

surrounding the shuttle project is, however, made more difficult by the fact that NASA has staked its future on the project at the expense of cuts elsewhere, for example, in the Nerva nuclear rocket development and in its failure to provide back up vehicles for expensive projects such as the orbiting astronomical telescope and the Mariner missions.

The chief argument put forward by the FAS against the shuttle is that it will not do sufficient business to achieve the economic savings that its supporters claim. Each launch by the shuttle is expected to cost between eight and ten million dollars above the research and development costs, compared with about \$20 million for a launch with the Titan system. Since development is estimated to cost in the region of \$9–10 thousand million between now and 1978, and a further \$4–6 thousand million between 1978 and 1990, only a high level of use will result in cost savings. Dale Myers, Associate Administrator for Manned Space Flight, testifying before the Senate Committee on Aeronautical and Space Sciences, estimated a ten per cent return on investment at a launch rate of about forty a year—sufficient to put a thousand tons into orbit. Pointing out that in 1969 and 1970 the United States launched less than fifty tons of unmanned equipment and 200 tons of manned vehicles, the FAS study emphasizes that by 1990 the unmanned launch rate would be less than 250 tons a year—short by a factor of five of the minimum economical capacity of the shuttle. "Such a programme with presently developed rockets would certainly cost more than shuttle operation," the FAS study concedes, but "that bookkeeping saving is swamped by a heavy development cost to be regained, more than \$0.7 thousand million per year, spread over the period 1978–1990".

The FAS study therefore concludes that the shuttle is justifiable only by a plan for substantial manned space flights in a programme several times larger than the Apollo programme in terms of tons orbited per year. If that is indeed the case, "no one has given any convincing rationale for what man can do in space, for peaceful or for military purposes, which cannot be done more cheaply and with less human risk by instruments, at least near Earth and within the next 20 years," the FAS retorts.

If the FAS had opened hostilities against the shuttle a few weeks earlier, its report might conceivably have had more impact on the appropriations for the project next year, but now NASA's budget has already gone through the House and the Senate. The Administration originally set aside \$100 million for development of the shuttle in 1972, but the authorization agreed by the

Senate early in July gave the shuttle project \$137 million in spite of an attempt by Senator Walter F. Mondale to delete all appropriations for the programme. In the event, the Senate agreed to the shuttle project by a 64–22 vote. In future years, however, budget appropriations for the shuttle will be a more tempting target for, as the FAS points out, this year's spending "is the thin edge of the wedge which will widen eighty-fold by 1978".

One of the factors which may have led to the sanction for the shuttle in Congress is the prospect of more unemployment in the aerospace industry if it were scrapped. Asked whether this factor was considered by the FAS, Professor Philip Morrison from MIT, who chaired the committee which produced the report, said that such considerations were not within his brief, and that, in any case, unemployment in the aerospace industry is to be the subject of a separate study by the FAS. He added that it does not seem sensible to justify such a project solely on the grounds that it would create unemployment if it were scrapped. One part of the post-Apollo project, the space tug, planned to drag payloads from low to high orbits, could bear closer scrutiny, Morrison suggested. So far, the tug has been considered only in relation to the shuttle, but he suggested that it should be considered on its own merits, for it seems to have advantages for commercial use.

HERBICIDES

2,4,5-T Report Attacked

from our Washington Correspondent

THE report of a scientific advisory panel on 2,4,5-T which recommended in May this year that the herbicide should be restored to full use pending further analysis of the health hazards has come under fire from several quarters. The report, which is not meant to be public knowledge until William D. Ruckelshaus, administrator of the Environmental Protection Agency, has pronounced on its recommendations, was attacked last week at a press conference organized by the Committee for Environmental Information (CEI). One of the chief grumbles at the report is that because it has been kept secret, its conclusions cannot be challenged easily by the scientific community, which is relying at present on bootlegged copies circulating illicitly.

The Committee for Environmental Information criticizes the report on five main counts. First, the advisory committee accepts that there is a "no-effect dosage" at which 2,4,5-T has no effect on test animals. But the CEI points out that to obtain a statistically significant result in experiments de-

signed to screen for effects that may be experienced by only a very small percentage of the population would require tests on a sample and control group of several thousand animals. And even then, it would be difficult to isolate any effects caused by 2,4,5-T from background "noise" from other teratogens. The CEI therefore concludes that there is no evidence "which would indicate that low levels of 2,4,5-T are innocuous to animals". Second, the statement points out that there is little evidence that 2,4,5-T breaks down in the environment. Third, dioxin contaminants in the herbicide may accumulate in the soil, and there are no analytical techniques sensitive enough to detect toxic amounts of dioxin. Fourth, the advisory committee implied that since there is no concrete proof that the use of 2,4,5-T in Vietnam is correlated with increased incidence of human birth defects, that no correlation exists. And fifth, the Committee for Environmental Information takes the advisory committee to task for not attempting to consider the benefits of using 2,4,5-T in regard to the hazards associated with its use.

The CEI statement was also supported by Barry Commoner (Chairman, Scientists' Institute for Public Information), John T. Edsall (Harvard), Samuel Epstein (Children's Cancer Research Foundation), Arthur Galston (Yale), Michael Prival (Union of Concerned Scientists), Jeremy Stone (Federation of American Scientists), and Harrison Wellford (Center for the Study of Responsive Law).

Short Note

by our Washington Correspondent

Medical Training

Two bills designed to increase the funding for medical training were passed last week by the Senate. One asks for expenditure of \$5.9 thousand million over the next five years for the training of doctors, and the other seeks to provide an extra \$1.1 thousand million for training of nurses. Both were approved unanimously, and were sent to a conference committee between the House and the Senate, where they will be considered together with similar bills which went through the House the previous week. There is little difference in philosophy between the House and Senate versions, but there is considerable difference in the amount of money requested. The House bill asks for \$2.8 thousand million to be spent over the next three years, and only \$710 million for the training of nurses. It seems that neither the Senate version of the bill nor the House version will be opposed by the Administration.