

The NAS-NRC report, which is slightly over two typewritten pages, is addressed from Norman to Seitz. Following an introduction that notes that the members of the review body "did not function as a committee in the usual sense because of the time constraints that were imposed," the Norman letter states,

"The consensus of the reviewers can be expressed as follows:

"1) Midwest Research Institute has

done a creditable job of collecting, correctly abstracting and citing much of the relevant published information, although, under the circumstances, the report could not be expected to cover in a truly comprehensive way so vast a literature.

"2) Of necessity, the preponderance of the material deals with herbicides as they are used in vegetation management in a diversity of situations and environments. On this general topic, abundant

data are available. However the scientific literature provides markedly less factual information on the ecological consequences of herbicide use and particularly of repeated or heavy herbicide application. The Midwest Research Institute report correctly reflects this disparity."

Thus, the inquiry inspired by the AAAS resolution of December 1966 is proceeding with all deliberate—speed?

—D. S. GREENBERG

The McNamara Legacy: A Revealing Case History—Death of the B-70

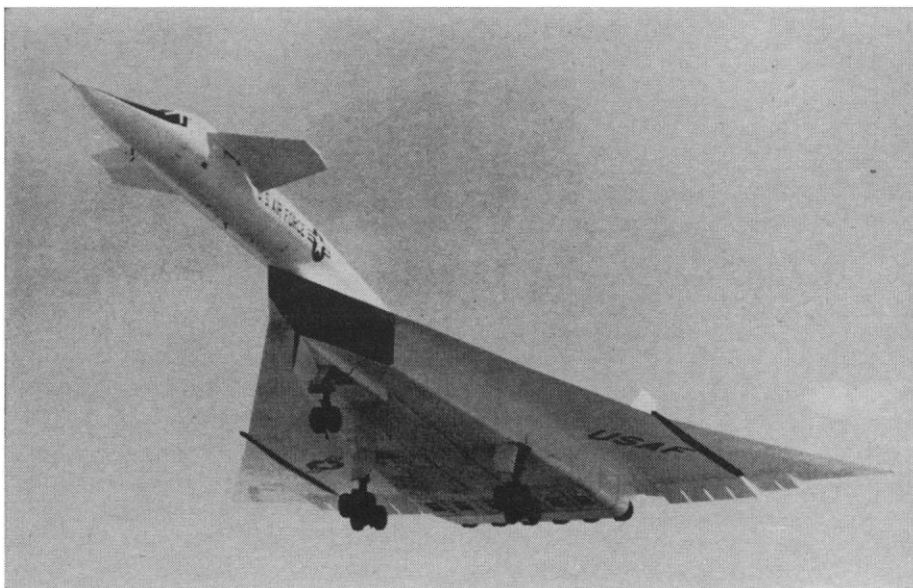
Most assessments of Secretary of Defense Robert S. McNamara's 7-year regime as master of the Pentagon will acknowledge that McNamara, who leaves office on 29 February, has insisted on great new rigor in the analysis of strategic requirements and weapons development. Moreover, he usually has stood firm on the results of such analysis even in the face of political pressures to do otherwise. His performance in this regard can be illustrated by a brief review of the costly and once much-debated B-70 bomber project, which, by coincidence, enters its final phase just as McNamara leaves office.

The B-70 program, conceived in the early 1950's, had run up expenditures and obligations of about \$800 million before McNamara took office in January 1961. While roughly another \$700 million was spent on it after he came to the Pentagon, McNamara reoriented the project from the goal of producing a \$10-billion fleet of supersonic bombers to that of building a few experimental aircraft, dubbed the XB-70. If, instead of the reorientation, McNamara had abruptly canceled the entire B-70 program (provided this had been politically possible), the close-out costs would still have pushed the total investment in the B-70 to well over \$1 billion. Moreover, such an action would have meant there would not be even a research vehicle to show for the large outlay of money and technical resources.

Two XB-70's were finally built, by North American Aviation, Inc., the contractor for the airframe, and the General Electric Company, the contractor for the engines. As the result of this production effort and the earlier R & D activities associated with the bomber project, some 1000 patent applications have been filed, mostly for small incremental improvements in various aircraft and electronic technologies.

Though designed to fly at the 2000-mile-per-hour speed and 70,000-foot altitude contemplated for the bomber, the XB-70 was not outfitted with the navigation system, the reconnaissance radar, and the other elaborate electronics equipment required for attack missions. This aircraft's most notable achievement has been to show that a plane of its size is capable of sustained Mach-3 flight.

If scarcely worth the huge expenditures the B-70 program has entailed, the XB-70 for the past 3½ years has been producing useful information on the performance and flight characteristics of large airframes at supersonic speeds and on the sonic booms they produce. This information has some relevance for the commercial super-



The XB-70, believed to be the world's largest experimental aircraft, is 189 feet long, has a 105-foot wingspan, and, fully loaded, weighs more than 500,000 pounds. This Mach-3 plane, based at the Flight Test Center at Edwards Air Force Base, California, since its first flight in 1964, will be retired at the end of the year. Although its fate is undecided, the aircraft may remain at Edwards as a symbol of the Test Flight Center's mission, or be flown to Wright-Patterson Air Force Base, Dayton, Ohio, to become an exhibit at the Air Force Museum.

sonic transport project, although in most respects the XB-70 and the SST are quite dissimilar.

One of the XB-70 aircraft, the better of the two, crashed in June 1966, in ignominious circumstances. This plane and a smaller aircraft collided while flying in formation to allow the General Electric Company to take photographs for public relations purposes. For the past year, research with the surviving XB-70 has been under the management of the National Aeronautics and Space Administration. Now nearing a point where the additional research data it produces are of marginal value, the aircraft will be retired at the end of 1968.

The B-70 project, in its early phases, provides a classic example of failure to analyze rigorously the concept of the mission to be performed and the state of the technology the mission requires. The project's history also illustrates the political weight which a military service and its supporters and cheerleaders in Congress sometimes can throw behind undertakings of little discernible merit.

Secretary McNamara was not the first to question the value of the B-70, but he, backed by President Kennedy, was the first to defy Congress and refuse to proceed with development of this weapons system. In 1960 the Eisenhower administration concluded that

the B-70 program should be limited to the production of two prototype aircraft. But Congress called for the development of an operational bomber fleet and appropriated funds accordingly. In his fiscal 1962 budget, submitted to Congress just before he left office, President Eisenhower capitulated on this issue and provided for the B-70's continued development toward operational status.

McNamara, however, in the revised defense budget submitted to Congress in the spring of 1961, refused to go along with this plan. He limited the project goals to the testing of the technical feasibility of the B-70's structure and configuration, plus that of certain subsystems. Congress again insisted on development of a complete, operational weapons system and appropriated far more money than McNamara was willing to spend.

Thus was the stage set for the big battle over the B-70 in 1962, although by then the bomber had been rechristened the RS-70. The Air Force, realizing that in an era of increasingly sophisticated weaponry there was no place for a new strategic aircraft carrying free-fall bombs, had redefined the bomber's mission. Now emphasized was the plane's potential as a "reconnaissance-strike" aircraft which, following a missile attack on the enemy, could survey the damage and hit major untouched targets with its own missiles.

The House Armed Services Committee, under its then chairman, Representative Carl Vinson of Georgia, was the congressional body most determined to force the administration's hand and to require that an operational bomber be built. In an effort to persuade Vinson and others in Congress of the folly of a full RS-70 development, McNamara submitted to them a statement concerning the proposed aircraft's "cost-effectiveness."

In part, the statement reflected the fact that, under McNamara's regime, all strategic programs were for the first time being systematically reviewed and compared from the standpoint of their value for meeting the nation's strategic objectives. No longer were the Air Force, the Army, and the Navy to be left to plan separately, each for its own kind of nuclear war. To be sure, the idea of a unified approach to defense planning had been around for a long time, but it remained for McNamara to implement it effectively.

For example, studies by the Secre-

Chicago Group Seeks To Sever IDA Tie

A faculty committee has recommended that the University of Chicago terminate its association with the Institute for Defense Analyses (IDA), a "think tank" that prepares studies on matters of national security for the Defense Department and other government agencies. If the recommendation is endorsed by the Council of the University Senate, the faculty's main decision-making body, and then approved by the university trustees, Chicago will become the first of 12 member universities to pull out of IDA. The issue of IDA affiliation is also under faculty scrutiny at Princeton, and Students for a Democratic Society (SDS), a left-wing activist organization, is campaigning to drive IDA off all 12 member campuses.

The students are particularly critical of IDA's role in military matters and the Vietnam war, but the five-man Chicago committee, headed by Julian R. Goldsmith, chairman of the geophysical sciences department, made "no moral judgment on the work of IDA." Instead, it argued for disaffiliation on the grounds that there is "no real interaction between the University of Chicago and IDA," since the university's representative on IDA's board of trustees and various faculty members who have served as consultants to IDA "have acted as individuals" rather than as "real" agents of the university. The trustee, for example, does not report to the university, nor is he advised by the faculty or staff. "The university-IDA relationship appears to us to be an anomaly," the committee said, "and our membership might best be described as a legal fiction."

The committee argued that "affiliation with other organizations should be mutually beneficial and produce direct interactions that broaden the university's function of research and teaching." The committee also found it "difficult for us to picture the University playing either a guiding or a restraining role in a situation where the University doesn't have any real knowledge of what IDA is doing." Many members of the faculty were not even aware of the university's participation in IDA until the issue was raised by SDS.

The Goldsmith committee's report deliberately refrained from recommendations that would limit "the freedom of individual faculty members to participate in IDA, or in fact to lend their abilities to any agency concerned with national problems, be it civil or military." Nor did the report recommend that the university representative, A. Adrian Albert, dean of the division of physical sciences, resign from IDA's board of trustees. Albert told Chicago newsmen he intends to continue as a trustee even if the Goldsmith committee's recommendations are adopted.—P.M.B.

tary's systems analysts showed that, even if an RS-70 could be developed, the need for it was questionable when cheaper, less vulnerable, and more effective strategic missile systems were available. Even the existing B-52 bomber offered certain major advantages over the RS-70. For instance, in periods of rising tension the B-52 would be far easier to keep airborne, and thus safe from surprise attack, because of its lower fuel consumption and cheaper maintenance.

Moreover, by flying in low beneath enemy radar, the subsonic B-52 might have a better chance to escape ground-to-air missiles than the high-flying supersonic RS-70 would. The higher the RS-70 flew, the earlier it would be detected by radar and become a target for enemy ground defenses. While the RS-70's performance goals were glamorous, it was clear that nobody in the Air Force had bothered to subject them to thorough cost-effectiveness analysis.

A major advantage claimed for the RS-70 was that, unlike a ballistic missile, it could be launched under "positive control" and sent on to its targets or recalled, depending on circumstances. This argument McNamara disposed of by noting that, when warning of an enemy attack is received, bombers have to be launched, because they are vulnerable. The fact that a mobile and concealed strategic weapon such as the submarine-based Polaris missile cannot be launched under positive control is a matter of indifference, he said, because launching can be delayed until a final decision is made that its targets are to be destroyed.

In addition to evaluating the RS-70 in the light of alternatives, McNamara pointed out that, to be able to carry out its reconnaissance-strike mission, the RS-70 would need a radar of extremely high resolution. Indeed, the concept of the RS-70 was predicated on the Air Force's optimistic belief that this and other highly ambitious electronics systems could be developed in time for use in an aircraft scheduled to fly by 1967.

Taking the radar as an example, McNamara underscored the uncertainty of the undertaking. "The proposed mission," he said, "would require the gathering of radar reconnaissance data on the presence of new targets—or known targets which may not have been destroyed or neutralized—and the prompt processing and analysis of these data in flight. The proposed radar, moving

NEWS IN BRIEF

● **PSAC APPOINTMENTS:** President Johnson has appointed two new members to the President's Science Advisory Committee (PSAC), including the first social scientist in the 10-year history of the committee. Appointed to 4-year terms were Herbert A. Simon, professor of industrial administration and psychology at Carnegie-Mellon University, and Harland G. Wood, dean of science at Case Western Reserve University. Simon received his Ph.D. from the University of Chicago in 1943, and has been chairman of the board of directors of the Social Science Research Council and is chairman-designate of the Division of Behavioral Sciences of the National Research Council. He is a member of the National Academy of Sciences (NAS) and its Committee on Science and Public Policy. Wood received his Ph.D. from Iowa State College in 1934. He is the founder of the department of biochemistry at Western Reserve and has been a consultant to the U.S. Atomic Energy Commission (AEC) and a member of the AEC's Advisory Committee on Biology and Medicine. He is a member of NAS and is a past president of the American Society of Biological Chemists. On PSAC, Simon and Wood succeed Philip Handler and Herbert F. York, Jr., whose terms expired at the end of 1967.

● **NEW PUBLICATIONS:** A revised edition of *Science Information in Japan* has been published by the Japan Documentation Society. The 192-page publication, which was first published 5 years ago, deals with the generation, flow, and use of scientific and technical information in Japan. The revision was supported by a \$10,400 grant from the National Science Foundation. Copies are available, at \$5 each, from the Japan Documentation Society, NIPDOK, Kikai Sinko Kiakan, Siba Park, No. 21, 1-5, Minato-ku, Tokyo, Japan.

Copies of congressional hearings on the *Scope, Magnitude, and Implications of the United States Antiballistic Missile Program* are now available. The hearings were conducted 6 and 7 November by the Subcommittee on Military Applications of the Joint Committee on Atomic Energy. Free copies may be obtained from the Joint Committee on Atomic Energy, Senate Post Office, Washington, D.C. 20510.

Part 1 of hearings on the *National*

Marine Sciences Program, conducted in August, September, October, and December, are available, without charge, from the House Merchant Marine and Fisheries Committee, 1334 Longworth House Office Building, Washington, D.C.

● **HISTORY OF SCIENCE:** A new undergraduate program, the History and Philosophy of Science, has been approved by the Princeton University faculty for the fall of 1968. The program will be directed by Thomas S. Kuhn, professor of the history of science, and will be staffed by ten faculty members from the departments of history and philosophy. Edward D. Sullivan, dean of the college, said the program is designed "to increase understanding of the central role played by the sciences in contemporary life."

● **NEW BIOLOGY CENTER:** Harvard University has announced the establishment of a Center for Environmental and Behavioral Biology which will coordinate the activities and facilities of several Harvard institutions. Among the facilities included in the center are the Museum of Comparative Zoology, the University Herbaria, the Biological Laboratories, and the Harvard Forest. The center, which will develop courses of instruction, is also seeking funds for new research facilities. The center will be staffed independently of the affiliated institutions, but will recommend appointments to the institutions with which it is affiliated. Eleven biologists were named as the first members of the center, including Edward O. Wilson, professor of zoology, who was named chairman of the center.

● **MARINE SCIENCES PUBLICATION:** The Committee on Marine Research, Education and Oceanography, which published *University Curricula in the Marine Sciences* last year, is seeking information to be included in an addenda. Colleges or vocational schools with courses in marine science, oceanography, marine technology, or ocean engineering that were not included in the first publication are requested to write the committee at Building 159E, Room 476, Washington Navy Yard, Washington, D.C. 20390. The previous publication is available free from the same address.

DNA Memoir Stirs Furor at Harvard



F. H. C. Crick



J. D. Watson



M. H. F. Wilkins

Cambridge, Mass. Harvard president Nathan Pusey, backed by the Harvard Corporation (trustees), last spring forbade the Harvard University Press to publish *The Double Helix*, Nobel-prize-winner James D. Watson's 40,000-word memoir about the discovery of the structure of DNA in 1953. Pusey's action was revealed last week by the *Harvard Crimson*, and a cross fire of contention has been under way ever since.

The book is highly personal in tone. It describes Watson's own emotions and the accidents of personal relations that affected exchanges of information leading to the discovery of the DNA structure. Parties, dinners, ski weekends, discussions of young women, Francis Crick's laugh, and Linus Pauling's circus-ringmaster speaking style are all introduced, as if the book were a novel.

After serialization in the *Atlantic Monthly*, *The Double Helix* is being published by Atheneum, which raised its initial print order for 13,000 copies to 23,000 when news of Pusey's action ran on the front page of the *New York Times*, under the headline "The Book that Couldn't Go to Harvard."

Pusey's action followed several months of consideration prompted by letters of protest from Crick and Maurice Wilkins, who shared the Nobel prize with Watson in 1962. Both held that the personal tone of Watson's references to them constituted invasion of privacy.

The news was first disclosed by the *Harvard Crimson*, which commented in an editorial: "Pusey jeopardized the Press' reputation for discriminating, in-

dependent judgment when he permitted Harvard to be pressured by scientists whose disagreement with Watson was purely personal."

A Boston *Globe* editorial commented that "the institution that blew the whistle on Sen. Joseph McCarthy 15 years ago has run up a flag, and it isn't crimson."

Watson's manuscript has been the subject of worldwide gossip among biologists for several years. Thomas J. Wilson, then director of the Harvard University Press—now at Atheneum, for reasons independent of the Watson dispute—approached Watson early in 1966. Ernst Mayr, a Syndic and head of Harvard's Museum of Comparative Zoology, had told Wilson about Watson's manuscript.

Wilson then began circulating the manuscript to nearly everyone mentioned in it, including Crick, Wilkins, Linus Pauling, and Sir Lawrence Bragg (who has written the book's introduction). Watson says "hundreds" of people read the book before publication, to check facts and to comment upon its tone. Many changes were made.

Late in 1966 Pusey received the letters of protest from Crick and Wilkins and informed Wilson he would have to consider the matter. While the consideration went on, Wilson announced his departure. Wilson also asked the Syndics to consider the book again. They reaffirmed the decision to publish. But Pusey and the Corporation finally decided against becoming involved in a "dispute among scientists."

—VICTOR K. McELHENY

with the aircraft at 2,000 miles per hour [and at an altitude of 70,000 feet], would be seeing new area at the rate of 100,000 square miles per hour or 750 million square feet per second. We cannot state today with any assurance that satisfactory equipment to perform this processing and display function in an RS-70 can be made operational by 1970, let alone by 1967, on the basis of any known technology, or whether the human interpretation job required of the operator can ever be done."

This proposal to leap far beyond the state of existing technology was in sharp conflict with McNamara's management philosophy. In his view, except for those relatively few weapons which might alter the strategic balance (an antimissile system, for example), development of a specific system should proceed by exploiting the potential of known technology—quite a different matter from starting with a set of mission "requirements" and then proceeding to create the necessary technology.

(The McNamara philosophy has been made explicit in the establishment of a series of R & D categories which begins with basic research, then proceeds through exploratory development, advanced development, and so on, until an operational system results. In short, an attempt to develop a weapon system normally awaits development of the "building blocks" which make it possible.)

To counter McNamara's refusal to bend to its will, the House Armed Services Committee resorted to what the Air Force might call a "show of force." The bill it first reported in 1962 did not simply authorize spending for an operational RS-70 but "directed" that this be done. This mandate, had it been followed, would have undercut not only McNamara's authority as Secretary of Defense but President Kennedy's as Commander-in-Chief.

No doubt realizing he had gone too far, Chairman Vinson allowed Kennedy to persuade him to rewrite his bill, dropping the mandatory language, and to count on the Administration to give the RS-70 a thorough restudy. Whatever face-saving value the promise of a restudy may have had for Vinson, it was clear that the most likely result of further analysis would be to confirm McNamara in his view that to develop the RS-70 would be folly. And so it did. Reoriented to a modest experimental effort, the project gradually faded from congressional and public

Vietnam: Rise Found in Plague and Cholera

The disruption of sanitary facilities and massive uncontrolled population movements in South Vietnam are linked with rapidly rising incidences of plague, cholera, and a number of other diseases, according to a report by the World Health Organization (WHO). The report, *Epidemiological Situation in Viet-Nam**, describes the health situations separately for both South and North Vietnam. However, even with the upsurge of disease in the South, the report states, "the general health of the population has not in the main deteriorated. With certain exceptions, health services have been maintained and in many instances improved and extended."

Information sources for the report on the South included official records of WHO and information provided by the South Vietnamese government. The account of the North was based on more limited information and, as such, "the health situation in North Viet-Nam must remain somewhat obscure," the report noted.

Since 1962 the incidence of plague has risen in epidemic proportions in South Vietnam. And, the report states, the threat of plague spreading from South Vietnam to other nations in the Pacific basin is causing grave concern among health and quarantine officials through the Western Pacific area. Cases of plague have been recognized in 27 of South Vietnam's 47 provinces and plague infection has also been found in rodents and fleas at a number of ports and airports including Saigon, Nha Trang, Cam Rahn, and Da Nang. During 11 months of 1967, there were more than 4500 suspected cases of plague in South Vietnam and some 200 deaths were attributed to plague. The number of suspected cases was nearly double the number estimated for 1966.

According to the report, after nearly a decade free of cholera El Tor, that disease reappeared in South Vietnam in 1964. Between 1 January 1964 and 24 November 1967, there were nearly 38,000 suspected cases of cholera in the South and cholera was listed as the cause of some 1100 deaths. The report states, "In proportion to the size of its population, South Viet-Nam is reporting the largest number of cholera cases among cholera endemic areas in recent years."

The rising rates of plague, cholera, and the venereal diseases were cited as "outstandingly serious problems" in South Vietnam. Another disease which is on the upswing in the South is pneumonic plague, which has been reported in several areas of the country since June 1966. Prior to that date, it had not been reported for more than 25 years. Other major health problems in the South include malaria and leprosy—even though incidences of those diseases have fallen in recent years. Tuberculosis was also identified as a major health problem in South Vietnam. "A prevalence survey . . . in 1962 showed that approximately 60 per cent of the population was infected and 10 per cent of children aged 10 years had x-ray evidence of clinically significant tuberculosis." Other communicable diseases reported in South Vietnam include all forms of dysentery, influenza, infective hepatitis, scrub typhus, and human rabies, which exceeded 700 cases between 1964 and 1966.

Although the reasons are unclear, there is no plague reported in North Vietnam. The report states that cholera and smallpox have not been present in the North since 1957. Smallpox has been absent from the South since 1959. The report also notes that in the North poliomyelitis has been nearly eradicated and the incidence of tuberculosis—although it has been cut back considerably—is still of public health importance. Bacterial dysentery is one of the most widespread diseases in the North.

The report concluded that "Where there are large-scale uncontrolled population movements, there is an increased risk of diseases. Where there are prolonged unsettled conditions, the normal development of health services is halted or retarded."—KATHLEEN SPERRY

*Available, without charge, from the Regional Office of the World Health Organization, 525 23rd St., NW, Washington, D.C.

attention. Even the Air Force, which has learned much under McNamara's tutelage, has not been sorry to see it forgotten. In fact, during a congressional hearing year before last, General J. P. McConnell, the Air Force Chief of Staff, pronounced it a "dead duck" and gave no sign of mourning the deceased.

Although by no means all of his decisions have won such acceptance (the controversy over the "TFX" or F-111 fighter is now in its 7th year), McNamara has brought off a revolution in defense management that was overdue. In his handling of the B-70 issue Pentagon historians will find a significant case study of what that revolution was all about.—LUTHER J. CARTER

APPOINTMENTS



G. J. F. MacDonald



C. C. Furnas

Gordon J. F. MacDonald, executive vice president of the Institute for Defense Analyses, Arlington, Va., to vice chancellor for research and graduate affairs, University of California, Santa Barbara. . . . **Clifford C. Furnas**, president emeritus of the State University of New York at Buffalo, to vice-chairman of the National Research Council. . . . **Franklin D. Murphy**, chancellor of the University of California at Los Angeles, to chief executive officer, Times-Mirror Company, Los Angeles. . . . **Eli M. Nadel**, chief of research in pathology, hematology, and laboratory medicine, Veterans Administration, to associate dean, St. Louis University School of Medicine. . . . **Howard S. Greenlee**, professor of history and acting dean of the College of Arts and Sciences, Tuskegee Institute, to dean of the faculty of Antioch College. . . . **Walter L. Koltun**, institute secretary for foundations, M.I.T., to director of the program for advanced study, Bolt Beranek and Newman, Inc., Cambridge, Mass. . . . **William Hines**, science editor, The Washington Star, to Washington editor of World Book Encyclopedia Science Service.