

a jump of \$20 million to \$91 million for development of high-gain breeder reactors, mostly for the kind cooled by liquid sodium. In the last two years the budget for breeder reactors has almost doubled.

In high energy research, the AEC is asking for \$25 million this year to start construction of the 200-400-BeV accelerator at Weston, Ill. Already in hand and being spent is \$7.3 million appropriated last year for design and engineering of the huge research facility. The AEC will also ask for authorization this year of the full \$250 million the project is supposed to cost in the next six years.

Operating expenditures for the agency's physical research program will go up \$15 million in fiscal 1969, mostly in the high energy physics section, whose budget request goes from \$113 million in 1968 to \$120 million. AEC officials say the request allows for small increases in a number of research projects, to cover rising costs. No provision has been made yet to pick up specific projects now run by the Department of Defense, which has said it is getting out of the high energy research business. However, some general fund money is available in the budget in case a worthwhile project needs support.

The new budget also includes an increase in the biology and medicine research program, from \$88 million to \$92 million.

The Plowshare program, to develop peaceful uses for nuclear explosives, is cut \$2.5 million this year to \$14.5 million. AEC hopes to carry out several experiments in fiscal 1969, however, in cooperation with industry.

Most likely tests are Project Bronco, now being negotiated, which would attempt to free shale oil by breaking up the underground rock; Dragontrail and Rulison, which, like last December's Gasbuggy, are aimed at freeing natural gas; and Sloop, a copper mining project.

NASA

Apollo funds down

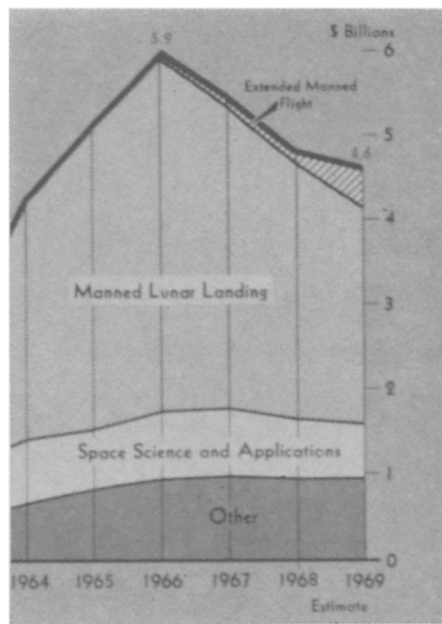
Man-in-space still tells the National Aeronautics and Space Administration's money story. The Administration's request is for some \$218 million less than last year's authorization (and \$597 million less than the year before). Reduction of more than half a billion dollars in funds for the Apollo program is at the root of the decrease.

NASA's big year was fiscal 1966, when it spent more than \$5.9 billion and had more than 420,000 people working for its contractors. Now things are cooling off rapidly, as revealed by

a request for some \$4.37 billion and a contractor work force now at 300,000 and dropping by 4,000 a month.

The launch pad fire that killed three astronauts a year ago delayed Apollo nine months and cost the program some \$410 million, but it is now back on the track, and next year may well see Americans on the moon. NASA's new concern is for what comes after. The biggest increase in the Administration's budget request is thus for the Apollo Applications Program.

Apollo Apps, as its mentors call it, received a bit more than \$250 million this year. In 1969, the Administration hopes to have almost \$440 million for the program, even though the fire pushed the first Apps flight into 1969 and Vietnam has now shoved it into at least 1970. The first such mission will include a multi-manned orbiting workshop, plus a second launch to revisit it. In 1971, NASA hopes to have



Bureau of the Budget

NASA: the lunar line points down.

a giant solar observatory that will dock with the workshop and be revisited three times that year.

In addition, NASA hopes the Apps program will lead to two manned lunar landings per year, following the first Apollo spectacular.

There have been reports—officially denied—that some scientists in NASA's scientist-astronaut program are thinking of quitting because so much of their time is spent in training for space flight and so little in scientific research. True or not, the fact remains that science, while not sinking into oblivion, is barely holding its own in the proposed new budget.

Physics and astronomy are hovering at about the fiscal 1968 level, a little more than \$140 million. There are two

more Orbiting Astronomical Observatories yet to come in that costly and much-delayed program, but the authorization request is for \$5.2 million less than this year's because the agency thinks it has finally worked the bugs out of the satellites. The complex, successful and valuable Orbiting Geophysical Observatory program will end after two more launches, and its request is down 35 percent.

Biology is up about 20 percent in the new request, most of which, however, is for human studies related to long-term space flights.

The sum requested for lunar and planetary exploration is down to \$107 million from \$140 million last year, since both the Surveyor and Lunar Orbiter programs are over. With budget pressures tighter even than last year, the agency no longer proposes the elaborate Voyager program of flybys, orbiters and landers to Mars and Venus.

Instead it plans an abbreviated program that will ignore Venus entirely, at least through 1973, and replace Voyager's costly, radar-guided softlanders with simpler parachute-equipped rough landers. The estimated cost of the overall program will be about \$500 million, barely a fifth that of a full-scale Voyager effort.

Up substantially for the second year in a row is NASA's earth applications program, which includes practical projects such as weather satellites. The biggest chunks of the increase are requested for a huge survey of what could be done with an earth resources satellite, and for advances in the multi-purpose Applications Technology Satellites, which check out new ideas for weather, communications, geodetic and a variety of other satellites.

Other agency requests for new ocean and earth applications satellites have been put off by the Bureau of the Budget pending completion of the NASA study and any possible non-satellite options it might turn up.

The two stars of the agency's Advanced Research and Technology office in the coming fiscal year, if the Administration has its way, will be the NERVA nuclear rocket and the quiet airplane engine research program. NERVA, which has been on-again-off-again for years, is now proposed in a smaller version, which could be mounted atop the giant Saturn V booster instead of its present third stage. The NERVA upper stage, NASA says, could double the rocket's payload to another planet.

In aeronautics, the X-15 and B-70 research aircraft will both come to the end of the line this year. Except for hypersonic research in the X-15's speed range, however, the Administration plans that all NASA's aircraft programs will get a financial boost.

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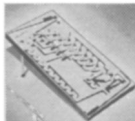
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Most of NASA's spaceport facilities work is completed. There's still a planned increase in the budget, though, for a pair of 210-foot antennas for the deep space tracking network, in Canberra, Australia, and Madrid, Spain. The first 210 is already in operation at Goldstone station in California.

Last year, says NASA Administrator James Webb, 94 percent of every NASA dollar went outside the agency to universities or industry. This figure has hovered between 90 and 95 percent for several years. But, warns Webb, if the cost-cutters keep cutting, this percentage could drop as low as 80 to 85 percent, with NASA research centers taking over more and more of the work that has been keeping the space industry rich.

SCIENCE FOUNDATION

New home for Arecibo

Mathematicians, high energy physicists, some chemists and astronomers, now comfortably supported by the Department of Defense, will shortly be in need of a new home. Many of them are expected to come rapping on the door of the smaller—but currently more willing—National Science Foundation.

For reasons of its own, the Defense Department has decided that the pure research programs in these areas, many of which adhered to the defense establishment in the days when nobody else was supporting basic research, are no longer appropriate as repositories for defense dollars.

The deep-dish radio telescope at Arecibo, in Puerto Rico, is one such installation; the cryogenic accelerator at Stanford University is another. The length of the list is still unknown.

It has been determined, however, that there will be no automatic assumption of responsibility by any agency for Defense's castoffs. Defense, the National Science Foundation and the Atomic Energy Commission are currently in close negotiation, in an effort to insure that worthy research projects don't fall between the cracks. But any researcher cut off by Defense is going to have to justify his project in terms of the needs of the Foundation, AEC, or any agency which might be willing to take on the project's support.

So far, in a budget marked by more cuts than increases, NSF has found \$1 million as a first step in the takeover of the astronomy done at Arecibo—Defense will continue to support the aeronomy there—and pieces of a \$26 million increase in NSF support for research projects are available for some of the physics, math and other projects expected to find themselves at loose ends.

All won't get in, of course; presum-

ably the good ones will. The Science Foundation regularly receives between 8,000 and 9,000 proposals for project grants a year, and funds about half of them. Next year, an increase in funds from the present \$172 million to \$198 million will permit the support of an extra 250 projects, and may provide a home for some of Defense's castoffs.

In a static budget proposal that nudges the \$500 million limit traditionally imposed on the Foundation by Congress, the support of project grants is virtually the only major category due to grow.

NSF Research Grants

(in millions)

	1968	1969
Astronomy	\$ 5.8	\$ 7.4
Atmospheric sciences	7.3	8.8
Biology (inc. IBP)	41.5	43.6
Chemistry	18.0	20.5
Earth Sciences	8.0	9.2
Engineering	19.6	21.0
Mathematics	13.1	14.5
Oceanography	19.2	24.0
Physics	24.2	31.0
Social Sciences	15.3	18.0
TOTALS	\$172.0	\$198.0

It is growing at the expense of such once-favored programs as the institutional support program, of which the University Science Development program was a much-vaunted part. University Science Development was the bellwether of the interagency Centers of Excellence program, designed to increase the quality of already good research institutions, adding them to the small list of greats.

NSF's piece of the Centers of Excellence program will drop next year from \$29 million to \$20 million, while such companion institutional programs as Departmental Science Development (\$12 million) hold steady.

"We had to make choices," says an official, "and the institutional programs generally entail some creation of new facilities." This was not the budget for the inclusion of new facilities: laboratory construction support was cut back from \$19 million to \$10 million, and a start on one major facility, the proposed radio astronomy array for Owens Valley, Calif., has been totally deferred to a latter year. Resurfacing of the giant dish at Arecibo is also deferred.

Areas selected for moderate increases include support of and research on computers for research and education, up \$2 million to \$23 million, and institutional grants to undergraduate institutions, raised from \$10 million to \$12 million.

Construction of the Kitt Peak National Observatory is being completed, and construction of the Cerro Tololo Inter-American Observatory in Chile is proceeding with the help of some outside money.