mated cost of benefits to employees of such institutions, Tolley went on to make these points.

These nonprofit organizations are already engaged in rendering public service and to the extent they pay unnecessarily into the Federal unemployment insurance fund, then to that extent their resources are diminished to carry on the work for which they exist.

This Federal unemployment insurance tax does not apply to Federal, State, or municipal employees. Federal employees are covered under a cost reimbursement plan as are some State employees. Nonprofit organizations which perform public welfare services should be given the same exemption from this part of the total unemployment insurance tax.

Secondly, exempt from unemployment insurance tax coverage the faculty and other professional staff members. Such persons have, in effect, no unemployment since the demand for teachers and professional personnel, such as doctors, research engineers and scientists, et cetera, greatly exceeds the supply.

For example, at the University of California on the various campuses the number of budgeted but unfilled teaching positions has almost doubled in 2 years: 438 in 1964 as compared to 262 in 1962.

In addition, 651 positions budgeted for regular professors and instructors in 1964–65 were filled with temporary, provisional, or part-time appointees compared with 531 2 years earlier. Professional personnel are in similar short supply.

It should also be noted that most research scientists and engineers at educational institutions are hired for specific projects or specific periods related to contracts or grants and accept such assignments with that understanding.

Third, exempt from coverage the students, in regular attendance at nonprofit educational institutions, and their spouses. The students and their spouses should be exempt from coverage since their attachment to the labor market is temporary and geared to the students' stay at the institutions.

The ACE statement, in essence, claims that universities are recession-proof but indicates a willingness to see blue-collar workers included in the unemployment compensation program. Other organizations have argued for a blanket exemption for educational institutions. Equal treatment for public and private institutions of the same type is urged. It has also been noted that the special character of employment in universities and colleges would make it possible for working students or student wives, or even faculty members, to work during the regular school year and vacation at the expense of the unemployment compensation fund.

Partisans also suggest that inclusion of the employees of nonprofit organizations with good employment records is being sought now by some because the payments of these organizations would help with expected heavy costs of other to-be-included groups, particularly farm employees, who are expected to have high unemployment patterns.

For the nonprofits, the experience of the past year has been an unsettling one. The stakes are high when tax legislation is under consideration, and Ways and Means Committee business often creates a bear-garden atmosphere for lobbyists. The private educational and health service institutions were not as practiced as other interest groups in getting attention, but lately they seem to have been doing better.

They would probably settle now for inclusion in the system under the special arrangement by which they would reimburse the state fund for benefits actually drawn by their employees. While it is risky to predict such things, there seems to be a good chance, if influential Ways and Means Committee chairman Wilbur Mills concurs, that this is in the cards.—JOHN WALSH

Vietnam: Jungle Conflict Poses New R&D Problems

Even though the Defense Department has long been served by a huge military research and development apparatus, which now spends more than $6.5 billion a year, the Vietnam war has thrown up its own special challenge to the giant R&D machine. The jungle environment and the nature of the conflict, which combines the characteristics of conventional and guerrilla warfare, have demanded innovations in strategy, tactics, and equipment. Moreover, the urgency of these demands has required drastic shortening of the 5- to 10-year period usually required for producing new military equipment—from the initial concept, through research, development, and testing.

John S. Foster, Jr., director of defense research and engineering, recently told congressional committees how the R&D effort for the Vietnam war was proceeding. Two projects to improve and expedite R&D activities in support of the U.S. effort in Vietnam have been initiated within the past 2 years—JRATA and PROVOST.

In April 1964 the Joint Research and Test Activity (JRATA) was established at Saigon as part of General William C. Westmoreland's Military Assistance Command, which exercises overall direction of U.S. forces in Vietnam. JRATA pulled together the test and evaluation activities which were being carried on in an uncoordinated fashion in Vietnam by the Army, the Air Force, and the Advanced Research Projects Agency.

These activities, together with those of a new Navy research and test unit, have kept their separate identities but have been under the central direction of Brigadier General John K. Boles, Jr., an officer experienced in military research programs and a graduate of Harvard's advanced management program. JRATA, regarded as a highly useful link between combat units in the field and the R&D apparatus in the United States, consists of about 150 people of whom perhaps 30 are civilian engineers and scientists, including some anthropologists, political scientists, and other social scientists.

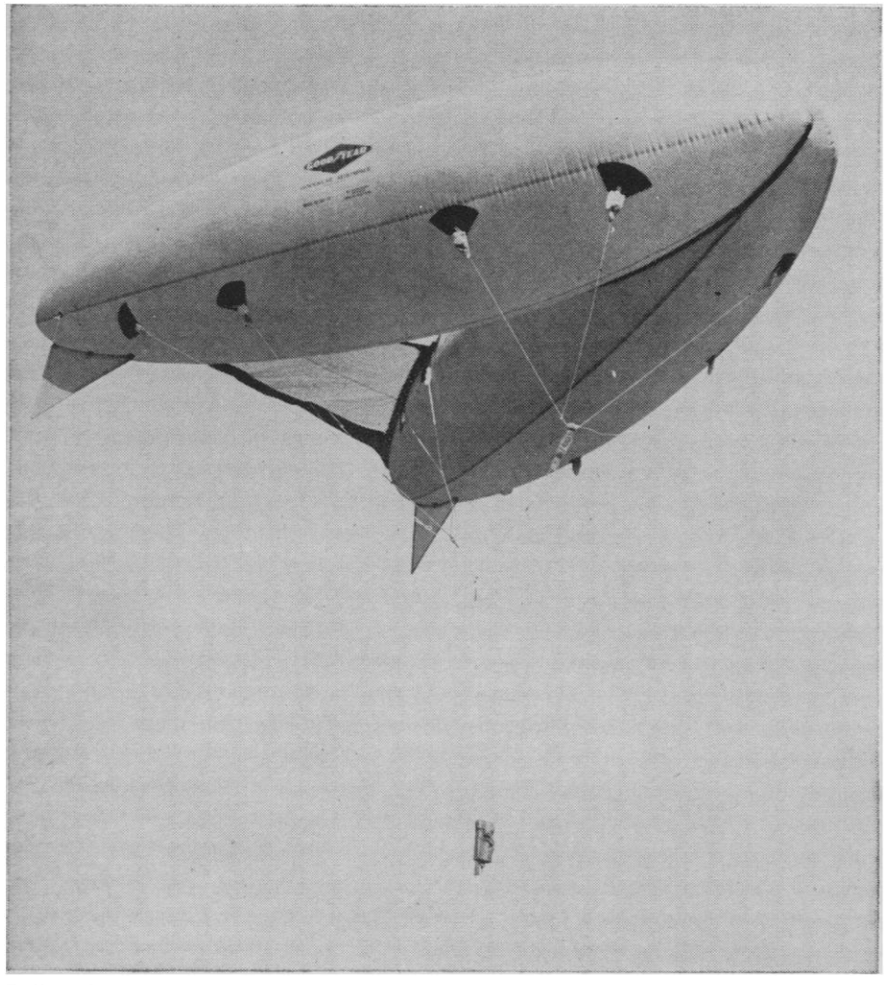
Project PROVOST—Priority Research and Development Objectives for Vietnam Operations Support—was begun last year in an effort to make new and needed material quickly available to the forces in Vietnam whenever this could be done by acceleration of effort. Directed by the office of Defense Research and Engineering, PROVOST is essentially an administrative procedure

through which high-priority activities are financed and pushed to early completion—with production of equipment often beginning within 6 to 18 months from the time a "requirement" is established. Thomas P. Cheatham, Jr., Foster's deputy for tactical warfare programs, is in charge of PROVOST. Cheatham, who holds a doctor of science degree from M.I.T., is a former vice president of Litton Industries.

According to Foster, a comprehensive PROVOST review begun last August identified 150 different developmental efforts that could be accelerated. The most promising were initiated immediately, with $58 million from emergency funds. An additional $227 million will be provided from new supplemental appropriations and the fiscal 1967 defense budget. PROVOST is concerned with virtually the entire field of counterinsurgency and limited-conventional-warfare weaponry and equipment, such as lightweight body and helicopter armor, grenade launchers, and improved night-vision and personnel-detection devices.

"Statistical tabulations of dollar expenditures are not adequate indicators of the emphasis we are placing on the support of our commitments in Vietnam," Foster has said. "Naturally, the war must be fought primarily with existing equipment which the troops are trained to use. However, the research and development community does have both the obligation and the ability to modify and improve this equipment for the peculiar conditions in Southeast Asia, and to devise new equipment to meet special problems that arise."

For example, he said, the scientific community has provided valuable assistance in devising tactics and equipment to counter the threat to pilots and aircraft posed by the surface-to-air missiles used by North Vietnam. Efforts of this kind do not require large amounts of money. "Rather, they require immediate and concentrated effort to produce quick and appropriate results," Foster said.



Balloon-borne VHF radio antenna system developed by the Army Limited War Laboratory at Aberdeen Proving Ground, Maryland, in order to overcome signal attenuation caused by jungle vegetation. The balloon is aerodynamically stable and has been flown successfully in simulated winds up to 35 miles per hour. [U.S. Army photograph]

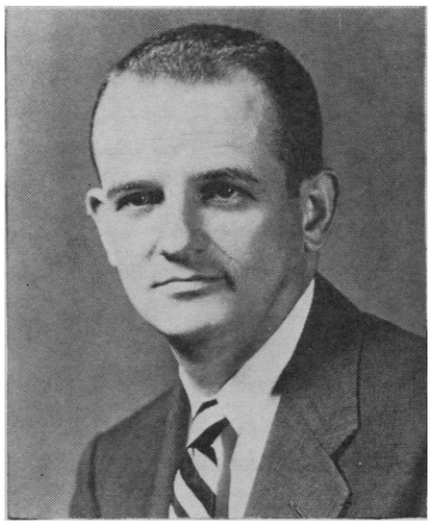
As Foster suggests, the problem of R & D support for the U.S. effort in Vietnam is largely one of identifying needs and then applying readily available resources. Nothing resembling the large-scale mobilization of university scientists and engineers undertaken just prior to World War II by Vannevar Bush and his Office of Scientific Research and Development has been necessary. Strong ties between the military and the academic community have been an inevitable, and apparently semipermanent, result of the East-West tensions—and the fear of "technological surprise"—that followed World War II and the Korean War.

The academicians' involvement in R & D activities growing out of the Vietnam war has been largely in the role of consultants to industry and to nonprofit organizations such as the Rand Corporation, the Research Analysis Corporation, and the Institute for Defense Analyses. Numerous university scientists and engineers serve on the three military services' advisory boards, and industry and the "nonprofits" often look to them as consultants. Under conflict-of-interest rules, these people do not act as industry consultants on projects on which they serve as advisers to the military.

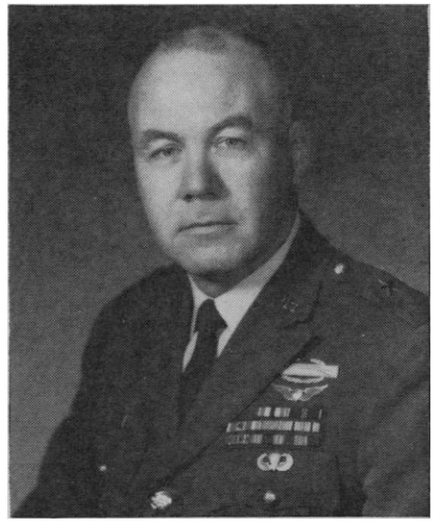
In Vietnam, General Westmoreland recently set up in his command a group that is responsible for staying in touch with field commanders and keeping informed of their urgent needs. Once these needs are translated into formal statements of requirement they are accorded priority treatment by the service departments and Defense Research and Engineering. The new "requirements" group works closely with General Boles and JRATA and stays abreast of their testing and evaluation of new procedures and equipment.

New ideas for equipment, tactics, and combat organization may develop anywhere—in a field command, in the requirements group, in JRATA, or in a service or industry laboratory back in the States. Therefore, close collaboration between the field, the command staffs, and the R & D people is deemed essential. Visiting specialists from the R & D community, JRATA personnel, and members of the requirements group confer routinely.

Some 250 technical representatives from industry are in Vietnam now.



Dr. Thomas P. Cheatham, Jr.



Brig. Gen. Alvin E. Cowan

Representatives of the services' "in-house" laboratories, of course, visit Vietnam, too. Of the 146 persons employed by the Army Limited War Laboratory at Aberdeen Proving Ground, Maryland, 25 have visited Vietnam on 90-day rotation tours.

Jungle Radios

The development of the Army's new jungle radio illustrates the intimate collaboration that goes on between R & D people and combat units. In 1962, as the number of U.S. Army "advisers" in Vietnam was growing to a sizable force, the Army discovered that it lacked a small radio suitable for jungle use. The radios then in service would not propagate signals well through the jungle canopy.

The Limited War Laboratory, which had just been established, undertook the development of an effective jungle radio. When the first prototypes became available in 1964, John C. Ackerman, an electrical engineer and chief of the laboratory's Development Engineering Division, took them to Vietnam for field testing. The ultimate testing, which proved the radio's merit and led to its production for regular use, was done by combat forces. The radios were tested by personnel at remote Special Forces camps, by Navy advisers aboard vessels of the Vietnam junk force, and by advisers assigned to Vietnam army units.

General Boles, credited by qualified observers in Washington with having gotten JRATA off to an excellent start, will soon become deputy commander of the Army test and evaluation command at Aberdeen Proving Grounds. On 1 May he will turn over his Vietnam command to Brigadier General Alvin E. Cowan, former director of developments under the Army's Chief of Research and Development. Cowan is one of a fairly large number of Army officers—more than 500 in all, from a total officer corps of over 100,000—who hold the Ph.D. degree. In fact, under the auspices of the Army civil school program, Cowan has earned three degrees from the University of Texas, having received his Ph.D. in physics in 1953. As a scientist himself, Cowan is expected to strengthen further the ties between scientific researchers and the combat soldier in Vietnam.

Much of the Vietnam-oriented R & D work has consisted of "quick reaction" projects—the development of the jungle radio, for example. Such projects have consisted mainly of applying engineering skills to produce weapons and equipment from items which were already available or which could be easily developed. (There are, of course, longer-range projects, too. The Advanced Research Projects Agency, for instance, is developing a four-legged "walking truck" which will enable a man to transport a 500-pound load over difficult terrain at 5 miles per hour.)

The Army Limited War Laboratory (ALWL), with its modest staff of 146 persons (consisting mainly of civilian engineers and a few scientists), has demonstrated that numerous useful military items can be developed at comparatively small cost. ALWL began with a budget of a few million dollars a year, and, although its budget has now been increased severalfold, the laboratory is still small compared to some defense laboratories. Nevertheless, the staff has had the wherewithal to pursue promising ideas, mostly through contracts with industry.

By dollar volume, 70 percent of its work is contracted to industry; of the remaining 30 percent, half is done "in-house" and half is done by other government agencies. Project fields include communications and electronic equipment, weapons and munitions, vehicles, and applied research and development in chemistry, physics, physiology, biology, botany, zoology, entomology, and the behavioral sciences.

As of late 1965, the laboratory had developed 24 items which were being used in Vietnam. These include, for example, a system for laying a smoke screen to conceal troops being landed by helicopter in enemy-occupied areas; a light-weight water purification unit to provide potable water in areas where water is polluted or mineral-laden; a "position locator," a small device, self-contained and weighing no more than 10 pounds, by which troops in unfamiliar terrain can determine their position; a jungle canopy platform—two steel nets laid crosswise on the treetops with a platform at their intersection—to permit helicopters to land in jungle areas; and a ballon-borne antenna system (see photograph) which extends the range of older VHF radios in jungle areas. (The new jungle radio does not require the balloon-borne antenna.)

Air Force Reaction

Sometimes Vietnam project proposals have met with an understandable, but undeserved, skepticism. In the Air Force such skepticism greeted the proposal that the old C-47 transport be equipped with side-firing machine guns and deployed as an attack plane. This new weapon system—known to the Vietnamese as "Puff the Magic Dragon"—uses the six-barrel Gatling gun and has an awesome firepower. In conventional warfare against an opponent armed with modern antiaircraft weapons this flying dragon would be hopelessly vulnerable. In Vietnam, however, it has been deemed a success. The Air Force's Special Air Warfare Center at Elgin Field, Florida, developed this weapon system, but no requirement was seen for it until after General Curtis LeMay, former Air Force Chief of Staff, decided it should be tested.

Many requirements for Vietnam are still unmet and continue to pose challenging R & D tasks. The lack of ade-

quate surveillance of jungle areas is a persistent problem. "The jungle canopy makes it difficult, if not impossible, to detect the movement and location of the Viet Cong," says an Army limited warfare specialist. Uncertain surveillance not only makes it hard to seek out the enemy but also jeopardizes the security of one's own encampments. Accordingly, studies are under way on new sensing devices, such as magnetic-loop and seismic detection systems, and on more effective defoliant agents.

Other Vietnam requirements also pose a wide array of R & D problems. Improvements in communications, troop mobility, firepower, and resupply systems for remote or besieged encampments—these are among the needs under investigation. Success in Vietnam, if achievable, seems likely to depend in part on whether the United States, with its huge military R & D establishment, can produce the new instrumentalities of war needed to help offset the advantages of climate, terrain, and jungle concealment now benefiting the Communist forces.

—LUTHER J. CARTER

Announcements

Northeastern University has received 20 acres of a former Nike missile site in Nahant, Massachusetts, from the General Services Administration for a **marine science research institute.** Last month the property was placed under control of the Department of Health, Education, and Welfare. It was then transferred without cost to the university. The school will convert a former officers' quarters into research and seminar rooms, offices, and a "wet" laboratory. Plans call for facilities for study in marine geology and biology, wave action, hydrology, corrosion, and harbor pollution.

A **Korean Institute of Industrial Technology and Applied Science** was established recently in Seoul. A U.S.–Korean agreement provides for a $750,000 U.S. development grant to help finance management guidance and technical advisory services during the institute's early years. The Korean government will provide Won-350 million ($1½ million) for the first year's operating expenses, and the two countries will meet later in the year to determine additional financial requirements for the institute's first 5 years.

The institute will operate as an autonomous foundation, governed by an 11-member board of trustees. It will, according to Korean president, Park Chung-Hee, "serve private and public owned enterprises alike. It will have access to many disciplines in science, technology, and engineering economics to carry out feasibility studies, to import and adapt foreign technology to Korea's needs and to conduct laboratory investigations." It will also provide opportunities for Korean scientists and engineers to conduct studies in their own fields.

Choi Hyung-Sup, head of the Korean Atomic Energy Research Institute, was named president of the new foundation.

Spain and the U.S. will cooperate in experiments to measure **wind, temperature, and pressure at altitudes of 18 to 36 miles**, under an agreement made in January. NAA and the Spanish Comi-

(Continued on page 264)

REPORT FROM EUROPE

Transatlantic Cooperation on Research: New U.S. Moves

London. An apparent increase in U.S. government interest in transatlantic collaboration on some big-science programs is attracting attention in Europe.

A flurry of visits by high-level American officials concerned with science and technology has begun. Proposals for collaboration on some ambitious projects in space have gained new significance because of the British government's eagerness to withdraw from the European program to develop large space launchers, and because the curtailment of budgets for the unmanned exploration of space has focused new attention on American space-research aims for the 1970's.

European speculation about the U.S. interest begins with the meeting in late December between President Johnson and West German Chancellor Ludwig Erhard. At that meeting President Johnson gave considerable prominence to his suggestion that the United States and the German Federal Republic work together on such projects as sending a rocket to the neighborhood of Jupiter. Also discussed were joint work on air and water pollution and intensified collaboration on developing fast breeder reactors.

In January, presidential science advisor Donald Hornig visited several European countries. In Paris he attended a meeting of science ministers sponsored by the Organization for Economic Cooperation and Development. In Germany he visited Bonn and Berlin, the Battelle Memorial Institute laboratory in Frankfurt am Main, the reactor development center in Karlsruhe, and the Technical University of Munich.

At the Paris meeting, Hornig told American reporters that the U.S. was ready to consider expanded technical collaboration with Europe if there were progress toward such goals as international monetary reform, an advantageous trade agreement between the United States and the Common Market, and continued integration of the Common Market. While giving no details, Hornig did say that the proposed cooperation with the German Federal Republic was an example of what might be possible.

American representatives at the Paris meeting also put it this way: they hoped that, as Europe embarked on further multinational projects whose size required complex cooperation, the U.S. would be permitted to take part. An example is the plan for significant participation by U.S. scientists in experiments with clashing beams at the European Center for Nuclear Research. Construction of the storage rings for these experiments is scheduled to begin this year.

The most dramatic of the suggestions made recently is that of sending