such places, and in fairly large numbers they expressed the view that federal policies guarantee that the rich get richer. H. B. Blodgett, dean of engineering at the University of Nevada, stated, "Good or bad, graduate students are being bought today and the better prospects are going to the highest bidders. If the government is to provide more assistantships, more attention should be given to the smaller schools desiring to improve their graduate capabilities. The 'name' places seem 'fat' enough."

A similar view was expressed by a Midwest mathematics department chairman who chose not to be quoted by name: "Most or many of the NSF fellows go to the 'big' name schools, so schools such as ——— never see such students."

Many who offered complaints along these lines recommended that fellowships be awarded directly by the universities, rather than by the federal agencies where they originate. The trend, incidentally, is actually in this direction, since federal agencies are now responding to the smaller schools' complaints that fellowship recipients who can choose their school are flocking to the prestige institutions and ignoring worthy but less known places. The space agency, for example, is distributing 880 fellowships this year, all of which will be tied to particular institutions, many of them on the small and less-well-known side.

Other representative statements were as follows.

H. C. Thomas, chairman of the physics department, Texas Technological College: "about the only ones we have who should go on [to graduate training] and do not . . . [are those] . . . who want to make some money or have financial obligations they cannot meet if they go to graduate school. I think it is unlikely that a graduate fellowship can or should provide a stipend comparable to what the B.S. could make if he went to work. I, therefore, am forced to believe that the place at which financial help would produce the greatest results would be at the undergraduate level. This would entail the provision for more and better teachers and for more financial assistance to the undergraduates."

G. M. Almy, associate head, department of physics, University of Illinois: "it is my impression . . . that when the cream of the entering group [at Illinois] has been awarded fellowships, the group accepting teaching assistantships is of somewhat lower quality in undergraduate academic performance and in their graduate work than the teaching assistants of six or eight years ago. . . . I think it is safe to say that we are not getting graduate students of the Ph.D. caliber in proportion to the greatly increased number of applicants."

J. B. Hart, chairman of the physics department at Xavier University: "The fellowship program should be extended to universities which offer only a master's program. More assistance should be given to those *undergraduate* departments which wish to improve the quality of their product. Why increase production at the graduate level when the raw material is not what it should be?"

Lamar Field, chairman of the chemistry department, Vanderbilt University: "Permit more teaching by NDEA, NSF, NASA, etc. fellows. These are now *discouraged* [from teaching] and represent those most able to reach and inspire undergraduates. Moreover, many of these present fellowships make it difficult for the smaller schools to compete for excellent graduate assistants."

P. Kusch, chairman of the physics department, Columbia University: "The current emphasis on encouraging students to undertake careers in science, of which the increased availability of fellowships is a symptom, has brought to graduate school an increased number of students neither temperamentally nor intellectually equipped for graduate study in science.

"It is my opinion that the college graduates with the greatest promise of productive careers in science had highly superior secondary school training. Corollary: Select high schools for boys and girls of exceptional promise. Offer strong inducements to people of ability to make a career of teaching in such institutions. Attempt to improve science teaching in liberal arts colleges. I think that potential talent is not discovered, encouraged and adequately trained in large numbers of independent liberal arts colleges."

Finally there was one questionnaire that went astray and ended up in the physical education department of a large southwestern university. The chairman replied that fellowships in his field were "definitely not" in adequate supply, and offered the view that "physical education should be included in the federal scholarship program."—D. S. GREENBERG

R&D: Ill-Starred Nuclear Plane Project Is Subject of Hard Look by General Accounting Office

A post mortem on the nuclear-powered aircraft program, which was canceled by Presidential order in 1961 after 15 years and $1 billion had gone into the work, has opportunely appeared at a time when the TFX affair has centered public attention on federal procurement policies and management of research.

The review of the so-called ANP (Aircraft Nuclear Propulsion) project was carried out by the General Accounting Office, the auditing arm of the legislative branch, which was created by Congress to keep tabs on how the money the legislators appropriate is spent. Although much of the material in the GAO's review of the Joint Atomic Energy Commission–Department of Defense project has appeared before in Congressional hearings and committee reports, the new study, with its detailed chronology and allocation of blame in unemotional auditor's terms, makes a useful primer of how not to conduct an R&D project. (A copy of the report, *Review of the Manned Aircraft Nuclear Propulsion Program*, can be obtained for $1 from the Accounting and Auditing Library, General Accounting Office, 441 G St., N.W., Washington 25.)

The GAO review says that the ANP project suffered severely over the years from changes in emphasis and direction in the program. Sternest criticism, perhaps, is directed at the Department of Defense and the Air Force for failing to furnish "sufficient and timely guidance to those responsible for carrying out the ANP program." The record shows, for example, that an AEC request in 1948 to DOD for its views on the military worth of a nuclear-powered plane did not receive a reply until 1951, and then only under pressure.

The report goes on to relate how facilities costing more than $17 million were built but not used, or little used, and how expensive design and related work was wasted. The GAO says also that cost data obtained from prime contractors was unsatisfactory and that unallowable costs were charged to contracts.

The veering course which the project took and its failure to pay off in a prototype plane or engine brought it under constant scrutiny from Congress and the Executive, and it was sub-

jected to a program review no less than 13 times in the last 6 years of its life. People familiar with the program in this period say these studies tended to turn into reviews of earlier reviews and to produce recommendations which were not put into effect.

GAO's major recommendation for future projects like ANP is for one agency to obtain congressional authorization for the cost of the project, since this would eliminate the problems inherent in dual control and "facilitate Congressional review and strengthen Congressional control."

Though many persons in Congress and the agencies remained convinced of the feasibility and value of the ANP —Congressman Mel Price (Democrat of Illinois)is perhaps the best known of its advocates—the absence of visible results lost the project many supporters in Congress, and in March 1961, shortly after President Kennedy took office, he asked Congress to terminate the ANP program because he said "the possibility of achieving a militarily useful aircraft in the foreseeable future is still very remote."

Congress complied with the President's request, the project disappeared from the budget, and the work was transferred to the AEC budget as a nondefense research item.

AEC officials say that many of the lessons learned in the work on ANP, particularly in reactor development and materials research, have proved valuable in the joint AEC-NASA work on the nuclear space program, which has a budget of about $400 million for fiscal year 1963. No agency now is working on a nuclear-powered aircraft project.

The GAO study centers on the administrative aspects of the ANP program and does not delve deeply into matters of policy, which is quite natural in an organization concerned with Executive agency fiscal operations and scrupulous never to intrude in areas where its employers, Congress, may be directly involved.

The review does, however, make the essential point that the ANP project was in competition with other defense systems, including missiles, and that over the past 15 years the project had suffered the common fate of manned aircraft—the shift in emphasis to missiles.

The project's ultimately fatal flaw was the failure to solve the central problem of developing a small, light, high-powered, adequated shielded reactor, and Secretary of Defense Robert McNamara last week underlined the point when he told the defense procurement subcommittee of the Joint Economic Committee that too much time and money was spent on an airplane and not enough on a reactor.

In retrospect, the ANP decision seems to have been an early example, and perhaps a classic one, of the application of Secretary McNamara's "cost effectiveness" analysis of major research and development programs—that combination of technological, strategic, and budgetary considerations which Congress and the defense contractors are now suspiciously appraising.—JOHN WALSH

AEC: Energetic Bargaining Brings Agreement on University Contract Clauses on Security, Information

Inherent in the patron-protégé relationship created by government sponsorship of university research is the possibility that a sponsoring agency's conception of national security will conflict with a university's idea of academic freedom. Such a conflict seems to have been reconciled recently in protracted negotiations between the Atomic Energy Commission and certain universities which operate big research installations financed and supported by the AEC but at which only nonsecret research is carried on.

Focus of the disagreement, in which Harvard University emerged as the AEC's chief antagonist, was the small print in AEC contracts which set regulations on employment and visits of aliens and Soviet bloc nationals and on exchanges of data between those employed at the AEC-supported installations and Soviet bloc scientists.

The matter came to public notice last month in newspaper stories describing differences which delayed negotiation of a new contract to operate the $12 million Cambridge Electron Accelerator located at Harvard and operated jointly by Harvard and M.I.T. However, other universities, notably Princeton, which operates major AEC-supported labs, and Stanford, which is building a 2-mile-long linear accelerator under a $114 million AEC contract, also raised objections to AEC proposals to standardize and refine its security regulations on foreign personnel and on information exchanges.

There is a feeling, not uncommon within the universities, that the AEC, which has responsibility for development of both military and peaceful uses of nuclear energy, is conditioned to a secrecy-mindedness that sometimes extends to areas of research where secrecy is unnecessary.

The AEC's concern for security is obviously proper where weapons research and development is going on, as at the national laboratories at Livermore and Los Alamos, and it also appears true that the agency has been striving over the years to work out policies appropriate to its split personality. An increasing proportion of the AEC budget is going into civilian applications, and a systematic attempt is made to declassify research information which cannot be construed as containing military secrets. The AEC also supports a large nonmilitary research program in which universities and other nonprofit institutions, as well as industry, participate as contractors.

The fiscal 1963 budget calls for $183 million for research in the physical sciences and $69 million in biology and medicine. A great many of these projects have no more strings attached than do grants and contracts for similar projects from, say, the National Science Foundation or the National Institutes of Health. In the case of large AEC-financed installations like the Cambridge accelerator, however, the AEC appears to feel the need of more formal safeguards against the loss of security-sensitive information about either research equipment or techniques or in the form of data.

Harvard, for its part, has been among the most militant in resisting contractual arrangements with federal agencies which, in Harvard's view, would compromise the universities' financial independence or allow the intrusion of federal control in peacetime. Harvard, for example, follows a rule of not accepting classified research projects. It was prominent among the universities and colleges which stayed out of the undergraduate loan program of the National Defense Education Act until the loyalty disclaimer affidavit was repealed. And Harvard has also made it a policy not to pay any portion of permanent faculty salaries out of federal project funds, a practice in which many universities less richly endowed than Harvard are compelled to indulge.

The difficulties over the Cambridge accelerator contract arose more than a year ago while the AEC was in the process of standardizing contract reg-