of Engineers for Rivers and Harbors, made up of the Deputy Chief of Engineers, five of the 11 generals who head Corps division offices, and a resident colonel. The Corps' civil works study board recommended that, in the interests of obtaining a "broader and more detached viewpoint," the board's membership be widened to include some people from outside the Army. This recommendation is still under study.

A more broadly constituted board might be better able to interpret sympathetically Army regulation ER1165-2-2, which Lieutenant General William F. Cassidy, Chief of Engineers, issued on 6 March. This regulation, taking note of the growing national concern for the preservation of natural areas, says that, if a project's "potential net economic benefits do not clearly outweigh the intangible aesthetic values that would be lost, serious consideration should be given to deferring development until doubts are resolved."

Scientists and conservationists in Indiana who have been protesting the Corps' plans for a reservoir which would flood a part of Big Walnut Valley that is described as Indiana's most remarkable natural area are disappointed in the board. For, in May, the board recommended construction of the project without so much as a mention of the natural areas to be lost. The Chief of Engineers has since appointed a special panel to study the Big Walnut problem.

The final review a water project receives before going to Congress, often to become just another piece of pork in the barrel, is that made by the Bureau of the Budget. To judge from the Bureau's superficial analysis of the Salem Church project (wherein, for example, the adequacy of the BOR recreation study was accepted on faith), much improvement could be made here.

"We must content ourselves with sampling and spot-checking," says a Budget Bureau official, who points out that the Bureau has a relatively small staff (four examiners are now assigned to the Corps' annual billion-dollar-plus civil works program). More aggressive reviews by a larger staff seem indicated. In any case, it is clear that, with the Corps of Engineers and the other water-project construction agencies scouting every river and creek bottom for dam sites, sharp eyes had best be watching. —LUTHER J. CARTER

ESRO: Space Sciences Research in Europe Suffers Growing Pains

Paris. Fragmentation is a salient feature of Western Europe's space effort. In addition to national programs of varying size there are separate intergovernmental organizations for space sciences, launcher development, and satellite communications. Urgings toward unification, or a least rationalization, have been heard for some time, and at a ministerial meeting in Rome in July a committee was formed which appears to have the best chance yet of framing and winning approval of a comprehensive plan.

The main intergovernmenal agencies are the European Space Research Organization (ESRO), the European Launcher Development Organization (ELDO), and the European Conference on Satellite Communications (CETS). A new consultative body at the ministerial level, the European Space Conference, has also recently been given permanent status.

The satellite communications organization is still mainly a sentiment in search of a program, but ESRO and ELDO are solidly established enterprises with a recent history of closer cooperation, in part encouraged by a crisis which nearly shook ELDO apart about a year ago.

ESRO is in its fourth year of full operation and entering a more expensive and ambitious phase as it begins to launch satellites as well as the sounding rockets which have been its mainstay until now. As its cost of living has risen, ESRO has encountered difficulties, some stemming from its own handling of its program, others political and of the sort that an intergovernmental organization competing for national funds is likely to encounter.*

British participation, for example, has recently been the subject of critical examination by a parliamentary financial watchdog committee. The essence of the British committee's advice was that Britain should unify its own national space program under a central authority and apply stricter limits to participation in international programs.

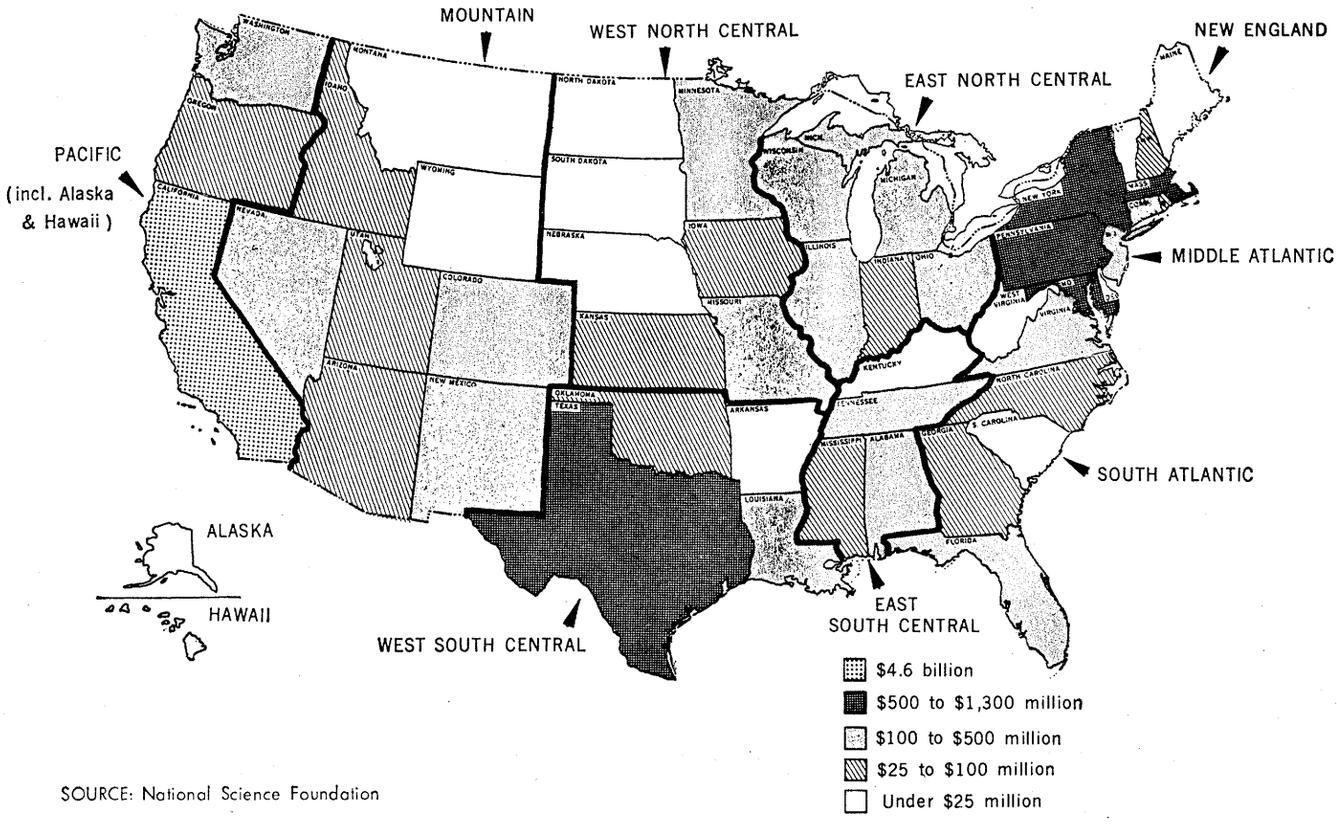
One of the committee's complaints was that British industry has not done well in gaining contracts from international space organizations of which Britain is a member. Britain, which contributes nearly 25 percent of the ESRO budget, for example, has won contracts worth only about $11 million, while France, which makes a contribution of 20 percent of the budget, has cornered ESRO contracts worth about $25 million.

Besides this sensitivity to what national aerospace industries get back in relation to national contributions, there are also differences among ESRO member nations over what they would like to see ESRO doing. Smaller countries with minor space programs of their own in general are enthusiasitc about ESRO's program of launching sounding rockets. France, on the other hand, with the biggest national space program in Europe, would like to see ESRO engaged in larger projects, particularly those which complement French activities. To insure something satisfactory for everybody, ESRO works within the framework of an 8-year program which lays out rough details of both budget and scientific program.

ESRO was established by a convention signed in 1962, which, however, did not go into force until 1964. Under the 1962 agreement the 8-year budget was to be the equivalent of 1509 million French francs (about

*Member states of ESRO and their percentage contributions are as follows: Belgium, 3.72 percent; Denmark, 2.15; France, 20.17; Germany, 24.31; Italy, 11.72; Netherlands, 4.04; Spain, 3.29; Sweden, 4.23; Switzerland, 3.24; United Kingdom, 23.13.

Distribution of total Federal R&D obligations by State, fiscal year 1965



SOURCE: National Science Foundation

R&D DISTRIBUTION: More than three-fifths of the federally financed research and development in 1965 was performed by industrial firms. Colleges and universities performed only 8 percent. The statistics are contained in a new NSF study, *Geographic Distribution of Federal Funds for Research and Development, Fiscal Year 1965*. According to the report, R&D expenditures by eight federal agencies totaled $14.4 billion, exclusive of facilities and equipment, which was 98 percent of the total 1965 federal R&D expenditure. The only previous year for which complete R&D data are available is 1963. The report indicates that between 1963 and 1965 federal R&D obligations rose 17 percent. There was "relatively little change in the distribution among geographic divisions," the report states, "but substantial changes in distribution to a number of the States, particularly those with lower dollar volumes." In 1965, almost 32 percent of the R&D total went to California. New York was second with 9 percent. By regions, the Pacific Coast received 34 percent of the total, while the next two divisions, the Middle and South Atlantic, received about 15 percent each. The federal agencies obligating the most R&D funds were the Department of Defense and the National Aeronautics and Space Administration. Other agencies included in the report were the departments of Agriculture, Commerce, Interior, and Health, Education, and Welfare, and the Atomic Energy Commission and NSF. Copies of the report are available from the U.S. Government Printing Office, Washington, D.C., at $1 each.

$300 million) at 1962 prices. The ESRO council was empowered to adjust these figures in response to major scientific or technical developments, but these adjustments must be accepted unanimously, and unanimity has been in short supply at ESRO.

ESRO is now passing through a period when expenditures have been particularly heavy for capital investment in buildings and equipment for the organization's five main research installations. These are the European Space Technology Center (ESTEC) and the European Space Research Laboratory, both at Noordwijk, Holland; the European Space Data Center at Darmstadt, West Germany; the European Space Research Institute at Frascati, Italy; and the European Sounding Rocket Launching Range near Kiruna, Sweden.

ESTEC is by far the largest of these installations, with a staff of 456, or nearly half the total ESRO staff, which is scheduled to reach 1000 by the end of 1967. ESTEC is responsible for applied research work and for studying and developing payloads for sounding rockets and spacecraft.

ESRO has also established a satellite tracking, telemetry, and telecommand network with four stations—Redu, Belgium; Fairbanks, Alaska; Ny Alesund, Spitzbergen; and Port Stanley in the Falkland Islands. ESRO also has use of the French network.

ESRO's 8-year grand design called for the launching of 300 sounding rockets and ten to 12 satellites, the latter at the rate of two or three a year, starting with the current year. In both categories, however, ESRO has fallen behind the projected pace.

It seems evident that the contem-

plated number of satellites will not be flown. And primarily because of budget problems, a midstream appraisal of the 8-year program and its funding is in progress. The cynosure is the Large Astronomical Satellite (LAS). LAS is planned as a satellite, mounting a telescope, equipped to do high-resolution spectroscopy in space and other experiments as well. Cost of the total project, by a recent estimate, could be as high as $170 million, which in the eyes of some makes it too costly for ESRO under current circumstances.

Adjustment of the ESRO budget was one subject of discussion at the Rome meeting of the European Space Conference in July. The conference is now a permanent body with membership open to any nation which belongs to ESRO, ELDO, or CETS. A prime reason for the formation of the conference is a wide and growing conviction that Europe must find a way to coordinate space policy. There were hopes, prior to the meeting, that some sort of unification of space organizations would be achieved at Rome, but it was decided that amalgamation was, at this point, impractical.

The major outcome of the meeting was appointment of the committee, referred to above, which was commissioned "to frame proposals for the establishment of a European space policy" and to report at the end of the year. The committee is headed by the highly respected Jean-Pierre Causse, head of the major French space research laboratory outside Paris.

With the fate of LAS in doubt, many ESRO partisans are perturbed because they feel that a big project is needed if ESRO is to maintain its momentum. The organization has had good results with its sounding rocket program, and in the first launching of an ESRO satellite (ESRO II) last spring the payload functioned well, although the shot was marred by the failure of an upper stage of the NASA-launched and usually reliable Scout rocket. But with decisions on the budget and on the future of LAS hinging on the Causse committee report, ESRO is nagged by uncertainty.

Some questions about the future role of ESRO also need to be answered. ESRO until now has been primarily an agency providing technical services and support for university scientists who prepare actual experiments. As experiments grow more complex, more work will be done in ESRO labs and by industry. And there is also the question of applications. ESRO was asked by the satellite communications conference (CETS) to make a study on how a satellite applications program should be organized. That report was submitted, and CETS then asked ESRO to work out the details. If ESRO were asked to carry out the resulting R & D program, this would add a new dimension to its tasks, to the probable pleasure of the ESRO engineers and chagrin of at least some of the scientists.

Although ESRO has its troubles, these are certainly not unrelieved. Perhaps the most encouraging development of the last year has been the assumption of responsibility for overall space policy by governmental representatives with ministerial rank. That is what formation of the European Space Conference denotes.

Another boost for morale has been the recent election of Hermann Bondi as director general of ESRO, to succeed Pierre Auger, now in his late sixties. Bondi, professor of mathematics at Kings College, London, and a fellow of the Royal Society, is one of the originators of the steady-state theory of the universe. He has long been interested in international cooperation in science, and observers think his election bodes well for ESRO unity and for the health of its research program.

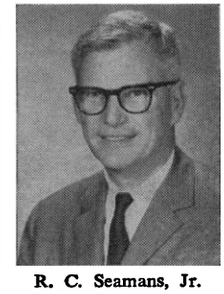
In assessing ESRO's troubles it should be noted that, in international organizations, difficulties—particularly budget difficulties—sometimes appear so serious because they are so public. In national programs, comparable troubles are often quietly adjusted.

A crisis may also have a salutary effect, as the experience of ESRO's near relation ELDO shows. A little more than a year ago there was such a serious dispute over plans and money within ELDO that the British foreign office announced that Britain was pulling out of the organization. ELDO was then engaged in building a launcher with nothing specific in view for it to launch, and the program had developed considerable drift. As a result of the crisis, support levels of the various member countries were changed and the program was altered so that ELDO launchers would be tailored to specific ESRO payloads. ELDO acquired the sense of purpose it had lacked. It may not be too much to hope that ESRO will profit similarly from adversity.

—JOHN WALSH

APPOINTMENTS

H. E. Newell



R. C. Seamans, Jr.

Homer E. Newell, associate administrator for space science and applications, NASA, to associate administrator of NASA, filling the position that has been vacant since December 1965, when **Robert C. Seamans, Jr.**, was promoted to deputy administrator on the death of Hugh Dryden. Seamans recently announced that he is resigning the position of deputy administrator to return to private life, effective 1 January. **Edgar M. Cortwright**, deputy associate administrator for space science and applications, has undertaken the position of acting associate administrator for space science and applications, until a replacement for Newell is named. No replacement has yet been named for Seamans. . . . **John J. Pruis**, vice president of Western Michigan University, to president of Ball State University. He will succeed **John R. Emens**, who is to retire. . . . **A. Curtis True**, director of clinical research, medical research division, The Squibb Institute for Medical Research, to associate director of the Institute, and director of the medical research division. . . . **Robert K. Quinnell**, supervisor of the aerospace medicine program, Office of the Air Force Surgeon General, to director, Office of Medical Relations, Pharmaceutical Manufacturers Association. . . . **Loy L. Sammet**, director, Giannini Foundation of Agricultural Economics and chairman of the department of agricultural economics, University of California, Berkeley, to vice chancellor-research on the Berkeley campus. . . . Brigadier General **Richard M. Scott**, USAF, chief, Nuclear Plans Section, SHAPE Headquarters, Paris, to deputy assistant to the Secretary of Defense (Atomic Energy). . . . **Ronald S. Rivlin**, L. Herbert Ballow University Professor, Brown University, to director, Center for the Application of Mathematics, and Centennial University Professor, Lehigh University.