ARMY RESEARCH AND DEVELOPMENT

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Army Scientists Get $25,000 Award for Nuclear Work

In recognition of research and development on nuclear battlefield weapons, including one of the Army's potent additions to the firepower of field troops, the portable Davy Crockett warhead, three scientists at Picatinny Arsenal (N.J.) on May 11 received cash awards totaling $25,000.

Secretary of the Army Elvis J. Stahr, jr., presented checks for $15,000 to Robert M. Schwartz, 40, $5,000 to Milton E. Epton, 44, and $5,000 to Mrs. Sandra Mayer, widow of the late Irving Mayer. Undersecretary of the Army Stephen Ailes and Army Chief of Staff George H. Decker were among high ranking dignitaries who attended the ceremony.

The $25,000 award is the maximum that can be made for R&D in a single area of effort by an individual or group. Since the Government Employees' Incentive Awards Program was set up in accordance with an Act of Congress in 1954, only three $25,000 awards have been approved.

Two of the three awards have gone to Army personnel. In 1959 five employees of the Diamond Ordnance Fuze Laboratories, Washington, D.C. —Dr. J. W. Lathrop, Norman J. Doctor, Thomas A. Prugh, James R. Nall and Mrs. Edith D. Olson—shared $25,-

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Army Testing First Mobile Nuclear Power Plant

Army use of nuclear power to solve logistical problems inherent in greatly increased mobility requirements of modern warfare has advanced significantly. Engineering tests are in progress on the Army's first mobile power plant, and the portable power plant at Camp Century in Greenland has been accepted from the contractor.

Announcement was made by the Atomic Division, Office of the Chief of Research and Development, that testing of the Army's mobile nuclear plant had started at the Atomic Energy Commission's National Reactor Testing Station in Idaho.

Initiation of the testing program on the reactor skid was termed a "major milestone" in the joint Army-AEC program to bring the benefits of virtually fuel-free (from a logistical viewpoint) nuclear power to the Army.

Until recently, a spokesman said, the Army Nuclear Power Program was limited, by technical considerations, to developing stationary and portable reactors to meet the needs of

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John H. Rubel
Ass't Sec. of Defense (R&E)

(*See story, page 16*)

Reliable Redstone Takes 1st U.S. Man Into Space

Successful launching of the United States' first astronaut into space on May 5 could be considered a capstone for the role in space exploration of the most successful missile, the Army's Redstone.

The "old reliable" of the Army's missile family boosted the National Aeronautics and Space Administration Project Mercury capsule and Navy Cmdr Allen B. Shepard on their uneventful flight down the Atlantic Missile Range.

Redstone's firsts as a booster of space payloads include the launching of the Free World's first satellite, Explorer I, and the still orbiting Explorers III and IV.

In its true role as an Army field weapon, the Redstone was the first missile to employ successfuliy an inertial guidance system, the first mounted with a heat-protected nose cone fired into space and recovered, and the first large ballistic missile to be fired by troops and employed overseas.

In the hands of the NATO forces since June 1958, the Redstone proved its long-range capability in 1956 when it powered the Jupiter-C vehicle, later used to orbit the Explorer satellites, 3,000 miles down the Atlantic Missile Range on the United States' first long-range ballistic missi'e trajectory.

Redstone today continues to be the Army's "Sunday punch," guarding the frontiers of the Free World in Europe. Because of the progress of Army missilry, however, the Redstone is scheduled to be replaced by the Pershing, a solid propellant, 2-stage ballistic missile about half as long as the Redstone and with approximately one-sixth its weight, but with longer range, shorter reaction time and greater mobility.

Theme of the Month

By Lieutenant General J. H. Hinrichs
Chief of Ordnance

There are many formal definitions of reliability. The way it is defined depends somewhat on the background and environment of the person giving the definition. A statistician will define it in terms of "probability" and "percent assurance." A GI in combat may never have heard of reliability in the sense we use it now, but he feels it intuitively in terms of trust and confidence. He has faith that his rifle will fire when he loads it and pulls the trigger, even if it has fallen in the dust several times or got wet and muddy. To us in the military, reliability means success or failure on the battlefield. It means life or death to our personnel. It has implications in morale and prestige. It means dollars and cents to the taxpayer.

In the Army, reliability has a high priority among other essential

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Objectives of this publication are: To improve informal communication among all segments of the Army scientific community and other Government R&D agencies; to further understanding of Army R&D progress, problem areas and program planning; to stimulate more closely integrated and coordinated effort among the widely dispersed and diffused Army R&D activities; to maintain a closer link from top management through all levels to scientists, engineers and technicians at the bench level; to express views of leaders, as pertinent to their responsibilities, and to keep personnel informed on matters germane to their welfare and pride of service.

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Theme of the Month

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ingredients in the package which includes performance, maintainability, human factors engineering, ease of operation, use of proven components, safety considerations, and ease of production.

Reliability has always been of paramount importance in the field of ammunition. Ammo is unique—it is dangerous! We must make our ammunition reliably lethal to an enemy, and reliably safe to ourselves. Since ammunition explodes, we must control its reactions so that they take place WHEN and ONLY WHEN we want them to do so. That frequently involves relatively complex control systems.

Although missile and atomic weapons have in recent years focused more attention on the subject of reliability, the Ordnance Corps has been vitally concerned with this subject throughout its history. We have learned, though, that a reliability of one in a million for premature functioning of conventional ammo is still not completely satisfactory. This may seem startling, but for types of munitions which involve large numbers, for example, 50 million rounds, the premature functioning of 50 can be serious.

What about vehicles? We see them by the thousands, all around us, and they seem to run along fine. You don't see many of them out of action for mechanical trouble. Truck fleet operators aren't happy unless they get engine life of 100,000 miles. Our current goals for military vehicles are fairly modest —for wheeled vehicles, we want a 90 percent probability of going 20,000 miles before we need to rebuild components—for tracked vehicles, we want the same probability of getting 4,000 miles.

What do we actually get? For wheeled vehicles, the BEST we get is a 42 percent probability of getting 20,000 miles without depot maintenance, the WORST has zero probability of reaching 10,000 miles. For tracked vehicles, we have only a 3 percent probability of getting our 4,000 miles. Why is it that components that give 100,000 miles of trouble-free operation in commercial applications seldom give us more than 15,000 in the military environment?

The military environment is a rough, tough environment. Our vehicles must frequently operate cross country; they must ford streams; in some cases they must be able to swim; often the drivers are suffering from fatigue or fright and may not have been adequately trained. The very diversity of requirements introduces complexity, and this, of course, leads to reduced reliability.

Our colleagues in the other Technical Services have their own special kinds of reliability problems. Almost everyone these days thinks that the most complex systems we have to deal with are guided missiles. The medics don't think so, though. They deal with man—a psychological and physiological organism. Determining the reliability of biologicals is a tough problem. First, there is the complexity of our own bodies. Then, the biologicals are themselves living materials, products of living materials, or modifications of one or the other, and often combined with one or more chemicals. Then there is the complexity of our minds. The possible interactions of such complex systems are so varied that our guided missile systems look rather simple.

There is an often repeated cliche that "Reliability must be designed and built into the system; it cannot be tested into the system." This is true—quality control can only minimize degradation of INHERENT RELIABILITY during the manufacturing. BUT RELIABILITY CAN BE TESTED OUT OF THE SYSTEM. Missiles that are tested and checked too much sometimes have been shown to be less reliable. Our concept must be—Design it right! Test it! Shoot it!

PERFECT reliability is something for which we strive but will never reach. We are exploiting every field of knowledge to reach higher reliability. We support basic research within the Corps, universities and industry in the theory of probability, in mathematical statistics, in design of experiments, in studies of environment, and so on. We work on engineering materials, on production methods, on simple designs. We work on any conceivable and reasonable chemical, mechanical and electrical test and study to get knowledge of system reliability. We keep up a constant surveillance program to detect changes in reliability which may affect the training or combat capability of our troops and that of our allies in the field. Getting reliable equipment into the hands of the troops isn't easy and we recognize it as a heavy responsibility. We can't relax our efforts for a moment; the consequences of failure are tragic.

To try to graft reliability into a system during production, or after, may cost too much in time, manpower, and dollars. To me, the real key—the first step—in getting reliability is to DESIGN reliability into our materiel. If we don't do it early, in the R&D phase, we may never get it.

Army Scientists Get $25,000 Award for Nuclear Warheads

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000 for their work in the microminiaturization of electronic circuits.

The other $25,000 award was made five years ago to Dr. William McLean, U.S. Navy, for his development of the sidewinder missile.

Schwartz, Epton and Mayer worked as a team in developing nuclear warheads for the Davy Crockett and the 280-mm. cannon as well as the adaptation kits for the Honest John Rocket and Jupiter Intermediate Range Ballistic Missile (IRBM).

Through use of the adaptation kits, soldiers with limited training can follow simple procedures for assembling and testing warhead sections, doing in minutes a job that used to take hours.

Schwartz is Chief Engineer-Scientist for Special Weapons at the Ordnance Special Weapons Ammunitions Command at Picatinny. Epton is Chief of the Special Weapons Development Division. Until his death in 1959, Mayer was Systems Manager for the Davy Crockett and Executive Assistant in the Office for Special Weapons Operations.

The team began work in 1953 to reduce ponderous warheads to a size that would fit battlefield guns and rockets. Schwartz headed the task force charged with developing the atomic shell for the 280-mm. cannon.

Developments thereafter resulted in steadily smaller nuclear weapons, rugged and safe for use by troops. The Davy Crockett warhead was the climax of the team's efforts.

In recommending the awards, Lt Gen J. H. Hinrichs, Chief of Army Ordnance, said: "It was these individuals who inspired others to achieve what was almost technically and physically impossible. They replied 'Yes' when conservative men of science advocated 'No.' They courageously probed the frontiers of knowledge in order to reap necessary but hard-won technological rewards."

Secretary of the Army Elvis J. Stahr, jr., looks over one of the nuclear warheads developed by Robert M. Schwartz (right) and Milton E. Epton (left).

President Acclaims 3 Picatinny Arsenal Scientists

President John F. Kennedy's message of tribute to three Picatinny Arsenal scientists for their work in developing nuclear warheads was read at a $25,000 award presentation ceremony by John W. Macy, Jr., Chairman of the Federal Civil Service Commission, as follows:

"I am most impressed by the boldness and ingenuity that have marked the outstanding technical achievements of three men being recognized by the Department of the Army today. These men were not only tenacious in spirit, but they had a high sense of mission; they used their talents and capabilities to the utmost; they were innovators.

"Their work represents the kind of top level performance and imaginative thinking needed in Government to meet successfully the great challenges confronting us at home and abroad. They are a tribute to the quality of the Federal Career Service.

"It is noteworthy that there is in Government a planned program that accents, encourages and publicly recognizes new ideas, innovations and superior performance from employees at all levels in all departments and agencies. Incentive awards, such as those being presented today, are the means by which our Government can recognize in a tangible way those individuals who do innovate, who do render outstanding performance.

"To Robert M. Schwartz, Milton E. Epton and the family of the late Irving Mayer go my congratulations and deep appreciation for their significant contribution to the defense of the United States."

Civil Service Journal Hails Government R&D

More than a passing word of recognition and appreciation for a job well done in behalf of the 165,000 scientists, engineers and technicians employed by the Federal Government is merited by an article in the April-June issue of the quarterly *Civil Service Journal.*

In "The Wondrous World of the Scientist in Civil Service," coauthors William M. Ragan, Deputy Public Information Officer of the Civil Service Commission, and Lawrence H. Clark, a Staff Assistant in the CSC's Public Information Office, have effectively delineated the important role of Government scientists, engineers and technicians.

Citing numerous examples of notable contributions of Government scientists, the article lists as "landmark achievements" the development of radar and sonar, first fully automated electronic digital computer, instrument landing system used by all commercial and military aircraft, electronic miniaturization, radiosonde and automatic weather stations, determination of atomic weight of hydrogen, basic design of most military and commercial aircraft, proximity fuze, and the atomic-powered submarine.

Government scientists, the article states, "have made many significant contributions to scientific knowledge, and their achievements have had far-reaching effect on our Nation's health, welfare, economy and standard of living."

Another installment of the 2-part article is scheduled for publication in the July-September edition of the *Civil Service Journal.*

CmlC Unit Marks First Decade

The U. S. Army Chemical Corps Training Command at Fort McClellan, Ala., is observing completion of its first decade of service.

With an average military and civilian-employee population of more than 2,000, it is responsible for the training of all men and units assigned to the Army's chief chemical officer, and is the Free World's educational center for chemical, biological and radiological weapons and defense. The current School Commandant is Col Carl W. Bartling.

Army Testing First Mobile Nuclear Power Plant

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fixed military installations. Now it has become feasible to undertake construction of nuclear plants with sufficient mobility to support the Army Field Forces.

Consisting of two major packages—the reactor skid and the power conversion skid—the mobile plant, known as the ML-1, will comprise a single package during both ground transport and operation. Control equipment is housed in a separate cab. Auxiliary systems used in startup and shutdown compose an additional package.

Total weight of the plant is 38.5 tons, permitting transport on a standard Army tractor-trailer, by ship or barge, by railroad flatcar, or by military cargo aircraft if the two major equipment skids are separated.

The ML-1, in basic concept, combines a conventional Brayton closed-cycle gas-turbine power system with a nuclear reactor heat source. Oxygenated nitrogen ($0.5\%O_2+99.5\%N_2$) serves as both reactor coolant and turbine working fluid.

Operative in a range of air temperatures from –65 to 100° F., the plant is designed for a minimum net output of 330 kilowatts. Mobile field plants of this type will operate at full power for 10,000 hours without refueling and are designed to be operable within 12 hours after arrival at a site. Preparations for relocation are possible 24 hours after shutdown.

Water moderated and fueled with enriched uranium dioxide, the reactor has a core consisting of 61 multiple-pin fuel elements housed in insulated pressure tubes. Reactor heat is removed by gas flowing through the tubes and over the fuel pins.

An integral radiation shield surrounds the reactor and is housed in a tank of borated water which provides additional radiation protection during plant operation. The tank is drained during movement to reduce weight.

Preliminary testing of the reactor skid is scheduled for completion late in 1961, at which time it will be combined with the power conversion skid to form a complete power plant. Testing of the complete plant to confirm design data for production models then will get underway.

Meanwhile, in the Army's "City Under Snow" at Camp Century in Greenland, the practicability of portable nuclear power plants is supported by

Army Nuclear Power Field Office power reactor, Fort Belvoir, Va., is stationary but components are transportable by air for remote installation. It set stage for first portable nuclear plant at Camp Century, Greenland.

the Army's final acceptance of a plant designed and built by ALCO Products, Inc., of Schenectady, N.Y.

Turned over to the Army's Polar Research and Development Center manning Camp Century, the $4 million plant delivers a maximum of 1,560 net kilowatts of electricity and 1,000 pounds of steam per hour.

Designated the PM-2A, the plant uses enriched uranium fuel that takes the place of more than 850,000 gallons of diesel fuel which would be required annually by a conventional power plant. Skid-mounted, the PM-2A is air-transportable when major components are dismantled.

In a recent speech Lt Gen Arthur G. Trudeau, Chief of Research and Development, Department of the Army, devoted much of his message to the vital importance of nuclear power plants and other nonconventional power sources, notably, for example, the fuel cell. He said, in part:

"Although the fuel cell promises some reduction in our supply requirements for fuels, in itself the fuel cell is not the complete solution to our age-old logistics problem. One possible solution I see, in the 1970's, lies in the integration of the fuel cell—or groups of cells—with the nuclear reactor."

(An early issue of the *Army R&D Newsmagazine* will carry a feature article on the nuclear energy depot concept.)

Morse Issues Statement Following Resignation

Effective June 1, exactly two years from the date he was sworn in as Director of Research and Development, Assistant Secretary of the Army Richard S. Morse has offered his resignation to President Kennedy.

Vested with increased powers when he was appointed by President Kennedy and sworn in on Mar. 3 as Assistant Secretary of the Army for Research and Development, Mr. Morse issued the following statement when he met with newsmen on May 3:

"In accordance with personal plans which I made more than six months ago, I am submitting to the President my resignation, effective June 1. I regret that announcement of my plans in this regard has appeared prematurely in the press, prior to submission of my resignation to the President.

"For 20 years I have been associated with various phases of national defense activities and, more recently, the management of research and development activities in the Army. In June 1959 I resigned as Chairman of the Army Scientific Advisory Panel and President of the National Research Corporation in order to devote full time to Government service as Director of Research and Development for the Army. At that time and prior to my appointment as Assistant Secretary of the Army (Research and Development), I clearly indicated that it was not my intention to remain in Government Service for an extended period.

"Substantial progress has been made in reorganization of the Army research and development effort and structure. I am pleased with the improved management of the Army's development programs and that the Office of the Assistant Secretary of the Army (Research and Development) has now been given increased authority and responsibility commensurate with corresponding positions in the other two Services.

"My association with both military and civilian members of the three Services and of the Office of the Secretary of Defense has been a stimulating and rewarding experience. Our new administration has brought to Washington an extremely able and dedicated group of individuals with whom I have greatly enjoyed working, and under the leadership of Secretary Stahr I am certain that the Army will make tremendous progress.

"I hope that my as yet undetermined plans for the future will not preclude a continuing association with other defense or other Government activities in the event my background and experience might be useful."

Leaders at the 11th meeting of the Army Mathematics Steering Committee included (left to right) Dr. Meredith P. Crawford, Director of HumRRO; Dr. Thomas H. Carroll, newly installed President of George Washington University; Dr. Ivan R. Hershner, Jr., Chairman of the AMSC and Chief of the Physical Sciences Division, Army Research Office; and Dr. B. D. Van Evera, Dean for Sponsored Research at the George Washington University.

Math Steering Committee Discusses Research Aims

Research opportunities in mathematics which have foreseeable major impact on broad military problems—related to modern warfare requirements for greatly advanced methods of calculating, computing, programing and analysis—stimulated discussion at the 11th annual meeting of the Army Mathematics Steering Committee.

Under the auspices of the Human Resources Research Office (HumRRO) headquarters on the campus of George Washington University in Washington, D.C., the Committee met on May 11-12 and was welcomed by Dr. Thomas H. Carroll, newly installed 13th President of the University.

Discussion centered on programing for activities at the Army Mathematics Research Center (AMRC), on the campus of Wisconsin University at Madison, Wis., and a program of numerical analysis under direction of Dr. Frank Murray at Duke University.

Other high priority discussion topics included a forthcoming Conference on Design of Experiments to be held this fall at the Army Signal Research and Development Laboratories, Fort Monmouth, N.J., and a proposed survey on information retrieval.

Among the principal speakers were Dr. B. D. Van Evera, Dean for Sponsored Research, George Washington University, and directors of three University-affiliated Government contract agencies—Dr. M. P. Crawford, Director of HumRRO, Dr. W. H. Marlow, Director of the Navy Logistics Research Project, and Dr. G .C. Jacobus, Director of the Army Logistics Research Project.

Distinguished mathematicians who made progress reports included Dr. Rudolph E. Langer, Director of the AMRC, and Dr. Murray, Director of Special Research in Numerical Analysis at Duke University.

Dr. Ivan R. Hershner, Chairman of the Committee and Chief of the Physical Sciences Division, Army Research Office, OCRD, presided at the general sessions. Dr. Hershner played a prominent part in establishment of the AMRC in 1958 and in the formation of the Army Mathematics Steering Committee in 1956.

QM Statistician Gets Degree As Doctor by 10-Year Effort

More than 10 years of night school studies directed toward a specific goal culminated successfully when Selig Starr received his Ph.D. degree from George Washington University June 7.

Dr. Starr, 41, has been employed since 1958 in the Operational Mathematics Office, Quartermaster Activities, Cameron Station, Va. A statistician in the Army for 10 years following his discharge from military service in 1946, Dr. Starr served in a similar capacity in the Naval Propellant Plant from 1956 to 1958. He received his A.B. degree from Brooklyn College in 1940 and his A.M. degree from George Washington University in 1951.

ABMA Schedules 2-Day Meet For Reserves on Missiles

A Guided Missile Orientation School for reserve officers sponsored by the 3353rd USAR Research and Development Unit is scheduled at the Army Ordnance Missile Command, Huntsville, Ala., Oct. 14 and 15.

Attendees will visit the Ordnance missile laboratories and the space vehicle laboratories of the National Aeronautics and Space Administration's George C. Marshall Space Flight Center.

Participating will be reserve officers from the 3rd Army area, five National Guard officers from each State, and a designated number of officers from 3rd Army posts, the Office of the Chief of Research and Development, Ordnance Corps, and the United States Continental Army Command.

Other Army officers on reserve or active duty status may attend by contacting the 3353rd USAR Research and Development Unit at Huntsville. A secret security clearance is required.

Lectures and briefings are programed on the Army Ordnance Missile Command, the Army's guided missile and ballistic missile families, the NASA laboratories and space travel, guidance, control and propulsion systems, ground support equipment, maintenance, repair and checkout equipment, and on health and safety considerations.

Maj Gen Lyter Assigned CG Walter Reed Medical Center

Maj Gen Clinton S. Lyter, Commanding General, Walter Reed General Hospital, Washington, D.C., has been reassigned as Commanding General, Walter Reed Army Medical Center.

General Lyter succeeded Maj Gen Clement F. St. John, who retired from the Army in April. General St. John, who served with the Army 33 years, has been named a vice president of the University of Cincinnati and head of its Medical Center.

Brig Gen Floyd Wergeland succeeded General Lyter as Commanding General of the Walter Reed General Hospital after serving as its Executive Director.

Von Karman Given Tribute By 700 on 80th Birthday

More than 700 Government and scientific leaders, including top figures in the aeronautical sciences, recently attended a dinner in Washington honoring Theodore von Karmon, "father of American aerospace science" on his 80th birthday.

The Air Force and Institute of Aerospace Sciences sponsored the tribute, which included lectures by former students and associates of the eminent Hungarian-born scientist. Air Force Under Secretary Joseph V. Charyk spoke at the dinner.

Army Scientific Advisory Panel members relax during break at spring meeting at Fort Eustis, Va.: (left to right) Maj Gen Norman H. Vissering, CG; TRECOM; ASAP Chairman Clifford C. Furnas. Chancellor, University of Buffalo; Col John D. Crowley, Jr., CO TRECOM; Lt Gen Arthur G. Trudeau, Department of the Army Chief of Research and Development; Richard S. Morse, Assistant Secretary of the Army (Research and Development).

ASAP Hears Stahr Call for Army Modernization

Priority problems concerned with advanced air, surface and water mobility concepts occupied some 60 of the Nation's leading scientists, industrialists, engineers and educators at the spring meeting of the Army Scientific Advisory Panel at Fort Eustis, Va. The U.S. Army Transportation Research Command (USA TRECOM) was host to the Panel.

Secretary of the Army Elvis J. Stahr, jr., called for acceleration of Army modernization, saying that scientists must respond to the President's appeal in this respect. Particularly needed, he said, is a major advance in ground mobility.

The Secretary asked Panel members for a "continuous flow of new ideas and concepts" and for counsel in deciding "what is best to adopt, produce and procure as new Army material, and what should be cast aside as unpromising."

Participants in the 3-day meeting included Assistant Secretary of the Army (R&D) Richard S. Morse, Chief of Research and Development Lt Gen Arthur G. Trudeau and Chancellor of the University of Buffalo Dr. Clifford C. Furnas, ASAP Chairman.

Maj Gen N. H. Vissering, CG, Transportation Training Command, welcomed the gathering which included Chiefs and Deputies of the Technical Services, General Staff and Special Staff.

ASAP subpanels considered problems in the fields of air mobility, chemical, biological and radiological warfare, communications and electronics, environmental research, improved firepower, surface mobility, human factors and engineering, and management of Army research and development.

Attendees viewed demonstrations of USATRECOM's newest equipment, including amphibious cargo carriers, ground effects machines (GEM), the Iroquois and Choctaw helicopters, fixed-wing aircraft such as the Piper Aztec, the Caribou and the Mohawk, and the S-62 Flying Boat. Shown also was the Skylark, an amphibian with retractable wheels capable of speeds up to 47 m.p.h. on water.

"Big Picture" Shows Teamwork Of Army, Industry on R&D

The vital partnership existing between the military and the civilian economy was brought home to TV viewers in the Washington area recently by the telecast of a program titled "Partners in Progress."

Part of the Army's television documentary series, "The Big Picture," the program told the story of the cooperation in research and development between the Army Corps of Engineers and American industry.

Within three or four months copies of the film will be made available through Army Central Film Exchanges and Information Officers at each Army headquarters, following TV showing at 394 Army and civilian installations, including 50 overseas.

Picatinny Centers Research On Ammunition Initiators

Scientists engaged in research and development involving ammunition initiators at Picatinny Arsenal, Dover, N.J., are profiting from the recent consolidation of facilities at the Arsenal.

In a newly remodeled building, facilities are available for welding microscopic wires to electrodes, photographing test explosions, X-raying initiators and for making electronic tests. The building also houses equipment for pilot-lot blending, simulated high-altitude tests, temperature and humidity tests and related operations.

Initiators are tiny but important components that set off an explosion of ammunition. Of the two most common types of initiators, detonators are generally more powerful, causing an explosion; a primer, the other type, simply initiates rapid burning.

Electric initiation makes up the bulk of today's work on the firing component, with emphasis on miniaturization. Standard initiators range in diameter from .145 inch to .285 inch. Small as they are, designers are trying to make them even smaller.

The exploding wire in the primer or detonator, which replaces the sensitive primary explosive ordinarily used, has gained increased importance. One of its major advantages is that it can rarely be set off unless high electrical energy is applied. Other initiators can inadvertently be activated by slight impact, stray radio waves, or by static electricity found in the human body.

Picatinny Arsenal, the U.S. Army Ordnance Corps' principal research and engineering center for ammunition and special weapons, has worked on detonators for antiaircraft and antitank ammunition as well as for such missiles as the Hawk, Jupiter and the Nike Zeus.

Nobel Biochemist to Address QM Chemistry Conference

Prof. A. I. Virtanen, famed Finnish biochemist and Nobel Prize winner, will speak at the 5th Annual Organic Chemistry Conference scheduled for Oct. 12-13 at the Quartermaster Research and Engineering Command in Natick, Mass.

Prof. Virtanen's subject will be "The Significance of Sulfur Compounds in Human Nutrition."

Sponsored by the National Academy of Sciences-National Research Council, the conference is expected to bring about 150 scientists to the research installation.

Industry, Military Engineers Convene at APG

Industry engineers exchanged views with military and civilian engineers of the Army and Navy at a recent joint meeting at Aberdeen Proving Ground, Md., sponsored by the Baltimore Section of the Society of Automotive Engineers.

Speakers representing the three groups addressed approximately 200 attendees. Dr. Andrew A. Kucher, president of the Society of Automotive Engineers (SAE) and vice-president, engineering and research, Ford Motor Co., Detroit, gave the keynote talk.

Mentioning that the various committees of the SAE had performed work which benefited the military services, Dr. Kucher noted specifically that the society's technical committee's standardization program had simplified design and production of material for the services as well as commercial products of industry.

"The development of a uniform SAE test method for the evaluation of air cleaners, lubricating oil filters and fuel filters provided valuable guidance for the military services," he said.

Other speakers included Brig Gen John H. Weber, Commanding General, Aberdeen Proving Ground, who welcomed the group; William A. Gross, Jr., of the Development and Proof Services, who spoke on "Engineering Testing of Ordnance Vehicles," and J. C. Emanuel, also of the D&P Services, on "Multifuel Engines—Why—How—When."

Representatives of the Navy who spoke at the meeting were H. V. Nutt, Technical Director of the Naval Engineering Experiment Station, Annapolis, Md., and L. J. Argiro, W. A. Tewes, Jr., and John Harrison, all of the Experiment Station.

The mission of the Proving Ground's Development and Proof Services was explained by a film shown to the group. The meeting also included a tour of the U.S. Army Ordnance Museum School's automotive shops.

Agencies Join in Mapping Ozone Concentration

Recording the geographical distribution of surface ozone concentrations in the Continental United States is the goal of several U.S. Government agencies concerned with the deteriorating effect of ozone on rubber, vegetables, fruits, tobacco and other growths.

The joint attack on ozone damage was initiated at a recent meeting of the Ordnance Tank-Automotive Command (OTAC) with other U.S. agencies. Representatives of the Materials Branch, OTAC, U.S. Public Health Service, U.S. Weather Bureau, U.S. Department of Agriculture and U.S. Army Signal Corps participated.

W. D. England, Chief, Materials Branch, Research & Engineering Directorate, Engineering Division, OTAC, discussed the attack of ozone on rubber, especially upon rubber items in long-term storage. He said it would be of tremendous advantage to the Department of Defense if ozone recordings were made at strategic points throughout the Continental United States. It would be possible then, he said, to store items in less ozone-concentrated areas and also to improve storage protection when ozone concentrations showed an increase.

Representatives of the Public Health Service disclosed they were planning to have approximately 50 recorders strategically placed throughout the United States by June 1. Since this equipment records total oxidants, and not ozone alone, OTAC offered to supply, as its contribution, six portable ozone recorders to be placed at Chicago, Cincinnati, New Orleans, Philadelphia, San Francisco and Washington, D.C.

Attendees agreed that their agencies would provide A. C. Stern of the Public Health Service with data which would enable him to augment his present program and to provide information to the other agencies relative to ozone concentrations throughout the United States.

$17,412,370 Contracts Let For M-60 Tanks, Retrievers

The Army has awarded two contracts totaling $17,412,370 to Continental Motors Corp. for production of engines for the M-60 tank and the M-88 tank recovery vehicles.

These contracts supplement the recent $56 million award to the Chrysler Corp. for 660 M-60 tanks, and the $17.6 million award to the Bowen-McLaughlin-York Inc., for 200 M-88 tank recovery vehicles.

Awarded by the Detroit Ordnance District, close to $14 million is for 792 tank engines, and about $3.5 million for 220 tank recovery engines.

The International Harvester Co. has been awarded a $34 million contract for 3,224 five-ton trucks.

USAR Units Slate Meeting In California Aug. 13-17

Reserve officers of the three services assigned or attached to R&D type units will participate in a seminar on Basic Research and Military Technological Development August 13-27 at the Davis Campus of the University of California, Davis, Calif.

The sessions, classified secret, are sponsored by the 6157th U.S. Army Reserve Research and Development Unit (Reinforcement Training), Davis, Calif.

The current status of the Army's research and development programs will be presented by each of the Technical Services. Featured speakers include Chancellor Herbert F. York, of the University of California, ex-Director of Research and Engineering, Department of Defense, and Lt Gen Arthur G. Trudeau, Army Chief of Research and Development.

Welcome will be extended to the reserve military researchers by Governor Pat Brown of California; Lt Gen Robert M. Cannon, Commanding General, Sixth U.S. Army; Maj Gen William N. Gillmore, Commanding General XV U.S. Army Corps; and Maj Gen Frederick R. Zierath, Commanding General, X U.S. Army Corps.

Following General Trudeau's opening review of the Army Research and Development program, presentations will be made by the Chemical, Signal, Transportation and Ordnance Corps, and by the Corps of Engineers.

Seminars will be held on the "Principles of Propulsion and Missilry," "Recent Advances in Genetics," "Modern Concepts of Matter," "Modern Concepts of Viruses," "Recent Advances in Agricultural Engineering," "Use of Radioactive Isotopes in Research," "Transfer of Information," and "Radiation Biology."

Field trips offered include one to the Aerojet-General Corp. plant at Nimbus, Calif., where the R&D shops, laboratory building, and test areas of the Liquid Rocket Plant and the R&D manufacturing building of the Solid Rocket Plant will be inspected.

Trips to the University of California Radiation Laboratory at Livermore, Calif., the General Electric Corp. Atomic Reactor at Vallecitos, Calif., and the Radiation Laboratory at the University of California's Berkeley Campus are also offered.

Dr. Paul A. Siple, Scientific Advisor of the Army Research Office, will review activities of the International Geophysical Year, and the Navy and Air Force will summarize their Reserve R&D programs.

CmlC R&D Guidance Seminar Arouses Widespread Response

Project WASP, the second of a series of U.S. Army Chemical Corps Research and Development Guidance Seminars, was held with the U.S. Continental Army Command at the U.S. Army Command and General Staff College, Fort Leavenworth, Kans.

Participants included Chemical Corps scientists and staff officers and combat arms officers as selected by USCONARC. Approximately 150 attendees represented educational institutions, industry, the military and Government agencies, including the Department of Defense, Chief of Army Research and Development, Office of the Chief of Defense Mobilization, Army Deputy Chief of Staff for Operations, The Surgeon General, U.S. Navy, U.S. Air Force and U.S. Marine Corps.

Lt Gen Arthur G. Trudeau, Chief of Research and Development, Department of the Army, opened the seminar with a discussion of the urgency for the reduction of lead time and the necessity for the exchange of ideas between the developer and the potential user.

Maj Gen Marshall Stubbs, Chief Chemical Officer, reiterated the objectives of the Chemical Corps and stressed the necessity for rendering research and development decisions that reflect that best integrated judgment of representative operational personnel.

Dr. Robert Strausz-Hupé, Director, Foreign Policy Research Institute, University of Pennsylvania, spoke on the "Protracted Conflict." He pointed out the need for realizing that there must be an integration of many factors such as political, economic, social, etc., as well as military, in the struggle with communism.

Other distinguished speakers included Dr. Aubrey K. Brewer, Office of Director of Naval Intelligence; Dr. Knut A. Krieger, Professor of Chemistry and Director, Project SUMMIT, University of Pennsylvania; Mr. L. W. Mullane, Vice President of Aerojet-General Corp. and General Manager of the Downey Plant; Col Carl S. Casto, Commanding Officer, U.S. Army Chemical Corps Biological Laboratories. Fort Detrick, Frederick, Md.; Col E. V. Needels, ODCSOPS; and Dr. Seymour D. Silver, Scientific Director, U.S. Army Chemical Research and Development Laboratories, Army Chemical Center, Md.

A Research and Development Guidance Seminar is a conference between the developer and user service at which particular subjects are studied, problems are solved, and opinions gathered. The problems consist of staff planning exercises of limited or general war in which candidate weapons systems are played. The results of the map exercises and the reasons for selection of "weapons of choice" are ascertained and evaluated.

Project WASP seminar speakers included (left to right) Dr. Robert Strausz-Hupe, Director, Foreign Policy Research Institute, University of Pennsylvania; Lt Gen Arthur G. Trudeau, Chief, Army Research and Development; Maj Gen Marshall Stubbs, Chief Chemical Officer; Brig Gen W. A. Cunningham III, Deputy Commandant, Command and General Staff College.

From an R&D point of view, the seminar presents a means of screening concepts and yields guidance for refinement of design criteria and program modification, with a resultant shortening of lead time.

The Chemical Corps provides all of the technical inputs to the seminar in terms of projected weapons systems, weapons effects forecasts, meteorological parameters, agent effects previews, projected defense requirements, and production to target logistics predictions.

The Operational Service provides the operational know-how in terms of map exercises of tactical or strategic operations, the facilities for conducting the seminar, the operational personnel for play of the seminar problems, and personnel for post-seminar analysis and evaluation.

The seminar is conducted as a team operation. Two operational service personnel solve the map problems. A Chemical Staff Officer and a Weapons Effects Specialist provide the needed technical information and answer technical questions that arise as a result of the play. During the exercises, information is exchanged and recorded and the reasons for the decisions of the operational personnel are documented. Final results are analyzed and evaluated.

From an R&D point of view, the seminars have very specific results. The first of these is the identification of the best possible candidate weapons systems. The next most important result is the identification of areas requiring further investigation.

These two items are the immediate result of the seminar and proceed from the decisions made by representatives of the user service.

From these come provisions for R&D program modification and continued redevelopment of the integrated master plan.

As a result of the operational play of the map problem, the user service not only has an opportunity of familiarization with candidate weapons systems but an opportunity of viewing them in operational context. Since the candidate systems are sufficiently advanced to merit operational consideration, the seminar can be used to evaluate systems concepts in terms of combat development and military requirements. This permits a preview of many parameters associated with operational use; for example, in training, organization and logistic requirements.

Attainment of the objectives of a Chemical Corps R&D Guidance Seminar may be summed up as follows:

1. Effecting a high degree of user-developer communication.

2. Bringing operational experience to bear on design criteria for biological and chemical weapons for modification of design or projecting new weapons.

3. Anticipation of the impact of biological and chemical weapons systems on future tactics and strategy.

4. Ensuring the proper orientation of the biological and chemical R&D program by direct contribution.

5. Reducing lead time.

6. Acquiring data and insight regarding combat developments, training, requirements, tactical doctrine, logistics considerations, organization, intelligence, medical and psychological factors.

Paraglider Rises From Toy to Mobility Device

A test flight program now underway may transform what started out to be a child's toy into an important tool for improving the Army's mobility.

Under test is a man-carrying aerial vehicle with a paraglider wing. The paraglider is an aerodynamically stable and controllable device shaped like two semi-conical sections fastened together horizontally to form a wing-like structure.

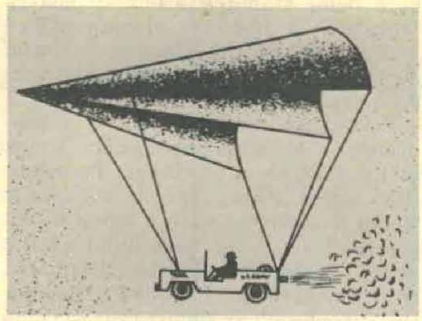
Originally, the paraglider was conceived by Francis M. Rogallo, an aeronautical engineer at the National Aeronautics and Space Administration's Langley Research Center, who put it on the market as a high-performance, tailless toy kite.

Spurred by curiosity, Mr. Rogallo continued to investigate his concept in the Langley wind tunnels, and otherwise. A free flight model built with a payload attached was dropped from a helicopter. Later a radio control unit was installed in a model and controlled flight was accomplished in a drop.

After these and other tests, Mr. Rogallo and his associates at NASA submitted the idea to the Transportation Research Command (TRECOM) at Fort Eustis, Va., with the suggestion that it might be used to improve Army air mobility. TRECOM engineers joined with NASA engineers in studies of possible uses of the paraglider.

Foreseeable possible applications of the device included airdropping loads on target, its use in air towing equipment to a drop area, as an auxiliary wing on an airplane to improve its short takeoff and landing capabilities, and as an emergency landing system in case of power failure.

Meanwhile, Ryan Aeronautical Co. became interested in the concept and built an aerial vehicle supported by a paraglider and capable of carrying a man. The company offered the vehicle to the Government for test flying. In March 1961, TRECOM negotiated a contract with Ryan, calling for a 30-hour flight test program. Designed to demonstrate the vehicle's control, power, stalling speed, rates of pitch, roll and turn, these tests set the stage for a 40-hour test program by NASA pilots.



Paraglider, powered by jeep, illustrates concept of using device to enable vehicle to hurdle an obstacle.

The machine will be instrumented to provide records of speeds, pitch and roll rates, control positions, and other data. Findings will enable TRECOM engineers to determine what would be necessary to make the vehicle capable of accomplishing some of its foreseeable military uses.

NASA has awarded two contracts to study methods of recovering large rocket boosters by using paragliders. TRECOM plans similar study in the area of improved Army mobility. The Ordnance Corps is planning to study possible use of the paraglider to recover boosters from weapons such as the NIKE.

The child's kite has already flown quite a way out of toyland.

WSMR Ordnance Mission Sets Up Calibration Laboratory

A calibration laboratory with mobile equipment for on-the-spot calibration has been established by the Ordnance Mission (OM) at the White Sands Missile Range (WSMR), N. Mex.

Occupying 14,000 square feet, the new laboratory is part of a formal calibration program set up to utilize and broaden calibrating and certifying services. To start its schedule, personnel have been transferred from the Standards and Instrument Control section of OM's Electro-mechanical Laboratories. Additional technical personnel are being employed and new equipment will be installed as activities expand.

Exemplifying equipment on order is an electrical meter calibration console. Accurate within a few hundredths of one percent, with digital readouts, it will speed up calibration of volt meters, ammeters, power meters for direct and alternating currents.

D. M. Herzmark, Army civilian employee, has been designated laboratory director and Glenn C. Wright, assistant.

The laboratory establishes and maintains basic electrical and mechanical standards for WSMR. These include calibration of WSMR standards by the National Bureau of Standards and intercomparison with other standards laboratories.

With the establishment of the new program, a system will be initiated whereby all the range's measuring equipment will be regularly calibrated. Careful records of the certification dates will be kept. At present, a survey of all such instrumentation is being made by each of the agencies.

When agencies report that certain test equipment will not be used over a considerable period, it will be sent to the laboratory's instrument library to be available for other users.

A unique feature of the laboratory, the instrument library has control over $1 million worth of multi-purpose instruments. Equipment is catalogued and specifications are carefully checked to keep the library's technical literature file on all instruments current. Rentals are made to all agencies at WSMR and to nearby military installations.

To keep the laboratory's technical personnel up-to-date on calibration standards and advances, special classes will be conducted.

David Dill Retires, Gains 2 High DOD Civilian Awards

David Bruce Dill, who retired April 30 as Deputy Director of Medical Research at the U.S. Army Chemical Research and Development Laboratories, has been recognized by two of the highest Department of Defense civilian awards.

Maj Gen Marshall Stubbs, Chief Chemical Officer, presented him with the Decoration for Exceptional Civilian Service, the Army's top civilian award. The internationally known physiologist was cited for his achievements in directing research in the biological sciences during his 14-year career at the Army Chemical laboratories.

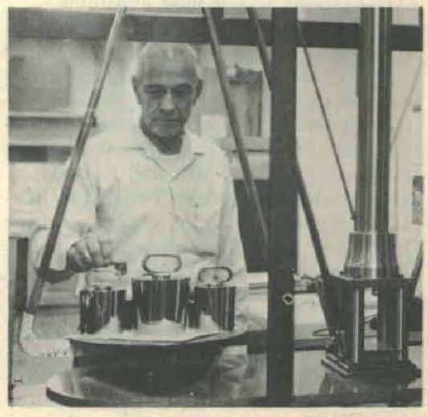
Dr. Dill also was presented the Department of Defense Distinguished Service Award by Deputy Secretary of Defense Roswell L. Gilpatric during a Pentagon ceremony.

Dr. Dill left the Harvard University faculty in 1947 to become a Chemical Corps scientist. He had been Deputy Director of Medical Research since 1956. Dr. Dill has accepted an appointment as a research scholar at the University of Indiana.

QM R&E to Publish Report On Tasty Dehydrated Hams

Scheduled for publication in the near future is a report on "Investigation of the Processing Conditions Necessary for the Manufacture of Highly Acceptable, Stable, Precooked Freeze-Dehydrated Hams."

Unclassified and to be made available as open literature, the report covers research conducted by Oregon State College under contract with the Quartermaster Food and Container Institute for the Armed Forces, Research and Engineering Command, U.S. Army.



M. M. Goldsby, Chief, Mechanical Standards, takes precise weight reading on missile component in new White Sands Calibration Laboratory.

Engineer Corps' Study Indicates Lunar Test Center Need

Before man and his instruments can perform useful work on the surface of the moon, the clothing, structures, life support systems and machinery to maintain them must be tested in an earthbound simulator of the lunar environment.

No governmental agency has yet been assigned the task of developing a lunar environmental simulator, but preliminary research by the Missile and Space Office of the Corps of Engineers Research and Development Laboratories (USAERDL) has determined what some problems may be.

The USAERDL study also indicates that the development of the environmental test center should be commenced in the near future, and that the scope of the problems involved commends the development of a single center with participation by all of the interested agencies.

The rockets and payload systems that will place man on the moon are moving ahead rapidly. Present estimates by the National Aeronautics and Space Administration and the U.S. Air Force are that systems capable of taking man to the moon will be ready sometime after 1970.

The USAERDL findings indicate that lunar environmental simulation "know how" needed 10 years from now may not be available for 20 years.

Studies foresee that design and construction of an adequate simulator would take 36 months, and that one or two additional years would be necessary to instrument it, to "de-bug" it and bring it up to its design capabilities.

Principal findings of the USAERDL studies are:

a. The technical capability to accommodate development of lunar support systems is not now available.

b. Based on past experience, it is concluded that development of lunar support systems must be carefully planned and controlled.

c. Development of a capability to test lunar support systems will require two types of facilities: (1) small-scale laboratory "bench top" facilities; and (2) a large-scale center that could actually simulate the lunar environment.

USAERDL researchers estimate conservatively that such a simulator would cost $6 million, exclusive of instrumentation and support facilities. The design of the facility alone, USAERDL estimates, will cost over $500,000.

The proposed simulator, according to current USAERDL studies, would be a dome standing about 10 meters high with a 10-meter diameter. The wall would be the simulator's basic shell and would incorporate its vacuum system.

Solar radiation would be reproduced by high-pressure xenon lamps in the laboratory's ceiling. To establish temperature control, the walls would be mounted with a liquid nitrogen heat sink; the heat input of the xenon lamps would be dissipated through the walls' heat sink, allowing the extreme lunar temperatures (plus 212° F. to minus 270° F.) to be simulated.

The floor of the chamber would be covered with a 5-meter thickness of simulated lunar soil, recreating the lunar surface's thermal factors and reflectivity.

One meter beneath the soil surface would be another laboratory simulating a shelter buried beneath the moon's surface. This laboratory would be extremely useful for life support studies—especially for study of the problem of removing human-exhaled CO_2 from the environment.

Between 18 and 20 vacuum pumps strategically placed in the dome's walls would maintain the lunar atmosphere, and chamber locks outside the lunar laboratory would afford entry of man and materials without destroying the lunar environment.

The USAERDL basic design provides for a separate lock to the underground chamber, allowing experiments there to be conducted independently of the surface chamber. The two chambers could also be integrated, and the laboratory's personnel could move from one to the other without going outside or disrupting the environmental system.

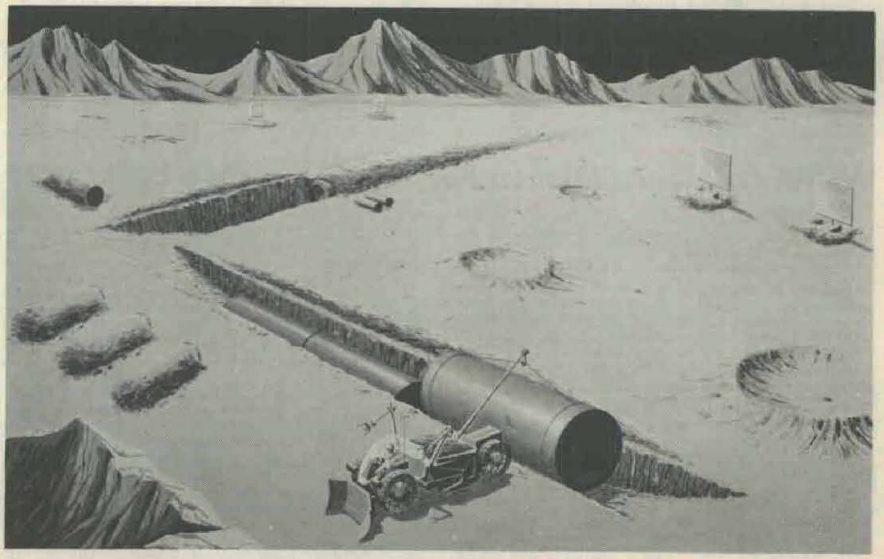
One problem in designing new laboratories is to determine future needs so that they do not become obsolete before their time. For this reason, the USAERDL design has incorporated a materials chamber lock large enough to allow the largest conceivable payload of the giant Saturn booster to enter the laboratory.

In order to test adequately the support equipment, USAERDL research indicates it may be necessary to sustain for a minimum of 15 days (the equivalent of a lunar day and night), the lunar environment inside the laboratory. To accomplish this a plant manufacturing 75 tons of nitrogen a day must be constructed next to the laboratory.

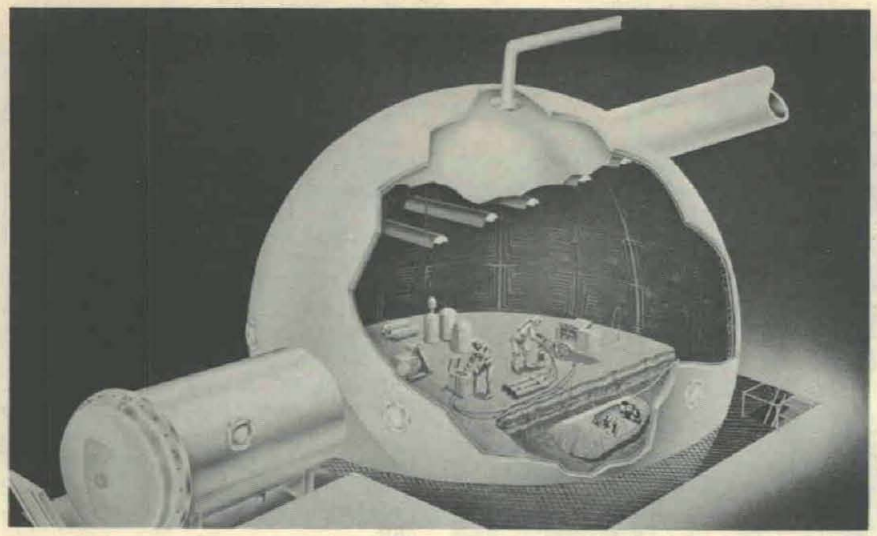
What answers will a lunar environmental simulator give?

According to one Missile and Space Office scientist, "for every answer found, more new problems will develop—problems we cannot now anticipate." He pointed to the Corps of Engineers' experience in constructing the Arctic simulators. Many of the problems whose solutions allowed the successful construction of Camp Century and the other Arctic bases had not been thought of until discovered through simulation of conditions.

Answers to known problems are formidable. Before mobility on the moon is achieved either with a manned or unmanned vehicle, one Missile and Space Office scientist explained, "We



Artists conception of lunar equipment which should be tested on earth before placed on the moon, including shelters, electronic gear, and tractors.



An early Corps of Engineers design concept of a lunar environmental test chamber. A more advanced design is described in the accompanying story.

have got to go back to the wheel and come up with one that will work on a bearing we don't have."

Before safe lunar structures can be built, research must be conducted to solve the problem of gas diffusion through construction materials.

Moon suits and man-machine combinations must be tested in a simulated lunar environment to test their safety, practicality, and reliability.

The problem of keeping man safe and his instruments in working order on the moon is quite different from the problem—mostly solved—of keeping man safe and his instruments in working order in space. Conduction, reflectivity and other problems connected with the lunar surface make simulated tests a necessity.

Because of the varied and unrelated types of basic scientific research that must be conducted before man's lunar supporting equipment is ready, the USAERDL studies recommend that plans for a lunar environmental center take into consideration every interested Government organization's known requirements.

Because the problems connected with building such a simulator are formidable, the USAERDL studies conclude that the best approach is to concentrate the national effort in the construction of one center available to all parts of the Federal structure, rather than dissipate the effort by allowing individual agencies to build their own specialized simulators for their own special needs.

CE Contractor Develops Lamp Brighter Than Sun

The most powerful xenon high-brightness lamp in the world—equal in lighting power to 200 present-day 100-watt light bulbs—has been developed by U.S. Army Corps of Engineers.

The new light source, which has a rated capacity of 8,000 watts, was built by the Duro-Test Corporation, North Bergen, N.J., under a contract with the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

Although developed for powerful Army searchlight applications, this new high-powered light source is expected to have numerous other military, space, and commercial applications.

The lamp creates a luminous source approximately 7 millimeters in diameter with a brightness of two to three times that of the sun. The radiating xenon plasma achieves a temperature of 15,000° F. and is confined by a fused quartz envelope under a pressure of 140 pounds per square inch.

It is expected that the new lamp will replace carbon arc lamps in many applications inasmuch as it is clean, offers maintenance free operation, has no open flame with carbon fumes, has perfect daylight color of light, and has a life up to 1,000 hours.

Pershing Missile Exceeds Range of Redstone in Test

Even though it was preset to cover less than its full range, the Army's Pershing ballistic missile in a recent successful firing test at Cape Canaveral, Fla., exceeded the maximum range of the Redstone missile it is scheduled to replace.

Brig Gen Richard M. Hurst, commander of the Army Ballistic Missile Agency, said, "The missile used high performance first stage and second stage motors. All test objectives were met. We were pleased with the result."

The missile carried a new tapered nose section. Two pieces of ground support equipment planned for use by troops were used in the firing. The missile was fired from its mobile transporter-erector-launcher, which, in turn, was mounted on a tracked prime mover that will be used for ground transportation. The Pershing will also be transportable in fixed wing aircraft or helicopter.

The test program for the two-stage inertially guided missile has been breaking all records for successful firings at the Atlantic Missile Range.

COLD WAR COSTS CITED

The East-West cold war is costing the people of the world $14 million an hour, mostly for building military weapons, Under Secretary of the Army Stephen Ailes said recently before the California Convention for Reserve Officers.

White Sands Solves Persistent Radar Problems

Engineering research of the U.S. Army Signal Missile Support Agency at White Sands Missile Range, N. Mex., has produced the answer to two problems that have plagued radar men since invention of the device. These problems are "ground clutter" and "heat boil."

Ground clutter is the interference with the missile tracking radar signal caused by objects on the surface of the earth. Heat boil is radar signal distortion caused by thermal energy stored in the ground, resulting in target shimmer.

To overcome these disturbing factors when tracking a missile in early stages of trajectory near the earth, research and development engineers at White Sands have developed an automatic target image tracking device mounted on the radar.

The automatic tracker also overcomes the interfering effects of dust, moisture, and other influences near the ground that bend, or "refract," the radar signal.

Before the development of the automatic target tracking system, it was necessary to operate radar sets manually when tracking a missile near the ground. An optical device positioned the radar in this part of the trajectory.

The target image tracking system keeps the radar on target automatically during the launch stage. Once free of disturbing ground influences, the radar locks on the target electronically and tracks it.

Harold Lambeth, Deputy Chief of Signal Missile Support Agency's Television Division, who developed the tracker, noted: "The exploration of automatic image sensing devices as aids in missile tracking has only begun. Application of this device is not limited to radar use. This is an important first step in the development of an entire family of target sensing systems."

Lambeth was assisted in the development of the device by Robey Cathey and James Stamps, under the supervision of Capt Albert Cunningham, Chief of SMSA's Television Division.

Army School Emphasizing Science of Management

Headquarters of the Army Management School, Fort Belvoir, Va.

In this electronic, atomic, missile age in which sound management decisions must be made quickly in all phases of military activity, the U.S. Army is placing increasing importance on the education of its leaders in the science of management.

Responsible in large measure for this educational task is the U.S. Army Management School at Fort Belvoir, Va. Nine times a year it gives a 3-week management course to Army officers of the rank of lieutenant colonel and above and civilians of GS-13 and higher. Besides the 3-week courses, the School conducts each year two Army Management Orientation Courses of one week each for general officers and GS-16s and higher.

The School was established on the philosophy that command, management and leadership are closely interrelated. Karl L. Bendetsen, Assistant Secretary of the Army for General Management in 1952, recommended that specialized management instruction be offered in the Army school system.

"The commander is the true manager in the Army," Mr. Bendetsen reasoned, and the present Chief of Staff, then Lt Gen George H. Decker, agreed with him. Early in 1953 General Decker, who was Comptroller of the Army at the time, forwarded a memo through the Chief of Staff to the Secretary of the Army recommending that a management school be established.

The Army Command Management School opened its doors on Nov. 28, 1956. Since the curriculum of the School covered areas other than technical instruction in the Army Command Management System, the name was later changed to the U.S. Army Management School. The School has been given the mission of assisting commanders and selected staff officers in performing managerial functions.

To carry out this mission, the School has established the following objectives: (1) to increase knowledge of Army management methods; (2) to stimulate investigation of good management concepts; (3) to study application of modern business methods; to exchange management ideas and information; (4) to foster acceptance of the new and different; and (5) to stress appreciation of the human factor in management.

Courses emphasize equally the executive management a commander or manager performs himself in order to accomplish his mission through his organization, and the installation management problems of program, finance, logistics and manpower management.

The curriculum of the School provides for seminars, exercises, case studies and guest speakers. About half of each course is instructor-oriented and the other half of free discussions is instructor-monitored.

Guest speakers include top Army leaders from the Chief of Staff on down, top Government officials, leaders of industry, and college professors with national reputations in their respective fields. Presentations are approximately one hour in length, followed by a half-hour question and answer period.

The case method of instruction has proved very effective since the attending officers and civilian have broad backgrounds of experience. Participants are told facts of a case situation based on factual events and are asked to discuss among themselves how they would handle it. Several methods of providing situational information for case discussions are used, including a printed record, a skit by the faculty or the participants themselves, or by film.

Though the School makes every effort to insure that participants are physically comfortable, it encourages the students through the media of frank and open discussions to make each other a bit mentally uncomfortable.

Students learn early they must join in classroom discussions with assurance that what they say is correct, because their remarks are critically evaluated by their classmates, who represent approximately 1,000 years of managerial experience.

The interplay of ideas spiced with healthy skepticism ("constructive discontent") and intellectual curiosity, the School has found, produces constructive results. Important to the ability to seek new and better ways to manage more efficiently and at less cost, the School stresses, is to think creatively and conceptually and to develop an attitude receptive to the new and different.

A 2½-day exercise, "Fort Simulation," is presented during the third week of the course. Participants are formed into six installation staffs to operate the installation. Each group is given a priority of missions and identical resources, and must determine optimum utilization to accomplish the overall mission. Decisions must be made on a quarterly basis for a period of six quarters. Results are computed electronically for each staff.

"Fort Simulation" is the only exercise of its kind in the Army school system. Students report it provides

Col William W. Culp, Commandant

an excellent opportunity to apply the principles they have just learned prior to leaving the School.

Instructors are carefully selected. Many faculty members prepare themselves by attending leading universities, the executive courses of major industries, and courses of the American Management Association. They maintain continuous liaison with educational institutions and organizations, and participate in their programs on an invitational basis.

Constant liaison with all echelons from the Department of the Army down to the installation level enables faculty members to keep abreast of current Army management practices and to project their thoughts and efforts into the future. Frequent visits are made to installations and agencies to observe day-to-day practices and to benefit from fruitful ideas of many who are "doing the management job."

Special sessions held by the School recently were the seminar for Army service school instruction, held in May 1960, and a triservice seminar on "Creative Thinking and Decision Making" held in March 1961.

Quotas to the School are controlled by Headquarters, U.S. Continental Army Command. As of mid-May 1961, a total of 3,388 officers and civilians have graduated, including 190 general officers, 2,548 colonels and lieutenant colonels, and 650 civilians.

A recent survey of 1,500 graduates showed that 96 percent felt that the School's curriculum was appropriate to its mission, 98 percent felt the course was beneficial, and 98 percent would recommend attendance for all Army key officers and civilians.

WAC Officer Performs Dual Role in R&D Projects

An attractive dark-eyed lady has an unusual assignment for a woman officer in the Research and Development Division of the Office, Chief of Ordnance.

She is Lt Col Sue T. Bradley, who is chairman pro tem and secretary of the Ordnance Technical Committee which acts on all Ordnance research and development projects. These projects include all materiel required to "arm the Army"—missiles, rockets, ammunition, guns, tanks, howitzers, many types of trucks and other vehicles .

"Wearing her other hat," Col Bradley is secretary and alternate U.S. member of the Tripartite (U.S.-British-Canadian) Ordnance Standardization Committee. This is an agency with the function of insuring full cooperation and collaboration among the member nations in the use of combined resources and effort.

This Women's Army Corps officer is married to Lt Col Robert E. Bradley, Jr., Commanding Officer of a Counter Intelligence Corps Region with station in Dallas, Tex.

She came to Washington from an assignment as WAC Staff Advisor to the Commander-in-Chief, U.S. Army Pacific, Fort Shafter, Hawaii. There she met her future husband, who was serving as an Intelligence Officer on the Pacific Joint Staff. Upon their return to the United States they were married at Fort Myer, Va.

Before starting her Army career in February, 1943, Col Sue Bradley was employed as administrative assistant to the personnel director, National Life and Accident Insurance Co., Nashville, Tenn.

She received her basic training at Fort Oglethorpe, Ga., and attended Officers Candidate School at Fort Des Moines, Iowa.

Col Bradley was one of the first WAC officers sent to London for assignment to Supreme Headquarters during World War II. She went to Normandy only a few weeks after the Allied invasion of the European continent and later proceeded to Berlin. After a tour in the Pentagon, Col Bradley (then a major) became the first Commanding Officer of the WAC detachment at the U.S. Military Academy, West Point, N.Y. Later she was a member of the Staff and Faculty at the U.S. Army Command and General Staff College, Fort Leavenworth, Kans.

She is originally from Nashville, the daughter of Dr. and Mrs. Winston Grady Trulock. A 1937 graduate of the old Ward Belmont School in Nashville, she attended Vanderbilt University and the University of Kansas. During her previous tour in Washington, she studied painting at Corcoran School of Art.

Her decorations include the Army Commendation Ribbon with two Oak Leaf Clusters. The ribbon was awarded in 1945 in Berlin, Germany; the first Oak Leaf Cluster, in 1958 at Fort Leavenworth, and the second Oak Leaf Cluster in 1960, at Fort Shafter.

Lt Col Sue T. Bradley

ERDL Presented Award For Promoting Safety

Winner of the Chief of Engineers' Honor Award for "outstanding contribution to safety in 1960" is the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

Presentation of the award was made early in May by Col J. D. Cole, Assistant Chief of Engineers for Research and Development, and was accepted on behalf of the Laboratories by Col John H. Kerkering, Director.

Two departments, one staff office, 15 branches, and 86 equipment and vehicle operators, supervisors, and individuals received awards in recognition of their fine safety records.

Recipients of the Class I award, limited to those engaged in hazardous work, with their accident-free manhours shown in parentheses, were Administrative Department (541,909); Mechanical Department (578,768); Facilities Planning and Maintenance Branch (530,432); Materials Branch (758,626); Climatic Research and Test Branch (264,522); Developmental Fabrication Branch (365,817); Evaluation Branch (221,484); and Sanitary Sciences Branch (229,572).

OTS Disseminates Worldwide Research & Development Data

An ever-broadening flow of worldwide scientific and industrial research information is available, at nominal cost, to American scientists, engineers and businessmen through the Office of Technical Services (OTS), U.S. Department of Commerce.

The feed pool of this information is the product of billions of dollars of research and translating done each year in the United States and foreign countries. Reports are collected, classified and catalogued by OTS.

OTS offers this information to industry and business, to State and local governments, to other agencies of the Federal Government, and to the general public through the preparation and sale of abstracts, digests, translations, bibliographies, indexes, and microfilm and other reproductions.

Since its organization in 1945 as the Government's technical information clearing house, OTS has built up one of the world's largest collections of nonconfidential technical reports, numbering over 250,000 items.

OTS collects research information from any source available. Most of it comes from the Army, Navy and Air Force, and their contractors, and the Atomic Energy Commission. Other Government sources include the Federal Aviation Agency, the National Bureau of Standards and the Maritime Administration of the Department of Commerce, the Bureau of Mines of the Department of the Interior and the Department of Health, Education and Welfare.

During the first half of 1961, OTS collected Government-produced documents at the rate of 8,000 to 12,000 a year. This rate may be virtually doubled as a result of an agreement between OTS and the Armed Services Technical Information Agency (ASTIA), effective July 1. ASTIA will release to OTS for reproduction and public sale copies of nonconfidential research reports gathered from the military services and their contractors. (See April issue of *Army R&D Newsmagazine*, page 6.)

Since OTS has been in operation, many companies, large and small, have made use of its technical information in their own industrial research and development programs to solve technical problems or improve production processes, without the expenditure of large sums of money.

For example, one company recently reported that two reports of research on a metallurgical problem, which it purchased from OTS for a few dollars, saved it $20,000 to $25,000 which it otherwise would have spent to acquire the same know-how. A large manufacturer of machinery reported that it annually saves thousands of dollars in experimentation and man-hours by using OTS services instead of carrying out the research work itself.

OTS collects and distributes its technical information in a variety of ways. Working arrangements have been made with several agencies under which OTS automatically receives multiple copies of each agency's reports on a cost basis.

When an agency prints copies for its own distribution, an over-run is made to meet the estimated needs of OTS. Of all printed military reports placed in the OTS collection, approximately 75 percent are purchased from the military agency on an over-run basis, and the remainder are printed in the Commerce printing shop.

Reports received in a single-copy reproducible form are reviewed by a 3-man committee of OTS to determine potential value and demand. This group also ascertains whether a report should be printed in full-size form by the photo-offset method or be made available only in photocopy or microfilm form. If the committee decides that a market exists for 100 or more copies of a report, it is reproduced by the photo-offset process, and copies are kept in stock for about two years.

Specialized and older reports, or those considered of limited interest, are not reproduced in volume. Instead, original copies of these documents—approximately 90 percent of the OTS collection—are deposited at the Library of Congress Annex, where they may be reviewed by interested persons. Microfilm or photocopy reproductions may be ordered from the Photoduplication Service, Library of Congress, Washington 25, D. C.

OTS distributes its technical information both by subscription and individual sales. Its technical reports are found in three separate collections: the Publication Board reports, known as PB reports; the Atomic Energy Commission, or AEC reports; and the translated technical literature.

All PB reports are announced and summarized in the OTS abstract journal, "U.S. Government Research Reports." This is a monthly listing of Government research reports available to industry through OTS for the price of reproduction and handling. On a subscription basis USGRR is available for $9 a year ($2.50 additional for foreign mailing) payable to the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. Single issues may be purchased for $1.

Supplementing the USSGR, OTS publishes the *Technical Reports Newsletter*, aimed primarily at small and medium-size industries. This publication summarizes six to eight new reports each month. It is sold by the Superintendent of Documents for $1 a year (50 cents additional for foreign mailing). Single issues cost 10 cents each.

OTS also publishes selective bibliographies, to cover special areas of interest, such as plastics, welding and transistors. The list of available bibliographies may be obtained free of cost from OTS; the printed bibliographies usually cost 10 cents each.

Twice a year OTS issues the AEC Reports Price List, a cumulative listing of AEC reports available through OTS. Since 1950, OTS has been the chief sales outlet for unclassified AEC reports. In addition to the thousands already on hand, new reports are received on automatic distribution from AEC and its contractors, at the rate of 400 a month. These are available from OTS as full-size prints, photostats or microfilm. Price lists are supplied free by OTS on request.

In 1958 OTS established a foreign technical information program to collect, catalogue and publish abstracts and complete translations of Russian and other foreign technical publications. Since then it has been serving as a national clearing house for translations and information regarding translations.

OTS itself collects the many thousands of complete translations and the many more thousands of abstracts of articles and books translated each year by agencies of the Federal Government. It offers these to the public at the cost of reproduction and handling. In addition, OTS catalogues and announces translations available from many other sources in the Nation, public and private, such as the Special Libraries Association Translation Center, which reports its work to OTS.

If a person wants to know whether a particular Russian or other foreign work has been translated or is being translated, he can write to OTS and the Office will use its many facilities to obtain the desired information. Also, if an individual undertakes the translation of a foreign work, he can report his project to OTS which will advise others who may be interested in the work.

To announce, index and abstract new translations available to the public, OTS, in cooperation with the Special Libraries Association, publishes Technical Translations twice a month. This publication lists and abstracts translated technical literature available from OTS, the Library of Congress, the Special Libraries Association, cooperating foreign governments, commercial translators and publishers, universities and other sources. It is sold by the Superintendent of Documents at $12 a year ($4 additional for foreign mailing), or 60 cents for a single issue.

As a further service to the public, OTS publishes the *Patent Abstract Series* and periodical supplements. This series abstracts Government-owned patents which may be licensed on a non-exclusive, royalty-free basis.

On the surface, the work of OTS appears to be a special boon to industry and business. By making possible lower costs of production, or improved products, however, OTS' dissemination of technological information in effect returns to the general buying public a substantial share of the vast sums of tax money spent by Government agencies for research.

Ordnance Technical Intelligence Charts Direction of R&D Activities

By Lt Col Robert G. Blaylock, Commanding Officer, Ordnance TIA

Relying upon strategic intelligence as a guide to operations in wars, hot or cold, is as old as mankind. The caveman who climbed a tree to learn the disposition of the enemy tribe, its numbers, and route of approach, was as necessary an instrument of combat as is his modern counterpart busily engaged in the analysis of complex electronic data.

Use of technical intelligence, i.e., the identity of enemy equipment together with an assessment of its capabilities and shortcomings, probably followed close behind. Nobody knows exactly when or how the first spear was invented, but its effect against the club was probably decisive. Undoubtedly it assured supremacy of the originating tribe until it was copied and surpassed by the enemy.

What does technical intelligence hold for modern research operations? By definition we mean intelligence pertaining to the principles of design and operation nomenclature, physical characteristics, and performance of materiel used by foreign forces. The implements of warfare have changed since the days of clubs and spears, the complexity has become enormous, and lead time in alteration of design has lengthened from hours to years. But the basic necessity of monitoring foreign developments and putting the information to our own use remains as vital as ever.

Unfortunately, this premise sometimes runs counter to the wall of human obstinacy. Americans, like their counterparts in other advanced countries, have occasionally evinced an attitude indicating that we have nothing to learn from abroad. However, those in intelligence continually see irrefutable evidence of the fallacy of such wishful thinking. It should be pointed out that the designer who has labored months, or even years, over his equipment frequently loses sight of the wider scope of things.

Preoccupation with increasing a gun's accuracy, range, and mobility is of utmost importance. Still the most accurate weapon that possesses maximum range and unbelievable maneuverability is just so much wasted effort if it can penetrate only—let us say—six inches of armor, when intelligence knows that the potential enemy will have eight inches of armor protection.

The situation becomes even more inexcusable if intelligence has available knowledge of foreign developments that could have increased the weapon's penetration to ten inches or more. The R&D man who operates without a knowledge of foreign developments—friendly, neutral, and potentially enemy—is literally handicapping himself with a self-imposed blindfold.

If one might question the wisdom of interest in friendly or neutral areas, a moment's reflection will supply the answer. A designer is as anxious to obtain a usable idea from a friendly power as he is from a potential enemy. However, some may still say: "All right, we'll consider friendly developments in our own design; but why must we worry about their defenses in developing our offensive weapons, and their offensive breakthroughs in designing countermeasures?"

Strategic intelligence has an answer. Any Ordnance innovation developed by one country will accrue to another through normal engineering progression, if that country has an advanced scientific capability, a sound industrial base, adequate funds, and an efficient intelligence system. Unfortunately, potential enemies usually possess all of these attributes. The intelligence effort must therefore be worldwide.

Few people today believe the Hollywood concept of intelligence collection through sinister-looking bearded agents who cavort with slinky blondes in an atmosphere of hidden cameras, stolen briefcases, and plunging stilettos. However, even fewer realize that important technical intelligence can be derived from foreign publications, films, broadcasts, and other completely open sources. This is equally true even in countries where strict censorship and stringent security regulations are accepted everyday facts.

Especially significant has been the frequent determination by foreign countries to propagandize their accomplishments in technology, reflected by descriptions of technical details in numerous public journals. In addition, emphasis upon economic penetration by numerous foreign countries has opened other avenues of information. Precision products and highly complicated machinery cannot be sold to other nations without detailed brochures. Since brochures must be scrupulously accurate for sales purposes, they are highly informative.

Acquisitions resulting from this collection effort must undergo numerous processes before they are ready for presentation to the scientist and engineer. Sometimes, but only sometimes, the information is acquired in finished form. More often, technical intelligence is obtained in bits and pieces, frequently meaningless in themselves, but highly meaningful when superimposed against a background of evaluated information.

Within the Ordnance Corps, thousands of reports are continually analyzed, evaluated, collated, and converted into finished studies applicable to a particular command, arsenal, office, or even an individual designer. They are transmitted via periodic publications, special studies, formal briefings, or individual conferences. However, the Ordnance Technical Intelligence Agency can be effective only if it receives specific requests from the research man and the designer.

Happily, this channel is being used with greater and greater frequency. A steady stream of requests for foreign information now flows regularly from the engineer through his own intelligence office to the Ordnance Technical Intelligence Agency.

If adequate advance notice is given, there is, of course, that much greater likelihood that the required information will be available at the time it is needed. This process insures the designer that he can have before him, in collated and readable form, all foreign developments—past, present, and predicted—which will in any way influence his work.

Information thus available reduces the necessity of expending many manhours, large sums of money, and valuable materials on the solution of problems that may have already been answered, in whole or part, by counterpart work overseas. To the engineer it also predicts the "threat" his design will face, that is, the hostile atmosphere in which his equipment will have to operate. This includes the characteristics of weapons that will be available to defeat his own innovation, and the obstacles that his equipment will have to overcome.

In summary, intelligence cannot guarantee the success of our R&D effort. Such success must continue, as it always has, to be dependent upon the skill and ingenuity of the American designer. Intelligence can, however, furnish him with tools that simplify his operations—can provide him with valuable direction and guidance to make attainment of his objective more likely.

Intelligence service has influenced and improved our R&D effort in a wide range of fields, from finished weapons to parts, to thermal batteries, and even to techniques such as improved methods for grinding metals and carbides; its need was probably best expressed by the Chief of Research and Development when he stated:

"In this technological age, foreign scientific and technical intelligence is of the utmost importance and should be further exploited. It is of vital importance that such intelligence be disseminated and utilized."

No one, least of all our equipment designers, can afford to disregard this advice. To do so may prove fatal.

President Designates Rubel Assistant SD

John H. Rubel has been named by President Kennedy to be Assistant Secretary of Defense (Deputy Director of Defense Research and Engineering).

The appointment changes Mr. Rubel's title, but continues him in the post of Deputy Director of Defense R&E to which he was named Mar. 14, 1960. It gives him a $3,500-a-year salary raise, a Government car and chauffeur. Prior to that he had been Assistant Director of Defense Research and Engineering since May 19, 1959, when he came to the Department from private industry.

A native of Chicago and an honor graduate of the California Institute of Technology, where he received a B.S. degree in electrical engineering in 1942, Mr. Rubel has been associated with the General Electric Co., Lockheed Aircraft Co. and Hughes Aircraft Co.

While with Hughes, which he joined in 1946, Mr. Rubel contributed to the development of one of the earliest successful celestial navigation systems in the United States. He also was associated with the development of the Falcon family of missiles. In 1952 he joined Hughes' radar laboratories, later renamed the Airborne Systems Laboratories of which he was named director in 1955. He left to join the Department of Defense.

Mr. Rubel's responsibilities with the Department of Defense have included research, engineering and engineering management aspects of long-range strategic strike forces in being, under development or contemplated for future development. He has also been concerned with related matters including operations analysis relating to the design of strategic weapons systems.

Forty-one years old, Mr. Rubel is a member of Tau Beta Pi, the Institute of Radio Engineers and the American Society for Engineering Education. He is married and has three children.

2 Young Scientists Seeking Aid On Small Problem—Any Takers?

Any Army scientist disposed to make two young potential scientists happy might, just to while away an hour or two of leisure time, prepare an answer which came to the attention of the *Army R&D Newsmagazine*, as follows:

Bureau of Research and Development
Washington, D.C.
Gentlemen:

Please send to me the structural formulas and names of the 1,858 isomers of tetradecane, $C_{14}H_{30}$. Thanks.

Gas Pipe, Lamp, Mirror, Lenses Used for Gun That Might Solve Space Signaling Mysteries

A young scientist of the U.S. Army Signal Missile Support Agency here has put together 70 feet of gas pipe and a fantastic optical system to make a gun that may solve some of the mysteries of sending signals through the upper atmosphere.

Charles Querfeld, 28-year-old physicist in the Missile Meteorology Division of the Signal Agency at White Sands Missile Range, N. Mex., made his gun with standard gas line pipe and fittings supplied by the El Paso Natural Gas Company.

The breech end of the gun is in a laboratory. The barrel, supported by concrete blocks on the sands of the New Mexico desert floor, extends 70 feet from the laboratory building, like a battleship gun from its turret.

Inside the laboratory, at the breech of the gun, Querfeld operates a lamp. At the muzzle of the gun is a concave mirror that bounces the light back to another lens system at the breech. In 100 bounces the gun will produce a light path of more than a mile.

By sealing both the breech and the muzzle of the gun, he may simulate any environment he chooses to test. Querfeld turns on a vacuum pump and extracts the air from the gun to produce the conditions of space. He can pump gases into it to find out, for example, the effects of carbon dioxide or nitrous oxide on the light energy. Or he can fill it with a dusty atmosphere for a desert test, or a salty one to simulate conditions at sea.

Querfeld is seeking data that will be used in the design of infrared devices to detect and track objects in space, and eventually for instruments that will send signals through the cosmos.

Scientists have known for some time that gas and dust particles in the atmosphere weaken and bend light beams and electromagnetic energy. But a system has been needed to measure precisely this "attenuation."

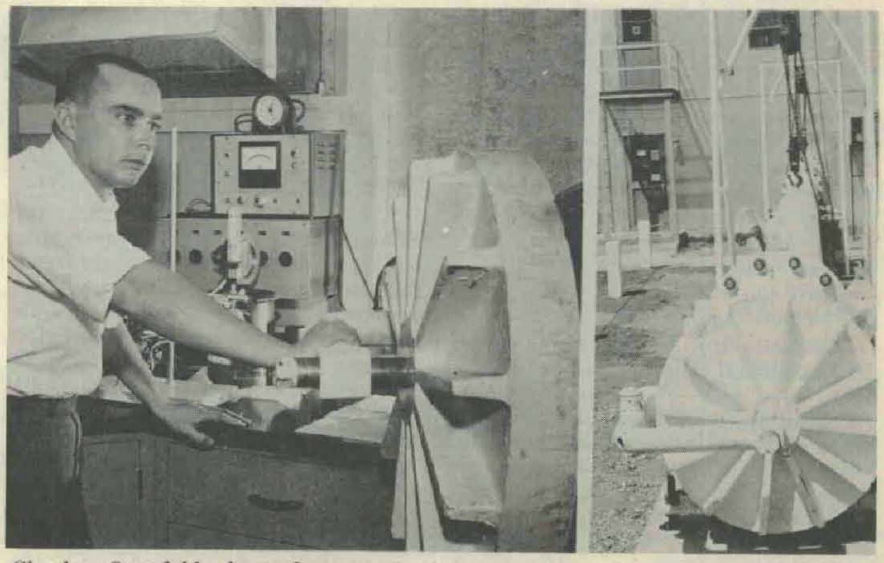
Querfeld's project is indicative of the increasing interest of scientists in electromagnetic phenomena that may cause such weird effects as radar "angels," for instance. These ghostly little figures appearing on radar screens indicate objects where there is nothing apparently but empty space.

Querfeld is starting his experiments with infrared light because it is promising for military application. All objects (including potential military targets) give out infrared rays without being illuminated, and thus can be detected and tracked.

In his space gun, Querfeld can bounce the light ray as few as four times back and forth to produce a path of 80 meters, or 263 feet. The number of light bounces can be exactly controlled. Querfeld plans bounces up to 100 times, for a light path of two kilometers, or 1.2 miles.

Serious scientist that he is, Querfeld, insists that his creation is not a "space gun," but an "absorption cell."

But the former Harvard physics student will go far enough to admit: "Yes, you could say that research with this instrument could lead to a better understanding of problems associated with infrared signaling through space."



Charles Querfeld closes breech of his space gun in experiment to gather data for design of interspace signaling devices. Right, 70-foot "barrel."

HumRRO Task Armornite Seeks Better Night Armor Capabilities

By Dr. N. Willard, Director of Research, U.S. Army Armor Human Research Unit

Task ARMORNITE has as its purpose the identification and solution of human factors problems peculiar to armor operations under conditions of limited visibility. Armor desires the same capability at night that it now requires in the daytime. Analysis of the tank weapons system indicates that these requirements are for movement, target engagement, communication and maintenance.

Research on night driving, target engagement, and a variety of crew skills, including communication and maintenance, has been conducted at the Armor Unit. I should like to discuss the problems associated with the detection and acquisition aspects of target engagement and training research on crew skills.

In the area of target detection and acquisition, the tank-mounted searchlight was developed to permit rapid target detection and delivery of aimed fire. Our research has developed guidelines for the effective employment of the light and these findings have been incorporated into the appropriate training manuals.

Our research has indicated that trained gunners can fire effectively at the light and hit the carrier vehicle with a reasonably high probability. These findings directed our interest to passive means of target detection and acquisition. Currently, research and development is proceeding on electronic means of target detection by research agencies other than HumRRO. However, these devices are still several years away from general issue.

Our staff felt that there might be an interim solution to this problem which is not dependent upon artificial illumination or electronic detectors.

Whenever enemy guns open fire at night, they could be engaged successfully if our gunners could lay their weapons on these flashes. First analysis revealed that no amount of training would permit this capability through a weapon system employing the existing fire control design. Accordingly, research was directed at specifying equipment modifications which, when coupled with appropriate training, would permit localization of enemy gun flashes and the return of effective fire.

In the case of the gun flash, target detection is simple but target acquisition requires a new reticle design plus new training procedures. Such a reticle was designed, tested in our laboratory, reviewed by the U.S. Continental Army Command and submitted to the Ordnance Corps for fabrication and field test. When coupled with current turret controls, this reticle may be a simple means of increasing our nighttime capability.

While the other devices under development, such as ground surveillance radar, passive infrared, and low-light-level television, are designed to increase the operator's sensitivity and, thereby, increase his ability to detect targets, these devices may present problems in sensory discrimination which require additional observer training. This Unit has observed the signal output of these proposed devises and is preparing a research program to study the sensory discrimination problems facing the operators.

Our work program has included concern about the training requirements for many other crew skills such as visual communication, maintenance, and employment of fire control instruments. Field commanders have been given relatively little guidance on how, within the larger training mission, to select skills requiring particular emphasis for night training, or on the allocation of time to these specific topics.

Standards for nighttime proficiency have not been developed. Aside from advanced individual training and basic unit training, there is practically no development of proficiency for limited visibility operations, and the commander is left to his own devices. The lack of formal attention to the specific content of training for night operations constitutes a major gap in our combat readiness.

We recognize at the Armor Unit the requirement for specific guidance on the development of a practical night training program. To this end we have studied the nighttime training requirements for a number of selected armor tasks. Results indicated that no general statement about training time requirements for nighttime proficiency was practical, though such a statement is the only guidance now provided.

Studies have indicated a broad range of training requirements, differing with the nature of the skill needed. We are undertaking the development of a night training program for armor which will be an attempt to consolidate and utilize the findings previously developed in this area.

Research directed at determining the optimum training program for each of the literally hundreds of skills required could not, however, be efficiently conducted by studying each skill in turn. With modern technological advances in the form of new weapons and equipment, the investigators would never catch up with the changing requirements.

It has been proposed, therefore, that the researchers attempt to determine fundamental lawful relationships between the nature of the task and a variety of possible training procedures. This research, while it will not provide an immediate answer to the question of how to train a man to repair a track, detect a target, or use a precision instrument, might provide guidelines for the development of effective training programs for these and a much broader range of skill requirements which the Army places upon its men.

In this article, I have described two facets of our research program. One deals with research directed at specific problems in military operation and training. The other research is designed to provide more basic or fundamental information about human learning. Both are needed to improve our night-fighting capability.

Wiesner Resigns From ASAP, After Joining Kennedy Staff

The Army Scientific Advisory Panel has announced appointment of two new members and the loss of two, one by resignation and the other by death.

Dr. Henry G. Houghton, Head of the Meteorological Department and of the Earth Sciences Program, Massachusetts Institute of Technology, and Dr. Ernest H. Volwiler, Chairman of the Board, Abbott Laboratories International Company, Abbott Universal Limited, North Chicago, Ill., have accepted appointments to the panel. Dr. Houghton will serve on the Environmental Research Subpanel, Dr. Volwiler, on the Chemical, Biological and Radiological Subpanel.

Dr. Jerome B. Wiesner, a member of the Communications and Electronics Subpanel, resigned from the Panel after being appointed as Special Assistant for Science and Technology to President Kennedy. Secretary of the Army Elvis J. Stahr, jr., regretfully accepted Dr. Wiesner's resignation.

Dr. Frederick R. Wulsin, member of the Environmental Research Subpanel, died in Tucson, Ariz.

Aviation Board Completes Man-Machine Compatibility Tests

By Lt Col J. T. Pierce III, Air Mobility Division, OCRD

The U.S. Army Aviation Board at Fort Rucker, Ala., has completed an Army Office of Research and Development sponsored project entitled "Man-Machine Environment Compatibility Studies and Tests in Support of Surveillance Aircraft Development."

U.S. Army Aviation Board pilots flew representative high-performance propeller-driven and jet airplanes for approximately 800 hours in a test program to measure effects of high-speed (up to 500 knots), and low-altitude environment (down to 500 feet) on the aircraft and pilot.

The need for improving and extending the Army capability for combat surveillance and target acquisition throughout the field army area is urgent. In December 1959, the Army Aircraft Development Plan, 1960-1970, prepared by the Office of the Chief of Research and Development, indicated the desirability of developing a new surveillance aircraft for deep-penetration missions. To this end, industry investigated possible aircraft developments and submitted many individual design concepts as solutions to the stated requirements.

In January 1960, an Army Aircraft Requirements Review Board was established to review industry's findings and explore possible courses of action. The evaluation of industry's design concepts pointed to the desirability, from a survival aspect, of conducting the deep surveillance mission in the high-speed, low-altitude flight regime. The major problem to be combated was fluctuating gust loadings on the aircraft and crew caused by turbulence.

The review Board recommended (and the Aviation Board was subsequently given the task) that studies and tests be conducted to determine technical and operating characteristics for a low-altitude, deep-penetration, manned surveillance aircraft and allied equipment, to include consideration of the human factors aspects.

As the first step in the project, literature surveys were initiated to correlate the results of research studies and test investigations in the areas of manned flight for sustained periods of time at high speed and low altitude. Since turbulence or rough air is known to be encountered 30 to 40 percent of the time at low altitude, and has a definite effect on the precision of the flight and efficiency of the crew, an aerodynamic survey was conducted to investigate causes, effects, and alleviation of turbulence.

T28-B

N-156F

A human factors literature survey was made to determine human performance and tolerance levels that could be expected in low-altitude, high-speed flight. Though several high-speed, low-level flight programs had been conducted, little measured and correlated objective flight test data pertaining directly to the man-machine compatability design problem had been obtained.

Lastly, more of an analysis rather than a literature survey was conducted to determine requirements for a specialized navigation and terrain avoidance system for high-speed, low-level flights.

Once the literature surveys were underway, arrangements for a flight test program were initiated. Pilot preparation started in May and consisted of 20 hours transition training in T2V-1 airplanes and 10 hours transition training in F9F-8B airplanes conducted by the U.S. Navy. By July, an intensive low-level flight training program was started in the Memphis area.

As the training progressed, altitudes were gradually lowered to 500 feet and airspeeds were increased to 500 knots. At the same time, techniques for high-speed, low-level navigation utilizing only pilotage and dead reckoning were applied. A 40-hour training program proved sufficient to acclimate pilots to their new low-level environment.

Concurrently, an instrumentation program for both aircraft and pilot was involved. Each type of aircraft was instrumented to record speed, altitude, normal acceleration, pitch, roll and yaw rates, and pilot control.

The pilots themselves were instrumented to record outputs from both the respiratory and cardiovascular systems. Additional human factors data were gathered by observers from the Aviation School who flew in the rear seat in the T-28B and the T2V-1. They performed tests in the areas of navigation, visual perception, problem solving, turbulence and aircraft response, and made evaluations.

The flight test program got underway at Jacksonville, Fla., in October. This area was chosen for the type terrain available there, i.e., flat, swamp, water. By the latter part of October the flight test program had moved to Memphis, Tenn., for tests over rolling foothills. By mid-November operations had moved to Yuma Ariz., for data over desert and mountains.

Between the Memphis and Yuma operations, two of the Board pilots received a factory checkout in the N-156F "Freedom Fighter." This aircraft was evaluated by the pilots in California and participated for a short period in the Yuma program.

Considerable data, both on aircraft and human performance, resulted

from the man-machine project. A representative sampling of turbulence was encountered in the program, and complete aircraft acceleration responses to this factor were tabulated.

The observers' subjective evaluation and data will be published at a later date, and are expected to contribute materially to human factors engineering of new surveillance aircraft. Findings will provide a foundation for further research and flight tests with different aircraft in the high-speed, low-altitude regime, leading eventually to determination of the maximum performance characteristics for the Army fleet of aircraft designed for present and anticipated needs.

The Aviation Board was assisted in the preparation and conduct of the Man-Machine Compatibility Studies and Tests by the U.S. Navy, which permitted the use of personnel, materiel, and maintenance facilities; the U.S. Army Aviation School, which provided observer personnel; and the U.S. Army Transportation Research Command, which prepared the aerodynamic literature survey and provided instrumentation equipment and personnel, technical assistance, and photographic support.

The Langley Research Center and Ames Laboratory of the National Aeronautics and Space Administration provided instrumentation equipment and technical advice.

The U.S. Army Aviation Human Research Unit (HumRRO) conducted the human factors portion of the flight test program and prepared the human factors literature survey. The U.S. Army Hospital, Fort Rucker, Ala., was responsible for the physiological portion of the test program.

Industrial assistance was given by the Boeing Airplane Co., the Lockheed Aircraft Corp., and the Grumman Aircraft Engineering Co.

AF Reorganizes R&D, Changes Unit Designations

The Air Force recently reorganized its research and development activities and has given them new designations.

The most significant change is the extraction of the Air Force Research Division from the Air Force Research and Development Command to a separate command level titled "Office of Aerospace Research" which reports directly to the AF Chief of Staff.

Other changes and redesignations include:

The Air Materiel Command is now the Air Force Logistics Command;

The Air Research and Development Command is now the Air Force Systems Command;

The Air Force Research Division is now the Office of Aerospace Research, under which are included the Air Force Office of Scientific Research, and the Air Force Cambridge Research Laboratories;

The Wright Air Development Division is now the Aeronautical Systems Division;

The Air Materiel Command Ballistic Missile Center is now the Ballistic Systems Division;

The Air Force Command and Control Development Division is now the Electronic Systems Division;

The Air Force Ballistic Missile Division is now Space Systems Division.

By Dr. Ralph G. H. Siu

You may wish to recall the following quotation by Vannevar Bush on a timely subject:

"In the first place, let us record that there are individual members of every profession who will never collaborate with anyone under any circumstances. Let them depart in peace; their day is nearly done. The time is over when a Leonardo da Vinci could comprehend all of known art and science. We are also past the day when men of genius could retire to a cubicle, exclude all, and emerge with an intellectual feat of scientific reasoning before which all would bow in humble admiration.

"Even in the remotest corners of extreme specialization, where isolated contributions springing full grown from a master mind are still possible, the most notable advances are made under conditions where mind works on mind and where credit for primary initiation is sometimes hard to assign. The man of genius still is the most important element in the whole array, and upon his excellence most of progress depends, but if he does not know how to collaborate or is too selfish or timid to do so, we can safely forget him.

"We cannot order collaboration. This is not dictatorship. Moreover, while shotgun marriages sometimes turn out surprisingly well, shotgun collaboration is a contradiction in terms. And no amount of artificial organization, no joint institutes, or combined reviewing committees, or joint directors, will come within the squirting range of a syringe of getting at the heart of the matter.

"I have only one prescription, and I cannot write even this one in Latin. The professions fail to understand one another sufficiently; let us attempt to bring them together. . . .

"Now I do not mean more joint professional meetings; not that! Nor do I have in mind lectures by a member of one profession for the edification of another. I am skeptical of the value of all lectures. I would hope that we might approach, much more nearly than any such artifices as those, the core of the dilemma. And that resides in the misconceptions which each profession has in regard to the other.

"Men do not learn to understand one another merely by sharing intellectual experiences. They must meet on an emotional level if the foundation is to be built for collaboration on a high plane.

"There are other ways, worthwhile no doubt, in which the professions may be brought to a better understanding of one another. It is not necessary that they be brought to a full understanding of one another's subject matter; that would be impossible. For, if they grasp one another's mores and traditions, methods of thought, deep convictions, and motivations, there will be no further need to stimulate collaboration of the highest sort. It will occur automatically . . ."

Almost like a Biblical scene, a deep crater and a pillar of sun appear in arctic cloud seeded with dry ice by Army plane in recent "whiteout" experiments.

Arctic Experiments May Overcome "Whiteout"

By J. R. Hicks and J. E. Jiusto

Recent experiments in the Arctic by the Corps of Enginers indicate that a solution to the problem of "whiteout" may be at hand.

Whiteout is a phenomenon in snow-dominated regions created by fog, blowing snow, or overcast skies causing poor visibility, shadowless surroundings, an obscured horizon and confusing depth perception.

This condition can—and usually does—curtail most activities involving movement of personnel or equipment, especially aircraft operations.

Experiments using dry ice seeding to cause precipitation from cloud formations have been under contract with the Snow, Ice, and Permafrost Research Establishment. Investigators have accomplished successful modification of the overcast type of whiteout at Camp Fistclench, Greenland.

Two methods of introducing the seeding material into low clouds were used: (1) suspension of dry ice from a captive balloon and (2) release of dry ice from an aircraft flying just above the cloud tops.

The first successful seeding was accomplished by suspending dry ice at 25-foot intervals along the tethering line of a moored balloon. About one pound of dry ice was placed in each of eight baskets and the baskets raised into the overcast.

The first seeding run was conducted on thin stratus clouds having bases at about 600 feet and tops at 800 to 900 feet. The temperature within this layer averaged –4.6° C. A very light wind, about 1-2 knots, was blowing from the southeast.

Immediate seeding reaction in the form of a long plume of ice crystals from each suspended basket was observed. At a downwind distance of 1.5 to 2 miles, snow began to fall approximately 30 minutes later. A clearing line up to 5 miles wide resulted which permitted the sun to reach the surface, and blue sky to become visible.

This seeding pattern continued for about 1½ hours, until the initial dry ice supply became exhausted.

A second successful seeding operation was performed under similar circumstances, except that the cloud temperature was approximately –10° C. Results were very similar to those of the previous test, with one notable exception—a wind shift occurred during the tests and a second fallout and clearing area was formed along the new wind line.

The snow area started 1.2 miles downstream from the point of seeding, and the snow blusters, consisting of smaller flakes, reached a diameter of about ⅜ inch.

Aircraft seeding was conducted successfully on two occasions. The first experiment was performed on a cloud deck about 1,000 feet thick with its base 700 feet from the surface; the temperature within the cloud was –9.0° C. The seeding was done in a Z-pattern with 3-mile seeding runs for aech leg. The three legs were seeded at respective rates of 2, 5 and 10 pounds per mile.

Fourteen minutes after the first leg was seeded and 6 minutes after the third leg was seeded a definite Z-pattern was distinguishable in the cloud. After 15 minutes sun dogs were visible in all three legs. After 18 minutes snow was reported falling on the ground and thin spots began to appear in the overcast. After approximately 25 minutes Camp Fistclench was visible from the aircraft through breaks in the cloud area. After 37 minutes a clear area approximately 4 miles long by 2.5 miles wide was visible.

Clear areas, perhaps not as wide as earlier, were still visible northwest of Camp Fistclench an hour after seeding of the first leg.

The second experiment was perhaps the most spectacular of the series. Seeding was done in one straight path, 8 miles upwind from the base, using about 5 pounds of dry ice pellets per mile. Twenty minutes after seeding, moderately intense snowfall occurred upwind of camp.

Visibility in the snowfall area was reduced from 10-12 miles to about ⅛ mile within the snow area, and the cloud ceiling dropped from 1,200 feet to a precipitation ceiling of approximately 300 feet. (The ability to form man-made snow squalls may have application in camouflaging tactical maneuvers in arctic areas where concealment is difficult.)

Snow continued to fall for 15 minutes, after which the seeded area cleared and remained so for more than 1½ hours. During this time, the plane from which the seeding had been done, descended through the clear area (3 miles long by 2 miles wide) and landed at Camp Fistclench.

These experiments demonstrated that weather-modification techniques can be applied, under certain meteorological situations, to assist military operations in Arctic areas.

Mr. Hicks is with the Corps of Engineers' Snow, Ice and Permafrost Research Establishment, Wilmette, Ill. Mr. Jiusto is with the Cornell Aeronautical Laboratory, Buffalo, N.Y.

Named on Filtration Unit

Richard P. Schmitt, Chief of the Sanitary Branch, U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va., has been named to a Task Group on Diatomite Filtration of Water of the American Water Works Association.

Schmitt will assume his duties with the Group at the AWWA convention in Detroit, Mich., June 5-8. He replaces Harry N. Lowe, Jr., Deputy Chief of the Missile and Space Office at the Laboratories, who resigned from the AWWA group because of the press of other commitments.

Leader of Overland Trek to South Pole Calls Feat Routine

"It was a routine business . . . we had filet mignon every other day."

This is Maj Antero Havola's nonchalant reply discounting praise bestowed on him for having led the first American group ever to travel overland to the South Pole, blazing a new "highway" as they proceeded. (See *Army R&D Newsmagazine*, Vol. II, No. 3, page 22.)

This attitude, however, overlooks the dangers encountered when the group found itself in the midst of a crevasse field's hidden peril, and other elements always present that can bring sudden disaster in Antarctica.

Still to Maj Havola, an Army Transportation Corps Officer on loan to the Navy as head of the Trail Operation Office, U.S. Naval Support Force, Antarctica, lonely subzero treks over ice and snow *are* his routine business.

This is the 18th such polar region excursion that Maj Havola has helped to organize. His experience with movement of men and supplies under such conditions goes back to his youthful efforts in Finnish lumber camps and as a Finnish officer in the Russo-Finnish War. His military experience consists of 29 years in the Finnish and U.S. Armies.

The 804-mile, 33½-day South Pole trek, equaling the feats of Amundsen, Scott, Hillary, Fuchs and the Russians before him, he said, was more routine—"sometimes even boring"—than previous trips.

The outspoken officer feels many on polar excursions exaggerate the difficulty and perils. Each time the stories are retold and reports refiled, he commented, "the temperatures get colder and the hardships worse."

One sunny day on Maj Havola's trip, a temperature recording taken in the sun was plus 54° F. It should be pointed out, however, that the temperature under a vehicle, in the shade, was minus 16° F.

What made the trip most routine, Maj Havola explained, was the efficiency of what he considers to be the best-trained crew ever to make a polar trip. "The meticulous maintenance and conscientious operation of the tractors and Weasels," he said, led to the "least mechanical difficulty" he had ever experienced.

Skillful maintenance and operation of the radio and navigation equipment also helped keep the trip uneventful, the Major reported. On one of his favorite subjects—food—he volunteered the information that the cooking at the "bottom of the world was out of this world." He compared his group's Christmas and New Year's dinners with those eaten by the early Antarctica explorer Scott to illustrate how engineering has done much to make trips across uncharted glaciers comfortable.

The men were fed and bunked in two wanigans (a transportable shelter named after the place where accounts were kept and men paid in lumber camps). Mounted on 20-ton sleds, pulled by one of the two low-ground-pressure caterpillar tractors, the wanigans, Maj Havola said with an apparently straight face, provided "all the comforts of home."

Before other Army researchers bored with their jobs started filing applications for polar expeditions, they should be advised that antarctic traveling is rough sledding. It involves peril and requires a lot of hard work.

Maj Havola's men were up daily at 4 a.m., underway at 6 a.m., and continuing on the trail, except for an hour's break at lunch, until 7 or 8 p.m. Bedtime was 10:30 or 11 p.m., after all the necessary maintenance had been completed. Only dedicated explorers would suffer wind-blown subzero temperatures, hour after hour on a platform in back of the Weasel, as CWO George Fowler, the group's navigation expert had to do.

A great danger to polar travelers are crevasses, cracks in the ice and snow hundreds of feet deep, which are sometimes concealed by a shallow bridge of snow. Crevasse detectors, which detect the chasms by breaks in the electrical currents of the snowfield, pick up false alarms caused by snowdrifts and sometimes fail to pick up large crevasses which have a deep layer of soft snow over them.

As Maj Havola puts it, the detector is handy when you know a crevasse field exists, but not too reliable in pointing out unknown crevasse fields. He termed crevasses one of the "routine" dangers polar travelers encounter and said "sometimes you just have to take a chance."

Born in Mikkeli, Finland, 50 years ago, Maj Havola came out of the north lumber country to join the Finnish Army in 1931 as a private. He graduated from the Finnish Military Academy in Helsinki in 1935 and was G-4 with an infantry division during the Russo-Finnish War. Subsequently he served as a Finnish Army Corps' Transportation Officer.

His second military career started in 1947 when he joined the U.S. Army as a private. He was commissioned at the Fort Eustis, Va., Transportation Corps in 1951. He served as staff officer in the Transportation Research and Development Station at Fort Eustis in the Environmental Operations Branch.

Before his antarctic assignment he was Sled Company Commander and Camp Commander at Camp Tuto, Greenland, where he directed the use of 18 low-ground-pressure tractors and 84 sleds. He has also conducted polar trips in northern Canada.

The Finnish-American cold weather expert believes that engineering in the future will do much to improve logistic and combat mobility. Of the two problems, he considers combat mobility is the most important.

"If the individual is not able to move and fight," he said, "there is not much sense in giving him logistical backup support. During the Russo-Finnish War the Russians furnished us with plenty of material to fight with because though they were better at moving large amounts of material, we were better at moving men."

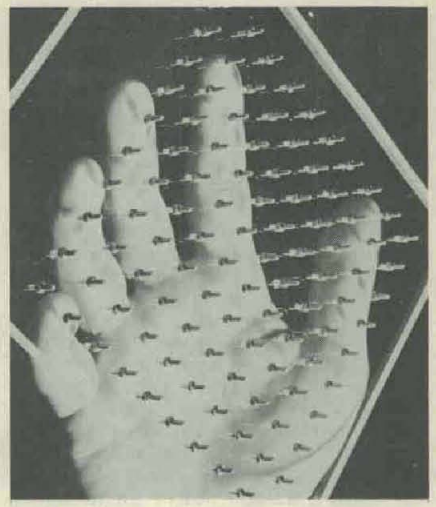
Members of Maj Havola's crew and accompanying scientists were (left to right standing) Dr. Forrest L. Dowling of the University of Wisconsin, CS1 Meridith Radford USN, CMC Walter L. Davis USN, Maj Havola, CWO G. W. Fowler USA, RMCA Edward A. Martens USN; (left to right kneeling) CM3 Marvin Medlin USN, CM3 James R. Douglas USN, RM2 S. F. Mahan USN, CM2 Willard E. Cunningham USN, and Henry Rosenthal, AURORA, USARP.

Tack-Size Radiation Detector Developed for Signal Corps

A radiation detector so small that a handful could equip a laboratory full of nuclear research workers with individual safety devices is under development by the Battelle Memorial Institute, Columbus, Ohio, for the Army Signal Corps.

Called a Radiac Detector, each device, no larger than a carpet tack, permanently records the total dosage of fast neutrons, a dangerous type of radiation produced by such sources as nuclear reactors and nuclear weapons.

The device is intended to eliminate the present involved procedure of measuring an individual's exposure to fast-neutron radiation. Consisting of a tiny silicon disk mounted between two electrical contact pins, the miniature dosimeter is insensitive to all other forms of radiation and permits rapid and easy measurements.



Miniaturized fast-neutron dosimeters

CRREL Geologist Wins Honor For Polar Work During IGY

In recognition of his contributions while participating in the United States scientific program in Antarctica during the International Geophysical Year, a mountain peak in Antarctica has been named for Vernon H. Anderson, a geologist with the U.S. Army Cold Regions Research and Engineering Laboratory in Wilmette, Ill.

Two of Mr. Anderson's colleagues who mapped the area in January 1958 proposed naming the peak Mount Anderson. This was approved by the National Academy of Sciences' Special Committee on IGY Geographic Names and the U.S. Board on Geographic Names, Department of the Interior. Mr. Anderson spent the 16 months from December 1956 to March 1958 in the Antarctic as glaciologist with the U.S. scientific team at Byrd Station.

Belvoir Employee Gets Patent On Turbine Firehose Nozzle

A new turbine type of firehose nozzle, which not only controls the fluid flow through it but also the character and pattern of the flow, has been invented by John D. Grabski, an employee of the Petroleum Equipment Branch of the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

The new type nozzle is designed to overcome the burdensome handling of a 3-inch, or larger, firehose and conventional screw type nozzle, which requires the efforts of several men. It also provides a means whereby the flow may be varied from a laminar flow stream of fluid to a clouded mist of fluid and air in a wide-angle fog pattern.

Mr. Grabski, who has been with the Laboratories since 1951, was employed in the Fire Fighting Branch when he invented the nozzle. In recognition of the achievement, Col John H. Kerkering, Director of the Laboratories, presented to Mr. Grabski a $100 award along with his letters of patent. The Government is permitted to use the invention without payment of royalties.

8 Army Scientists Serve As Judges at Science Fair

Army Judges at the 12th annual National Science Fair-International were Dr. J. Fred Oesterling, Assistant Chief Scientist, QM R&E Command, Natick, Mass.; Dr. George D. Sands, Senior Scientist, Office of the Chief of Transportation, Washington, D.C.; Dr. Boris Karpov, Senior Scientist, Ordnance Ballistic Research Laboratory, Aberdeen Proving Ground, Md.; Col. George W. Burnett, Chief, Department of Dental Research, Walter Reed Army Institute of Research, Washington; Dr. Gordon L. Bushey, Deputy Chief, R&E Division, Chemical Corps, Washington; Dr. Paul A. Siple, Scientific Advisor, Army Research Office, OCRD, Washington; Dr. George H. Hickox, Senior Scientist, Engineering R&D Laboratories, Fort Belvoir, Va.; and Dr. Craig M. Crenshaw, Chief Scientist, Office of the Chief of the Signal Corps, Washington.

Frankford Physicist Wins SA Fellowship at Cambridge

Dr. E. R. Levin, physicist in the Research and Development Group at Frankford Arsenal, Philadelphia, has been awarded a Secretary of the Army Research and Study Fellowship.

Dr. Levin becomes the fourth Frankford Arsenal physicist to receive this award, which in his case permits a year of attendance at the Crystallographic section of the Cavendish Laboratory, University of Cambridge, England. He was graduated from Temple University in 1949 with an A.B. degree in physics and in 1959 received his doctorate from the same university. He has been employed at the Arsenal since 1945, working in the field of solid state physics.

Missile Techniques Studied For Aircraft Safety Checkout

Application of electronic checkout techniques used presently in missile launchings may save valuable manhours in determining whether Army aircraft are safe for flight, the U.S. Army Transportation Command has reported.

Known as Project ALARM for Automatic Light Aircraft Readiness Monitor, a concept being studied by Bendix Corp. under contract envisages the installation of electronic sensors at critical points in the engine, transmission, drive shaft, bearings, propellor or rotor, and selected sites in the structure. These would be connected to a central control panel where the pilot or maintenance personnel could literally tell at a glance the status of the aircraft.

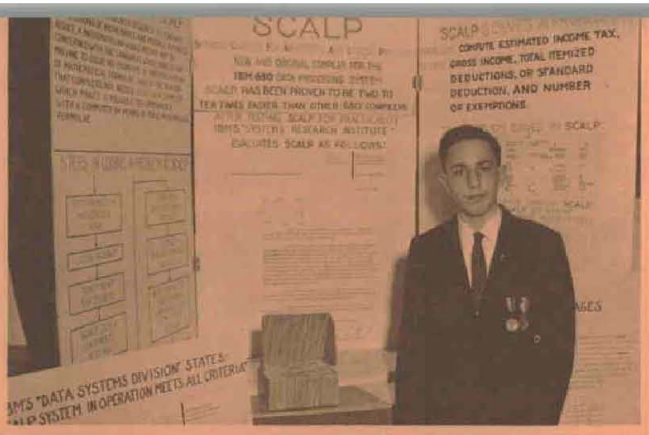
The ALARM system incorporates self-testing circuitry, making the system virtually foolproof. Bendix is currently testing the system on the HU-1 Iroquois, the Army's new turbine-powered helicopter.

President Picks APG Employee For Century 21 Exhibit Task

Leonard W. Nederkorn, Training Material Advisor of the Ordnance Training Command, Aberdeen Proving Ground, Md., has been appointed under Executive Order of the President to be design coordinator for the U.S. Science Pavilion at the Century 21 Exposition to be held in Seattle, Wash., Apr. 21 to Oct. 21, 1962.

A native of Germany, Mr. Nederkorn has received the War Department Civilian Merit Award and was one of six persons nominated for the Rockefeller Public Service Award in 1953 for his outstanding work in visual education.

Leonard W. Nederkorn



Christopher G. Cherniak, 16, (left) of Melbourne, Fla., and Robert E. Strom, 14, of New York City, exemplify the dazzling skills of the National Science Fair-International award winners. Cherniak also won first awards offered by the U.S. Army, U.S. Air Force, U.S. Navy and American Medical Association for his work in developing a technique for keeping single nerve cells functioning for weeks in a culture. Genius Strom designed a computer system compiler 2 to 10 times faster than existing compiler for IBM 650 system. Fair executives included Joseph H. Kraus (left), staff coordinator, and Leo J. Roedle, chairman. ***(For list of Army judges at the Fair, see page 22.)***

National Science Fair Reflects Genius of Rising Generation of Scientists

Sixteen of the Nation's brightest young science students will spend one week of their summer vacations as honored guests at Army research and development installations. (*See Back Cover for pictures of winners and establishments they will visit.*)

From a record number of 385 exceptionally gifted high school science students who competed as finalists in the 12th annual National Science Fair-International, a panel of eight Army judges selected 16 winners of awards offered by the seven Technical Services.

The big show of 385 science exhibits prepared by teenage students for display in the huge Kansas City municipal auditorium was the highly successful culmination of a vast effort by the Science Clubs of America.

Displayed was a convincing refutation of those inclined to belittle the serious interests of American youth or the standard of science education in American high schoo's. On parade with the proof of their talents, providing a stimulating reassurance of the vigorous capabilities of the rising generation of U.S. scientists, were the students who had survived rigorous competition.

In 1960, leading up to the big show, more than 740,000 students' science exhibits were arranged. Some 25,000 Science Clubs in the continental United States and at U.S. military installations in foreign lands contributed to this effort. About 4,000,000 persons viewed exhibits at 200 preliminary fairs in 45 States, the District of Columbia, Puerto Rico, Germany, France, Italy, Japan, Canada, and Thailand.

Administering this overall program is Science Service, a nonprofit institution. Its trustees include members of the National Academy of Sciences, National Research Council, American Association for the Advancement of Science, E. W. Scripps Estate and the journalistic profession.

A roll call of all the organizations and individuals supporting the National Science Fair-International—in the firm belief that it is a dramatically dynamic manifestation of the Nation's future scientific potential—would read like a roster of "Whos Who" in American science, education and industry.

A 10-year survey of the career decisions of award winners at the fair—in fact, of all the finalists—shows that more than 90 percent go on to become scientists and engineers.

Achievements of the fair finalists, ranging in age from 14 to 19, are ever a source of wonder, almost to the point of incredulity, for visitors to the fair. This year, for example, Christopher George Cherniak, just tuned 16, one of the Army winners, displayed a nerve cell he had kept alive for weeks in a culture—a feat that amazed top-ranking medical men and won him a flock of awards.

Winner of Science Fair awards each year since 1957, Cherniak has kept alive nerve cells of frogs and crabs. He is attempting to develop a technique for linking single nerve cells with each other so they can function together as a neural mechanism, such as a reflex arc. He is a member of the Junior Academy of Sciences, National Honor Society and the Mathematics Honor Society.

Robert E. Strom, an Army award winner, has been receiving Science Fair awards since 1956 though he is only 14 years old. Recognized as a genius, Strom is a part-time instructor in computer programing and techniques for International Business Machines. His techniques have been acclaimed as superior to those of IBM professionals.

Multiply the prodigious accomplishments of Cherniak and Strom by a factor of hundreds of other young scientists and you come up with an answer conducive to glowing optimism regarding prospects of the United States maintaining its prestige in the scientific world—for at least the generation ahead.

SCIENCE FAIR WINNERS of special awards presented by the U.S. Army and the Association of the United States Army, together with titles of their exhibits and Army installations they will visit, follow:

(Top, left to right) Baylor B. Triplett, 18, Albuquerque, N. Mex., "Solid Rocket Propellants," Ordnance Corps, Aberdeen, Md.; Robert Himes, 17, Dayton, Ohio, "The Peripheral Jet Ground Machine," Transportation Corps, Fort Eustis, Va.; Ann E. Stuart, 17, Camp Hill, Pa., "Development of Lysozyme-Resistant Mutant, Bacillus megaterium," Quartermaster Corps Research and Engineering Command, Natick, Mass.; Robert W. Berner, 17, Kalispell, Mont., "Nuclear Magnetic Resonance," Corps of Engineers, Fort Belvoir, Va.; David B. Goodson, 18, Auburn, Wash., "DNA Mechanism in Viral Infections," Walter Reed Army Institute of Research, Washington, D. C.; Rosemary T. Smith, 18, Carlsbad, N. Mex., "A Study of the Solar Cell," Signal Corps, Fort Monmouth, N. J.; Kathryn A. Kampe, 16, Selma, Ala., "Transduction in Bacteria," Chemical Corps, Army Biological Laboratory, Fort Detrick, Md.; Robert E. Strom, 14, New York City, "Symbolic Compiler for Arithmetic and Logical Programs," Abedeen; (bottom, left to right) Keith G. Morgan, 18, Idaho Falls, Idaho, "Phonetic Digit Recognizer," Fort Monmouth; Joseph F. Litwin, Jr., 18, Boxford, Mass., "Mechanical Optical Seismograph," Fort Belvoir; John E. Pearson, 17, Brookings, S. Dak., "The Hyperbolic Paraboloid," Aberdeen; Will F. Rogers, 17, Jonesboro, La., "Wind Tunnel," Aberdeen; David C. Hill, 16, Grand Blanc, Mich., "New Titanium Polymers," Natick; Richard Lee, 18, Williston, N. Dak., "The Computer," Fort Eustis; Christopher G. Cherniak, Melbourne, Fla., "Development and Use of Tissue Culture of Functioning Single Neurons," Chemical Corps Army Chemical Center, Edgewood, Md.; John G. Wilkes, 17, Little Rock, Ark., "Chemical Modification of Radiation Effects," Medical Service, Walter Reed Army Medical Center, Washington, D. C. (See full story on page 23.)