the United States by the Geological Survey and the Bureau of Mines. The BRDC would also include two of the smaller facilities in the Ministry—the Hydraulics Research Station and the Forest Products Research Laboratory. Finally, it would absorb the National Research Development Corporation, which the government set up in 1949 to help promote the commercial exploitation of new inventions and processes. The Royal Aircraft Establishment and other aerospace facilities comprise a major portion of the Ministry's research activities, but they were left out of the proposed reorganization on the grounds that they have been reduced in size, are already deeply involved in civil work, and, on the military side, serve as a procurement agency for the armed services. Why these considerations should bar them from membership in the corporation is not clear. But aviation carries a lot of political weight in British political and economic affairs, and the Ministry may have concluded that its plans for reorienting government research toward profitability stand a better chance if they are unencumbered by the peculiarities and influence of the airplane business.

The Ministry, which, through a recent government reorganization, now functions more as a Ministry of Industry than simply as a Ministry of Technology, makes it clear that it is taking a cold-blooded view of the factors that should determine survival in research. Thus, while acknowledging that the government would remain the BRDC's biggest customer, and that straight grants would be the best means of supporting basic research and other activities of uncertain profitability within BRDC, the Ministry comes out, in effect, for letting the users of research determine whether the performers should continue to be supported. Thus, the Green Paper states that "specific tasks or projects for Government departments would be charged at full costs.

A gradual change to a contractual relationship should help to bring about a marked change of attitude within departments, which will have to pay for the work they want done, as well as within the Corporation, which will have to satisfy its customers." To which the paper adds that "it would be a healthy discipline for departments and organizations to have to pay directly for the programs they sponsor."

In regard to work for industry, the proposal links the BRDC even more closely to a marketplace scheme. "It is not possible to estimate exactly how much of such work industry would want," the paper states, "but if a new research and development organization were set up which would live to a growing extent on its earnings from contracts, joint ventures, royalty arrangements, etc., its success in meeting the needs of industry would play a part in determining the eventual level at which it operated."

On the subject of staffing, the paper bows to the Civil Service by recommending that employment conditions with the corporation be comparable to those that now exist in the laboratories. However, it then goes on to state, "The terms and conditions of service of employes recruited after it had been established would be a matter for the Corporation; but it would be important to ensure that staff could transfer readily between the Corporation, industry and other organizations both within and outside the Civil Service"—which, among other things, is another way of saying that the BRDC would not be saddled with the tenure regulations that have impeded past efforts at reorganizing research institutions.

With the Labor Government expected to put on a final legislative surge before the election that must be held sometime within the next year, there is a good chance that the BRDC may come into being. If it does, it will be worth watching, since the situation that inspired the concept is not confined to Britain.—D. S. GREENBERG

Defense: Laird Decentralization Alters Civilian, Military Roles

The Nixon Administration has wrought a fundamental change in the way business is done and decisions are made at the Pentagon. Defense Secretary Melvin R. Laird gives the process a name which sounds, curiously, as if he had borrowed it from the New Left. He calls it "participatory management." Power over the defense dollar is to be returned from the "bosses" in the defense secretariat, where it was concentrated by former Secretary Robert S. McNamara, to the "people." But at the Pentagon, the "people" are the military services, particularly the uniformed staffs of the Army, Navy, and Air Force.

The change has jumbled the Pentagon's bureaucratic pecking order, giving increased power to the military Chiefs of Staff and decreasing the stature of the civilian offices of Systems Analysis and Defense Research and Engineering. Even the military Joint Staff, which coordinates operations and plans for all three services, has diminished importance in the new emphasis on decentralized planning, budgeting, and weapons design. Finally, a new element has been added to the process of setting defense priorities. The National Security Council, a Cabinet-level policy board, now issues guidance on defense strategy and reviews the defense program before it is approved by the President.

New lines of power have not yet solidified. But these Pentagon shifts are worth recording for the obvious reason that, at a proposed level of $71.8 billion for fiscal 1971, defense spending will continue to represent the single largest federal activity and a very significant proportion of the new federal budget of $200.8 billion. (If trust fund expenditures for such programs as Social Security, Medicare, and highway construction are excluded, proposed defense spending represents about 46 percent of the new federal budget.)

The men who control defense budgeting and planning will have a very important voice in the future allocation of national resources. It seems fair to say that the uniformed services will be a great deal less likely than civilian defense analysts to propose the major reorientation and reduction of defense programs advocated by liberals of both major parties. Carrier admirals usually do not question the value of carriers, nor do bomber generals question the value of new bombers.

A shift toward decentralized management at the Pentagon was probably inevitable after McNamara's departure in 1968. The question, on which there is lively debate at the Pentagon, is how far Laird will allow the pendulum to swing. At the extreme pole is the model set by President Eisenhower's first Defense Secretary, Charles E. Wilson, who

is said to have made a decision on competing weapons only once, and on that occasion to have decided to go ahead with both (the Atlas and Thor liquid-fueled intercontinental missile programs of the Air Force). "Engine Charlie" Wilson came to the Pentagon from the highly decentralized corporate world of General Motors. His job, as he saw it, was to get things organized, pick the right people to carry out the missions, and check to make sure they were doing the job right. Defining the defense mission was a different matter, left to military discretion or negotiation among the services. Each service developed its own interpretation of the amorphous "Basic National Security Policy" guidance supplied by the National Security Council. The result was a defense budget dominated by military parochialism and fierce interservice rivalry.

By Eisenhower's second term it was obvious to the Administration and to Congress that the Defense Secretary needed additional staff and legal authority to curb the excesses of the system. The result was the Defense Reorganization Act of 1958, which made possible the subsequent "McNamara revolution" in defense management. The pendulum began to swing toward centralization.

The "McNamara Revolution"

McNamara came to the Pentagon in 1961 from the tightly centralized management structure of Ford. He chose to define the defense mission himself, rather than arbitrate interservice rivalries. To harness the military he introduced budget planning by military function (strategic forces, general purpose forces, airlift and sealift, and so on) instead of by military service. A 5-year budget system known as "planning-programming-budgeting" (PPB) was introduced to give direction to planning. As carrot, McNamara and President Kennedy increased defense spending and told the Joint Chiefs of Staff to draw up their demands without reference to arbitrary budget ceilings. As stick, McNamara created the Office of Systems Analysis under Alain C. Enthoven. Enthoven, an economist, was in his early thirties when assigned this central role in the new system. He built a youthful staff of analysts to help McNamara define the defense mission and to address such questions as, How many bombers do we need, what role should they play, and what are the best characteristics for bombers in such a role? (*Science*, 23 February 1968).

The Systems Analysis office also drew up the basic planning documents which described major defense functions and strategies and dictated military force levels in great detail.

Senior military planners came to dislike heartily Enthoven's "whiz kids," largely because McNamara frequently chose to follow the recommendations of Systems Analysis rather than "experienced military judgment." Enthoven once explained, "I usually win because I understand the way the boss thinks."

The McNamara system introduced a higher degree of rationality into defense planning than had existed previously. The most important result probably was the development of the so-called "strategic model," an analytical system for determining the purpose and structure of the nation's strategic deterrent forces.

Toward the end of the McNamara era the analysts also began to make progress toward redefining the basic requirements for such major defense components as land forces, Air Force and Navy tactical air forces (including carriers) and antisubmarine warfare forces. These subjects, far more than nuclear strategy, involve the basic structure of the military services. The analysts found themselves in frequent, heated collisions with the traditions, prejudices, and logic of the military, particularly the Navy.

To some extent the same friction existed in research and development, notably in connection with the F-111 (TFX). That two-service aircraft project was put together by the Office of Defense Research and Engineering and the Air Force and it was bitterly opposed by the Navy. (The Systems Analysis office, although frequently blamed for the TFX, actually had nothing to do with the launching of the project and, in recent years, strongly favored canceling it.) The Director of Defense Research and Engineering (DDR&E), unlike the other top staff aides to the Defense Secretary, has statutory power to control R & D budgets of the services. Under McNamara's centralized management approach, the DDR&E staff became deeply involved in details of service research projects and weapons development.

By the end of McNamara's tenure the military were in open revolt against the defense secretariat, particularly Systems Analysis. They found allies in Congress who were prepared to make life miserable for any Secretary of Defense who frequently turned down military proposals in favor of alternatives proposed by his civilian staff.

At about the same time the civilian analysts were becoming concerned about several shortcomings of the McNamara system. The lack of fiscal constraints on the military plans sent forward by the services forced the Defense Secretary and his staff to make a lot of relatively minor decisions in putting together a budget. Thus valuable analytical and management time was spent deciding such matters as what kind of engine to put into the Navy's A-7 tactical bomber. A more serious drawback, in the analysts' view, arose from the same lack of fiscal guidelines in the planning process. Since they were not required to plan within fixed budgets, the services found it to their advantage to recommend ever more complex and expensive new weapons systems without indicating how compensating savings could be achieved.

Rising Weapons Costs

For example, the latest nuclear carrier authorized by Congress will cost about twice as much as the last carrier delivered to the fleet, the oil-burning *John F. Kennedy*, commissioned in 1968. New Navy and Air Force "air superiority" fighters, the F-14 and F-15, will cost three to four times as much as the aircraft they replace. These are not isolated examples, according to defense officials. The result was a continual increase in the complexity and cost of the armed forces, and continual pressure for increases in defense spending. The analysts frequently argued that simpler, less costly weapons would provide as much effectiveness, or that the military were exaggerating the mission requirements and expected benefits of new weaponry. But after McNamara left they found it increasingly difficult to win their case. They came to the conclusion that the military services should be required to plan their forces and their new weapons within fixed budget ceilings. "Fiscal responsibility," they hoped, would curb the military penchant for "gold plating" new weapons.

The Joint Chiefs of Staff (JCS), meanwhile, wanted to gain a more positive control over the basic job of setting defense priorities. The military hoped the new Republican Administration would be responsive to their demands. Some officers wanted the Office of Systems Analysis abolished or at least relegated to a subordinate role. In the midst of the dispute over defense

management, the House Armed Services Committee last year proposed to eliminate the Defense Secretary's authority to appoint an Assistant Secretary of Defense for Systems Analysis.

Laird Approach Emerges

The management and bureaucratic power issues were thrashed out in a series of meetings last spring and summer between Laird, his deputy, David Packard, the Chiefs of Staff, the service secretaries and the assistant secretaries of defense. The Joint Chiefs won the right to initiate military force plans. The post of Assistant Secretary for Systems Analysis was retained, but its function was drastically altered. Instead of drawing up the basic documents of the military program, Systems Analysis in the future will review military strategy and program proposals forwarded to the Secretary of Defense by the Joint Chiefs of Staff and the military departments. Also it will issue "fiscal guidance" specifying how much each service may plan to spend in each of the functional defense program areas: strategic forces, tactical air forces, and so on.

When the services submit their detailed recommendations to the Secretary, Systems Analysis may comment or make alternative proposals. These, however, are frankly regarded by Laird as "devil's advocacy." Last year challenges raised by Systems Analysis had relatively little impact on the fiscal 1971 budget proposals, which basically followed military recommendations.

(For example, it was widely reported last year that Systems Analysis had opposed the following weapons systems, for which provision is made in the fiscal 1971 budget: the B-1A strategic bomber, also known as AMSA; the F-111; the F-14 Navy fighter with its associated Phoenix missile; the F-15 Air Force fighter; a new nuclear-powered aircraft carrier; the S-3, a new carrier-based antisubmarine warfare aircraft; and the entire antisubmarine warfare carrier force.)

Throughout the transitional period of 1969 the acting head of the systems analysis office was Ivan Selin, 32, an electrical engineer and mathematician, who formerly served Enthoven as deputy for strategic systems. But Selin came to realize that lingering resentment of the "whiz kids" in Congress and the military made it difficult for him to continue in the job. He resigned, effective 31 January, to set up a consulting firm. His successor is Gardiner L. Tucker, 44, who was the principal deputy director of defense engineering and research. A physicist, Tucker previously served as Director of Research for International Business Machines.

On 21 January the Pentagon announced that the functions of DDR&E would also be changed "in line with the participatory management philosophy of the Secretary of Defense." In the future, most research and weapons projects are expected to originate in the military services, subject to broad policy and fiscal "guidance" from DDR&E. The amount of monitoring by the DDR&E staff will be sharply reduced.

Military officers directing development projects will be held more directly accountable for costs, performance, and schedules. The direct chain of command for project managers has been drastically shortened, bypassing, for example, direct supervision by DDR&E as well as by various staffs in the military departments.

The important questions about the new management style at the Pentagon are these: Will controlling and reducing defense spending become easier or more difficult in coming years as a result of the changes? And will the system encourage the most effective and balanced use of defense resources?

Many senior defense officials who have served both Laird and McNamara say the new management system is an improvement that retains the best features of the McNamara revolution while giving the military a more responsible role. "McNamara forced the services to learn systems analysis and cost-effectiveness techniques. That's why they are now in a position to take on a larger role in defense planning and budgeting," one official said recently.

Others, more pessimistic, believe Laird has no real interest in the analytical approach to defense planning and is unlikely to challenge priorities set by the military. They say he sees his job as one of getting the most money for defense that the fiscal and political situations permit, dividing it among the services, and keeping friction to a minimum. "If the Navy, to keep 15 carriers afloat, decides to reduce flying hours, ship maintenance, and logistical backup, that's the Navy's prerogative, in Laird's view," said one analyst. Others described the fiscal 1971 budget process as "pure Charlie Wilson."

But the optimists argue that it is unfair to judge Laird's qualities as a defense architect on the experience of 1969 alone. There will be more time for consideration of the major post-Vietnam defense issues in the coming year, they say.

There are two other forces at work which lend credence to the view that the next defense budget may be considerably smaller. One is the Administration's work on alternative national strategies and defense programs. This study, started early last year, draws heavily on the office of Systems Analysis at the Pentagon, on the National Security Council staff at the White House, and on the State Department, for its analytical work. More important, it is integrated with planning done by domestic affairs advisers to the President in order to show roughly what additional domestic options are gained or lost by swings in defense spending.

The second force is Congress, which has become increasingly aware of the salient defense issues. In the last 2 years a number of publications have aired the recommendations of Defense Department "insiders" and former officials for reducing defense spending. Political pressure to carry out these recommendations is likely to increase in the coming year.

In taking a more skeptical approach to defense questions, both the Administration and Congress have drawn upon intellectual capital accumulated by McNamara's "whiz kids." So while the Pentagon power balance is shifting, politicians on the other side of the Potomac are in a better position than ever before to challenge the traditional military view that reducing defense spending necessarily reduces national security.—ANDREW HAMILTON

RECENT DEATHS

Horace R. Cayton, 66; sociologist, University of California, Berkeley; 22 January.

Austin C. Cleveland, 80; former professor of psychology; Oklahoma City University; 19 January.

Richard Evans, 67; former professor of botany, University of Wisconsin; 20 January.

Donald E. Flieder, 45; professor of oral medicine, Marquette University; 15 January.

Francis C. Frary, 85; former director of research, Aluminum Company of America; 4 February.