, origins and internal processes of stars.

In the past, says Dr. James E. Kupperian Jr., OAO project scientist at Goddard, most ultraviolet observations have been done from sounding rockets. In the past 15 years, sounding rockets have spent a total of perhaps 200 minutes making such observations above most of earth's atmosphere, and most of that time has been spent looking at nothing. The OAO has been designed for at least a year of constant use, 24 hours a day, seven days a week.

Four of its telescopes are 12.5-inch-diameter instruments, equipped with photometers to map broad portions of the sky under the direction of Dr. Fred Whipple of the Smithsonian Astrophysical Observatory in Cambridge, Mass. Within six months, Dr. Whipple expects to have cataloged some 25,000 stars, more than 25 percent of the sky, extending down to the ninth magnitude, about 12 times fainter than the human eye can see.

More specific targets, such as the clouds of interstellar matter in the Orion Nebula, will be photographed and measured by the remaining OAO instruments, one 16-inch and four 8-inch telescopes and a pair of spectrometers. Dr. Arthur D. Code of the University of Wisconsin will be in charge of these observations, which are planned to cover an average of one individual star per orbit, or about 1,000 stars in six months.

If it is successful, the OAO will still not be the world's first space observatory. A giant cruciform satellite, 1,500 feet across, was launched by the U.S. on July 4, and is at present listening to radio emissions from deep space. Almost four months before that, Russia launched Cosmos 215, an optical observatory equipped with eight small ultraviolet telescopes and one to look at X-rays. The satellite stayed in orbit for only about six weeks, turning slowly the whole time, so its observations were limited.

The next OAO, to be launched late next year, will carry a 38-inch telescope to make ultraviolet observations with much finer spectral resolution than the present ones. The final shot in the present program will fly a 32-inch reflecting telescope for Princeton University in 1970, with spectral resolution 20 times finer than its predecessor.

Unlike previous unmanned satellites, which collected their data automatically to be transmitted to earth on command, OAO will have to be controlled manually at all times, requiring a 200-man ground crew at Goddard and five other ground stations. To the astronomers, however, the labor, like the cost, will be well worthwhile.

FOCUS AND FUNDS

The Nixon Presidency

The election of Richard M. Nixon to the Presidency of the United States last week places major elements in the structure of Federal support for science and technology in a new perspective.

Had Vice President Humphrey been elected, the picture would probably have remained largely unchanged. The same embryonic efforts that have been evident in the last two years to control spending without making major changes in the structure would have gone forward. Decisions on the pursuit of a less spectacular, perhaps more scientific space program would have been made. And the search for a capability within the scientific community to help the nation with its social problems would have been continued.

Under a new Administration, despite an essentially unchanged Congress where science is concerned, sharply different prospects are likely.

Mr. Nixon, though not unconcerned about social problems and the health of university research, as his policy statements have indicated (SN: 11/9, p. 477), is expected to make a renewal of the arms race with the Soviet Union a major focus of his Administration. And the stimulus given research and development programs by that sharp focus could represent a sharp growth in overall R&D support which a disarmament oriented Humphrey Administration could not as easily have justified.

It is anticipated that the deployment of the antiballistic missile system, with its concomitant pressure for better electronics and intensified warhead testing by the Atomic Energy Commission, will accelerate. So will the development and deployment of new breeds of nuclear attack submarines (SN: 7/27, p. 79), along with a new spurt in oceanographic research that the new weapons systems will require. Not only in new techniques of search and rescue, which deeper and swifter submarine systems will need, but in weapons, navigation and undersea communications as well, there will be increased pressure for advanced technology.

And closer links could come between the now lagging military space effort, focused on communications and a manned orbiting laboratory, and a civilian space agency—and industry—hurting for post-Apollo stimuli.

Mr. Nixon has also promised an effort to supplant Federal support for research with private support wherever possible. There have, in the past, been proposals for use of the nation's tax structure to accomplish such goals. There may very well be, for instance, tax credits to industry for the conduct of research which the Government regards as in its interest.

The selection of a science adviser to the new President will probably not be made in the early weeks of the interregnum; among Nixon's supporters within the scientific community, Dr. Willard F. Libby, 1960 Nobel Prize winning chemist from the University of California at Los Angeles has been mentioned. But there is a likelihood that Mr. Nixon will look for an industry-oriented source of policy guidance and liaison with the scientific community.

That job has been downgraded considerably in recent years, largely because of the decreased reliance on new scientific sophistication as underpinning for national defense and security. Whether the pendulum will swing back under the pressures of a new arms race remains to be seen.

Despite the change in Administration, there may nevertheless be some effort to reorganize the entire science advisory function around the growing recognition of the need for a Federal Department of Science.

President Johnson's science adviser, Dr. Donald F. Hornig, as much as three years ago predicted that his successor would have to live with a vastly expanded White House Office of Science and Technology, with operational responsibilities rather than the simply advisory functions that have existed and grown since President Eisenhower initiated the office.

With the accelerating falloff in support for basic research, and no apparent technique for inducing industry to take up the burden of university research support, some amalgam of the support functions of those agencies—like the National Science Foundation—whose only mission is to support basic science is still likely.

This will in all likelihood not diminish the role of the science adviser—more than it already has been—but will provide a spokesman for science within the Administration, rather than expecting a Presidential adviser to divide his loyalties between his boss, whose interests he must serve, and his fellow scientists, with whose problems he sympathizes.

How much of any reorganization ends up being window dressing behind which there will be no real progress or growth, however, will probably ultimately depend on the ability of President Nixon to bring the Vietnam War to a close, freeing some funds, at least, for necessary civilian programs.