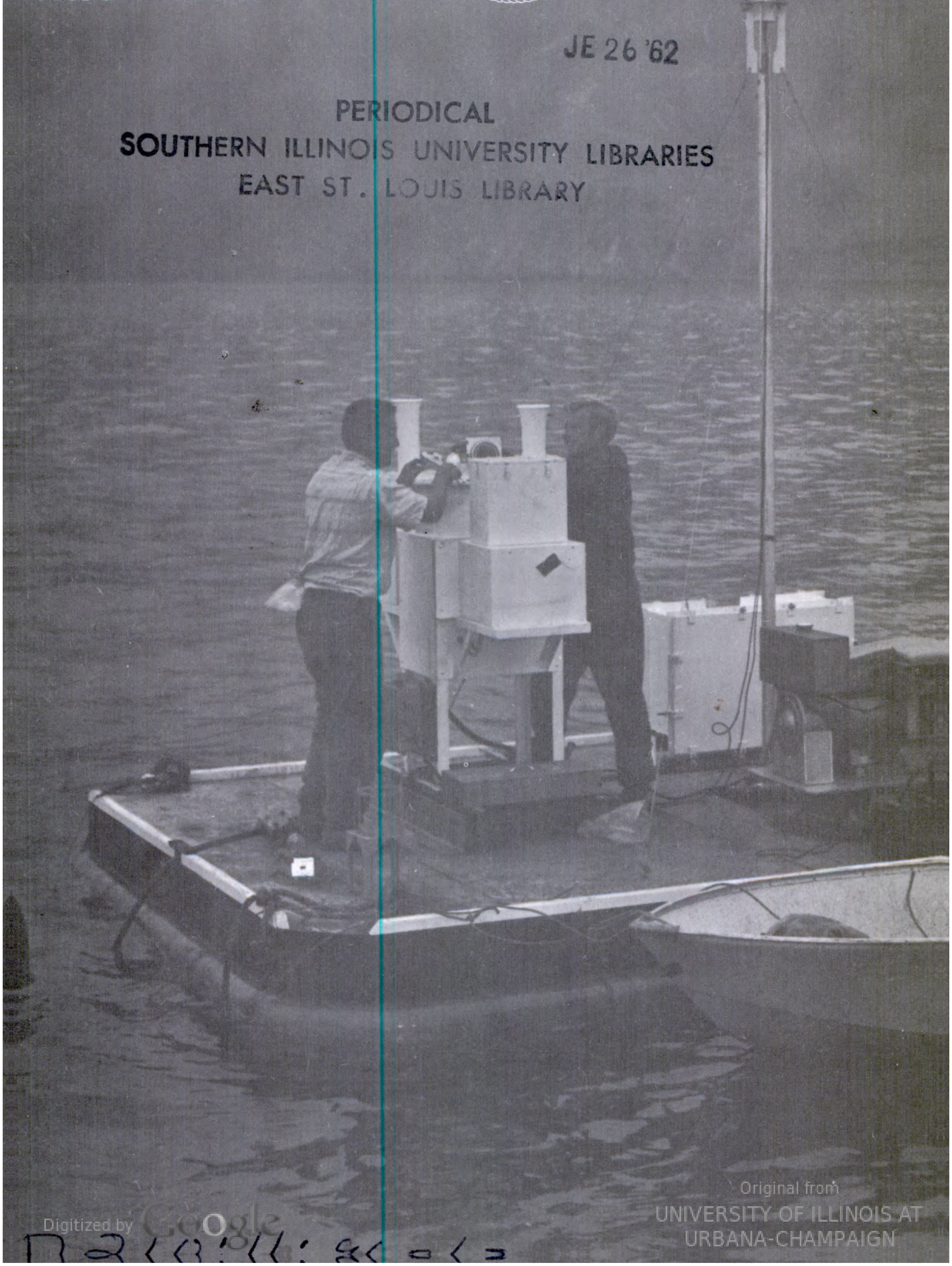
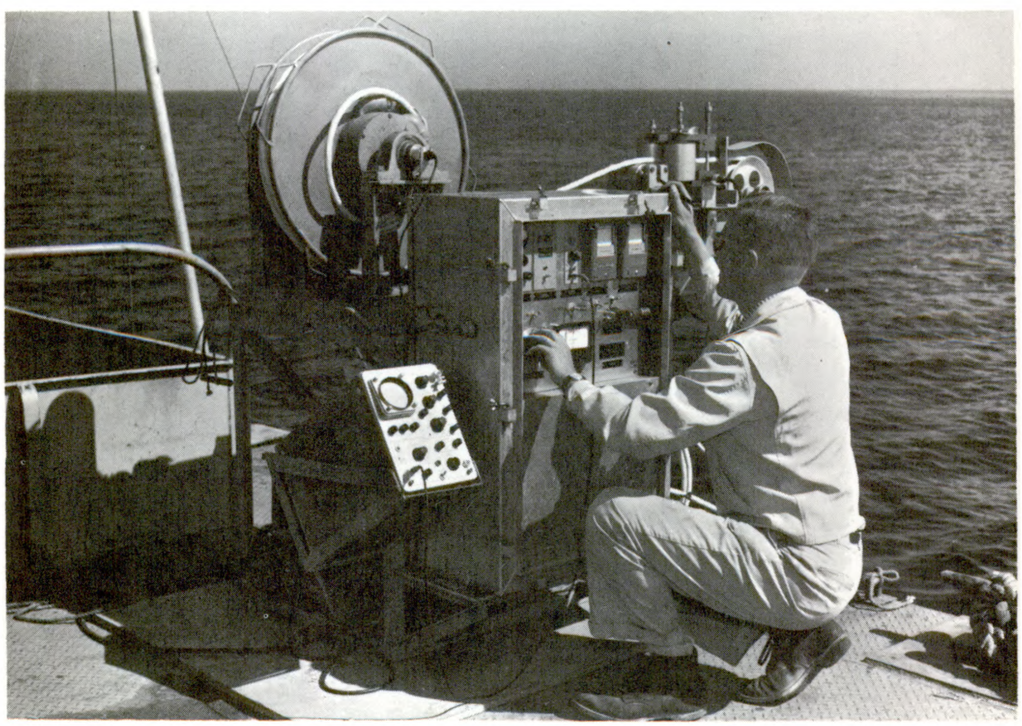
NAVAL RESEARCH REVIEWS

MARCH 1962



Installing dropsondes in a helicopter prior to release over shot point



Topside instrumentation of the gamma probe which measures activity in seawater to a depth of 200 feet

A New Variable in Underwater Explosions

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Although the threat of undersea warfare is taking on greater importance in the military outlook, defensive weapons are keeping pace with the rapid advances in submarine technology. For example, the development of the nuclear depth charge and its various means of delivery have greatly extended the kill range produced by the underwater shock wave. With this development is a new variable foreign to fleet operations as they were known during World War II. This attendant problem–radioactivity–is being studied by the Navy in a major research effort at the Naval Radiological Defense Laboratory on the West Coast.

Project HYDRA (hydrodynamic-radiological), presently sponsored by The Defense Atomic Support Agency, was initiated by the Bureau of Ships to evaluate the impact of the radiation produced by the detonation of an underwater nuclear explosion. Because of the moratorium on nuclear weapons testing much of the research effort has been devoted to the employment of conventional high explosives as an experimental model. Under the HYDRA program the first phase of a large-scale test series was completed at San Clemente Island this summer. This series proved that specially designed high explosive charges will provide answers to the phenomena in question, and radioactivity in the form of a tracer can be employed in the charge to determine the time-space history of the explosion products. Insight is being obtained to the questions of how the products from an underwater explosion are being distributed both in the ocean and in the atmosphere.

A unique 10,000-pound charge of a rather common high explosive, HBX-1, was developed for the test series. Requirements necessitated that the charge be spherical and uncased, be centrally initiated and be capable of accepting a capsule of radioactive tracer at its center. With the help of many Naval organizations, an excellent charge design and fabrication procedure evolved. These high explosive charges, being the largest uncased spheres ever cast, were detonated over a range of depths at the test site.

Two radioisotopes were employed as tracers. Five-hundred curies of Lutecium-177 were placed in the center of each of three charges and five-hundred curies of Xenon-133 were employed in a fourth charge. The problem of combining two rather hazardous materials–high explosives and large quantities of radioactivity–was resolved quite satisfactorily after much thought and planning. Prior to the operation, two studies had to be made; the effect of gamma radiation on the high explosive had to be determined and the heating effect caused by the absorption of the radioactivity in the booster needed further understanding. For the conditions of the experiment it was shown that no serious effects would develop.

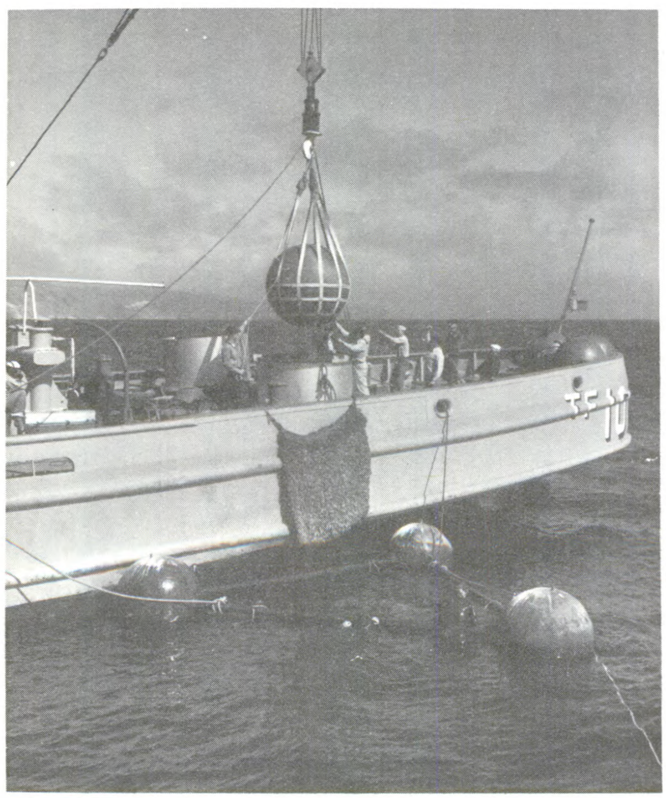
Placing a radioactive capsule in a charge of common explosive

The surface of the water above the charge had to be kept free of any floating structures. This arrangement was required in order to assure proper shock wave and explosion bubble interaction with the air-water interface. To accomplish this a cradle was designed to support the charge such that when underwater the entire system had approximately 1500 pounds of positive buoyancy. Thus, a cable attached to the charge support was run vertically to the bottom and through a sheave attached to a large clump at a depth of 300 feet. The haul-down cable was then run to a winch on the main instrument barge which was fixed in place with a four-point moor, some 1200 feet away from surface zero. By working the winch the charge could be lowered to any required depth. This system proved quite stable and permitted depth positioning with an accuracy of plus or minus 6 inches.

The distribution of radioactivity was measured in the atmosphere and in the ocean around the point of detonation by means of beta and gamma transducers and by sampling both the air and the water. Several unique instrumentation systems were developed to accomplish these determinations. In order to measure the spatial distribution of the tracer-laden explosion products in the rising plumes above the surface immediately after the detonation, a helicopter was positioned over the shot point at 3500 feet and a series of three dropsondes were released. Each instrument package sensed beta and gamma activity as a function of space-time coordinates and the data were telemetered to a magnetic tape recording station ashore. The radioactivity in the water was surveyed after the detonation with a newly designed gamma probe winch assembly capable of reading levels as low as the Potassium-40 background of the sea. Its operable range was to 200 feet of hydrostatic pressure. This probe was mounted on an LCM, and by photographic and geometric tracking a three-dimensional grid of the residual radioactivity in the water was obtained. These instruments, plus an array of raft stations moored to surface buoys and which carried beta transducers recording by hard wire to a master tape recorder, completed the radiation-measurement phase of the program.

The NRDL research effort was complemented by the participation of some fifteen additional projects which took advantage of the high explosive series. Such projects obtained valuable data on air shock waves, underwater hydroacoustics, water waves created by the explosion, seismic detection, and the interaction of both tracer and underwater shock on marine life.

The next 12 months will be spent reducing and analyzing the great quantity of data obtained and correlating inter-project findings. It is hoped that from these measurements and from future tests of this kind the Navy will be in a better position to determine operational doctrine in modern sea warfare.



Ten thousand-pound HBX-1 uncased charge
being placed on a charge raft

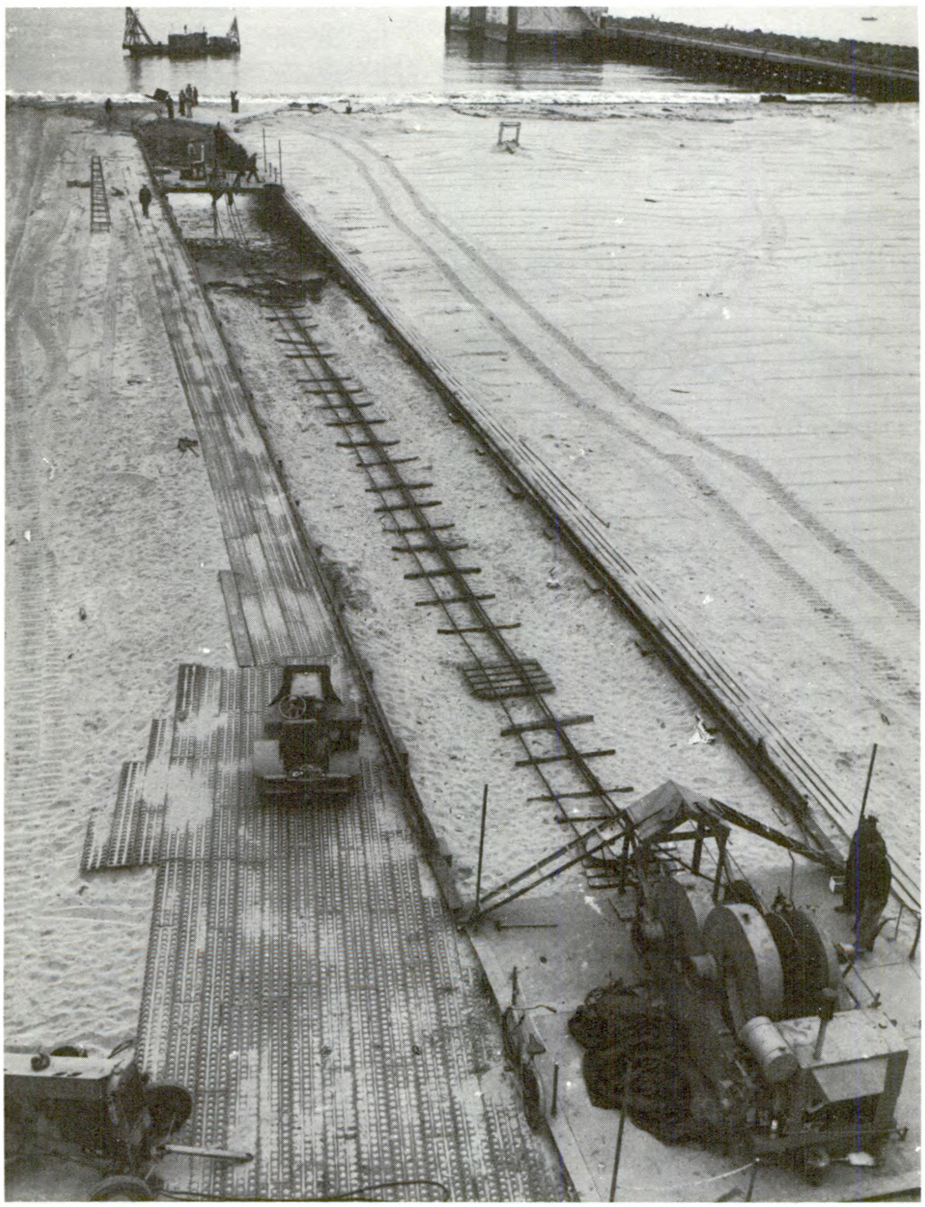
The Naval Civil Engineering Laboratory

NCEL, now eleven years old, is the research and testing arm of the Bureau of Yards and Docks. Its motto "Nanciscar Cursum Extuendo Licet" (I will find a way or make one) is in keeping with the can-do philosophy of the Construction Battalions and the CEC officers it serves. More specifically, the Laboratory seeks–through in-house research or monitoring the development work of others–new techniques, materials, and equipment that will improve the operations of the Seabees and the Navy Shore Establishment. NCEL is located at Port Hueneme, on the California coast about halfway between Los Angeles and Santa Barbara.

Although NCEL is called a "civil engineering" laboratory, its program encompasses a broad field and includes work in other fields of engineering (mechanical, electrical, electronics, chemical, sanitary, and nuclear) and in the sciences of chemistry and physics. Technical problems from many of the Navy's far-flung bases are referred to the Laboratory. In the short time since it was organized in 1950, it has already made several outstanding contributions to military research and development.

The technical program has been broken down into three groups, or types of research, that cut across organizational lines: lead programs, foundational programs, and monitored programs. The lead programs are made up of those problems for which the Bureau of Yards and Docks has major responsibility. These include polar bases on sea ice, deep ocean systems, water front structures, and amphibious operation systems. Two others are lead programs because NCEL has made an extremely effective start in them: water demineralization and atomic defense engineering. In the latter, NCEL has an exceptional staff and the only known blast simulator anywhere, so the Laboratory will probably maintain its leadership in that special field for several years.

The second group of programs consists of the work that is appropriate to NCEL because it has many special facets unique to BuDocks requirements. There are other people doing research and development in these areas, but because this work is basic to the BuDocks mission it constitutes a basic or foundational activity of the Laboratory. These tasks include the work on floating dry docks, cranes for shipyards, and other special items and systems required by the Navy Shore Establishment. A very important program in this group is electromagnetic radiation reduction; its purpose is to eliminate, from the Shore Establishment, interference with communications and with the control of missiles.



The anchor-testing facility at Port Hueneme

Other important programs are concerned with techniques of construction and maintenance; in these, NCEL personnel evaluate the construction procedures used in building equipment for the Seabees.

The last group of programs–monitored research–includes areas in which the Laboratory must be prepared to advise the Bureau when a special requirement occurs. Since other agencies are quite active in these areas, NCEL does not maintain large continuous efforts. To the Army, for example, polar transportation, railroads, and automotive equipment are of major concern. The Bureau of Yards and Docks is entering into an active research and development program. There are other monitored areas such as inspecting and operating techniques where there has been little research and development required. In each of these areas, the Laboratory monitors other people's progress in order to keep abreast so that when a special requirement does occur NCEL is ready to help.

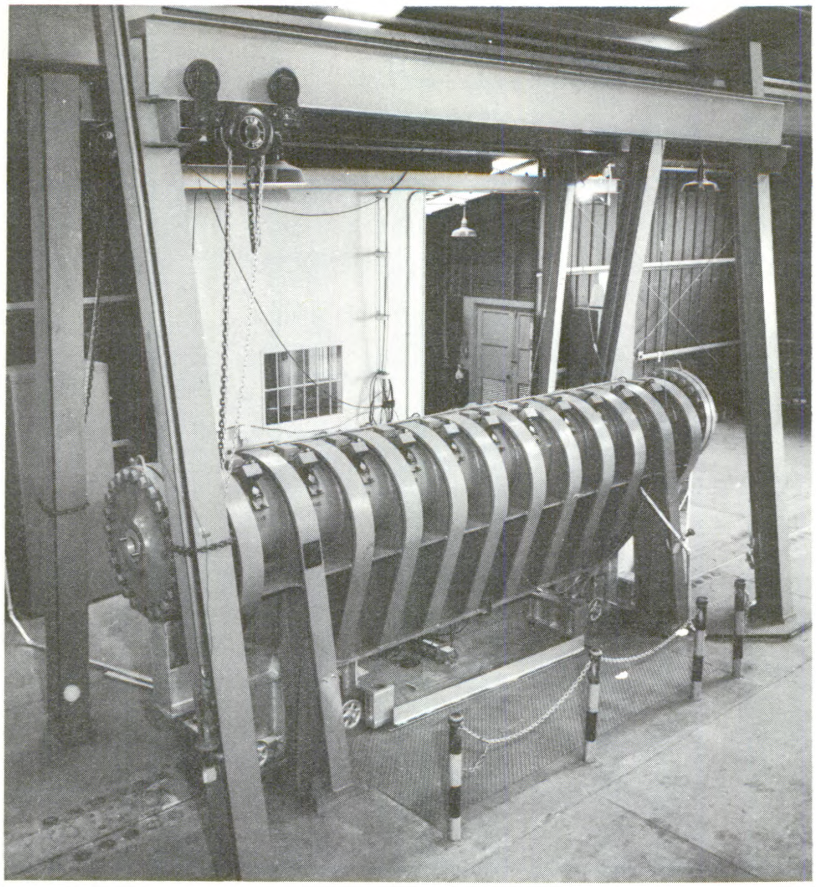
SPECIFIC PROGRAMS AND EQUIPMENT

The Bureau of Yards and Docks is responsible for the protection of shore station personnel and structures against the effects of atomic warfare. Thus, NCEL's atomic-defense project is designed to develop shelters and accessory equipment to defend against such warfare. Several tasks of this general problem are underway at the Laboratory. They are the study of improved methods, techniques, and equipment for radiological decontamination in cold weather regions, the development of a fenestral sprinkler system, and a shelter habitability study. Studies also are being made to improve existing knowledge on gamma and neutron shielding properties of shelters and to verify experimentally, where necessary, theoretical information developed in this field.

An important tool in this research is the Laboratory's unique atomic-blast simulator. It is used to generate pressure configurations similar to those resulting from the detonation of nuclear weapons. Pressures in the simulator up to 185 psi (260,000-pound total load) can be obtained in approximately 0.001 second. The duration of the pressure wave can be varied from 0.4 to 7 seconds in order to simulate pressure conditions resulting from both kiloton and megaton nuclear explosions.

NCEL R&D at a Glance

Civil Engineering	Mechanical Engineering	Applied Science
Structures	Polar	Chemistry
Materials	Process	Physic & Math.
Soils and Pavements		Electronics
Harbor	Environmental Control	
Amphibious	Equipment	



Atomic-blast simulator

Structural components, structural systems up to 8 inches in width, and instruments are subjected to these pressures to provide designers with new technology in blast-resistant structures.

Another program that is specific to the BuDocks mission involves deep-water oceanography, for the technological developments and changing concepts of naval warfare indicate that construction in deep ocean areas will be required in the future. In order to provide this capability, research and development is required in the over-all area of deep ocean facilities. Problems which have been identified to date and which will be important in the development of ocean bottom systems include the following: undisturbed samples of the bottom; installation and anchorage of foundations; current forces and other pertinent oceanographic data; scouring problems; behavior of materials; moorings; positioning of objects; operation of motors and other equipment.

In support of polar operations, cold-weather test and development sites have been operated continuously by the Laboratory since 1947. Depending upon project requirements, the sites have varied from the Sierra Nevada to the Rockies, and from Northern Alaska through Canada to Greenland. Frequently, more than one site has been active at a given time. A low-temperature test chamber at the Laboratory is large enough to accommodate tests on heavy construction equipment down to -65°F. Starting systems of various equipment, lubrication systems, manifold systems, and structural adequacy are tested at low temperatures. Such tests have enabled BuDocks to increase usability of Arctic assigned equipment from 25 to 75 percent usable.

AMPHIBIOUS AND WATERFRONT LABORATORY

The Amphibious and Waterfront "Laboratory" is an exposed beach and a close-by stretch of deep water. The experimental "tools" are a representative collection of warping tugs and amphibious craft and vehicles: a specially equipped DUKW and YFU, trucks, bulldozers, pontoon barges and tanks. These items have been used in support of developmental work on moorings, wave studies, special anchors, stake piling, waterfront structures, antenna masts, and ship-to-shore handling equipment, such as overhead tramways, fuel lines, special vehicles, and conventional barge systems made from strings of pontoons.

A prominent beach-front installation is the anchor-testing system. The equipment includes a 20-foot gage railway, a traveling instrument car, and a winch mounted on a stationary platform. The instrument car may be used to simulate the movement of a ship dragging its anchor or other simulated movement. The car carries an electric dynamometer to measure a retarding force up to 600,000 pounds, allowing Navy anchors of sizes ranging from 100 to 30,000 pounds to be tested. And the installation, because of its length and location, also may be used for applying tension loads to varied items or to equipment which could not be load-tested in standard testing machines. For example, it may be used in conjunction with traction pulls, breaking pulls against fixed objects, spooling pulls against torque converters and other dynamometer equipment.

Facilities are available for development of ship-to-shore fuel-delivery systems and floating booster stations, pontoon causeway assemblies, ship-to-shore movement of general cargo by aerial tramways, conveyors, and heavy duty systems for cargo in containers.

NCEL's Commanding Officer and Director, CAPT A. B. Chilton, USN, is one of the modern-type professionals who is as much an engineer-scientist as he is a naval officer. A graduate of the Naval Academy (1939), he holds two engineering degrees from Rensselaer and a M.Sc. and Ph.D. in nuclear physics earned at Ohio State. CAPT Chilton is assisted by a staff of 300, representing 110 colleges in this country, the British Isles, and Western Europe.

In this relatively small group, civilian scientists and engineers and CEC officers work as a team to solve many of the engineering problems associated with building and maintaining the Navy's Shore Establishment. Interest is further heightened by the fact that these problems are not exclusively military in nature. Hence the Laboratory serves a real need in peace as well as in war.

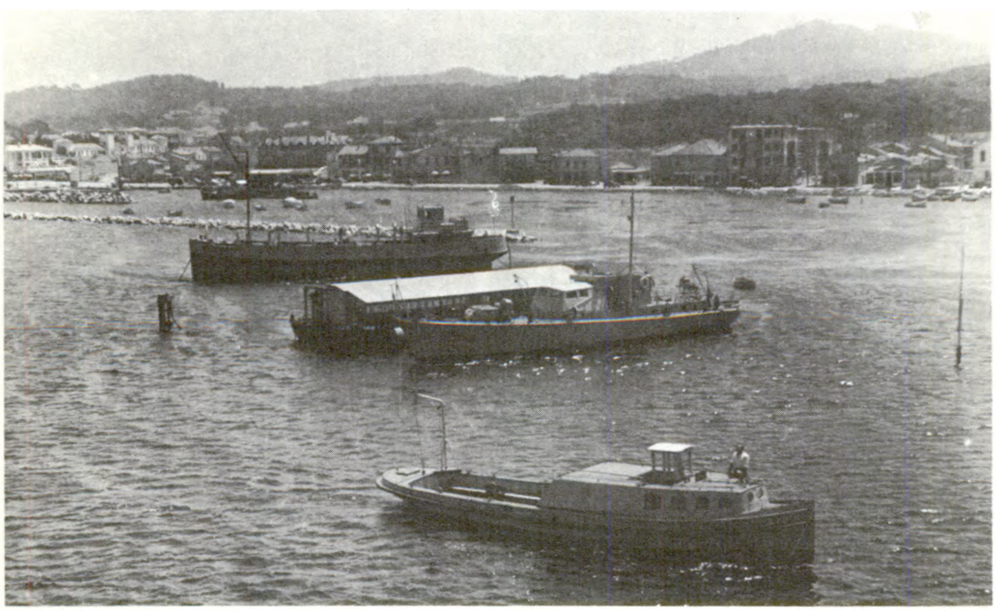
The French Navy's Underwater Sound Laboratory

M. P. Foache
Chef du Laboratoire du Brusc
Le Brusc, France

It was during World War I, when locating the position of enemy submarines became of utmost importance, that the French Navy first became engaged in research on underwater acoustics. At that time it was thought that the most efficient method of detection was to listen in on their propeller noise. To this end special microphones for underwater use were constructed and placed on the bottom of harbor entrances.

Subsequently, a French naval captain named Walser conceived the idea of using a kind of spherical dioptre stethoscope permanently mounted on the hull of escort vessels and so arranged that it provided a focal point for every direction of incident sound, much in the fashion of an acoustic lens. An acoustical horn, manually operated over the focal area, enabled the operator to determine from the horn position the direction of the incident sound. This Walser Detector, a cumbersome and not very sensitive piece of equipment, was abandoned when new developments in construction, of hydrophones and electronic amplifiers made possible the production of hydrophone arrays having greater accuracy, sensitivity, and simplicity.

The earlier listening techniques described above made use of audible sound only. The research work done by Langevin introduced the



Harbor of Le Brusc with calibration barge and experimental vessels

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ultrasonic beam which utilized the piezoelectric properties of quartz. The first detection method made possible by this new technique was called echo-ranging. After tests in Paris and in Toulon from 1915 to 1918, equipment of this kind was installed on the escort vessels of the French Navy in 1924.

About this time it became apparent that laboratories for underwater acoustics research would have to be created in order to study both the theoretical and practical aspects of the problems presented by antisubmarine warfare. Two laboratories were established at Toulon, both rather poorly equipped. Because of the scanty means at their disposal to undertake major development, the engineers decided that the presently used echo-equipment was working satisfactorily, and was sophisticated enough to be put into service.

It is possible that this early research work, undertaken perhaps a little too hastily, did not get quite down to the tactical and physical roots of the problems of ASW. Some critics challenged the efficiency of the echo-ranging method, pointing out that the detection ranges inevitably varied with bathythermal conditions. In any event, this form of detection gear was somewhat neglected and finally shelved, and, in 1938, a series of new echo-detection equipment had to be contrived in a hurry. Meanwhile, since 1934, listening arrays with electrical compensators were fitted on submarines and gave very good results. Some were fitted on surface ships, but with poor results due to self noise and to wide variations of low-frequency transmission near the surface. It is perhaps interesting to note that, in that early period, damping of the hull around hydrophones was frequently realized with a layer of coaltar of about ten centimeters thickness.

During World War II, the laboratories were destroyed and the equipment was either lost or rendered unusable. In 1946, it was decided that a new laboratory would be constructed in the Toulon area. A number of seemingly appropriate locations were surveyed and finally the harbor of Le Brusc was chosen as the site. The considerations favoring this little fishing port were:

- The depth increases sharply, thus providing the dual advantage of permitting acoustic propagation measurements in deep water and noise ranging on moving ships.

- The harbor, approximately 550 yards from the laboratory, provides an excellent shelter for the laboratory's small fleet of experimental vessels.

- The proximity of the Bay of Sanary facilitates measurements in shallow water.

- Very light navigation in the area allows measurements that are comparatively free from disturbance of passing ships.

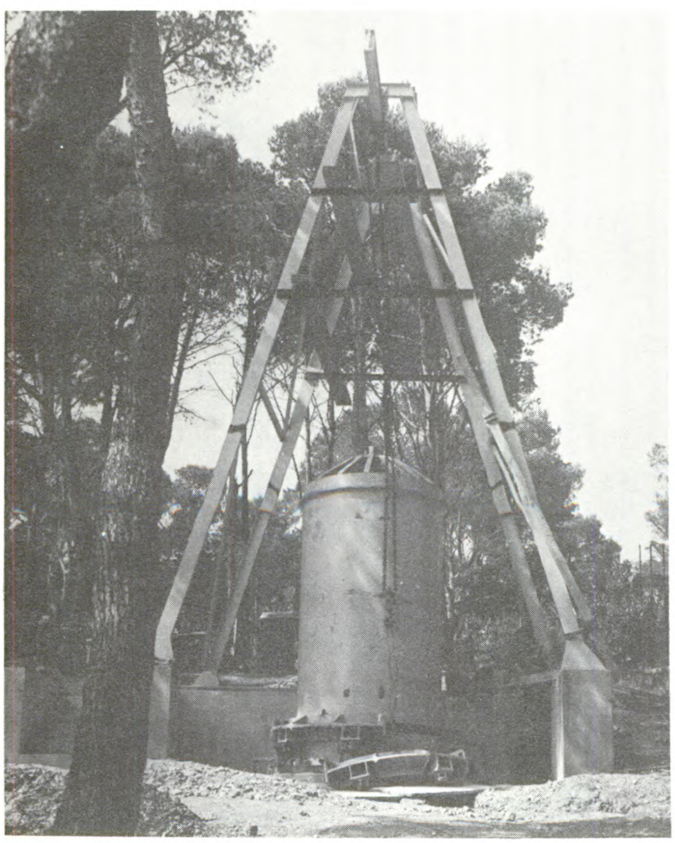
The Laboratory is a modest establishment, consisting of one brick building and several temporary wooden structures, situated in a pine-wooded area on the seashore. Construction of a large concrete building to replace the wooden structures is scheduled to begin in 1962. The Laboratory's main facilities for research and testing operations are two anechoic tanks, two calibration barges, a pressure tank, and two small seagoing vessels.

RESEARCH PROGRAM

The research program at Le Brusc is devoted entirely to underwater acoustics. The Laboratory personnel are divided into five teams with task assignments as follows: transducers, sonar systems, electronics, noise measurements, and testing operations at sea.

The hydrophones and sonar projectors used by the French Navy are designed at Le Brusc. For this purpose, the Laboratory has two workshops–one for hydrophones and the other for sonar projectors, both specially equipped for building prototypes to be reproduced by industrial contractors. The sensitive parts of most of the hydrophones and transducers are piezoelectric elements such as crystals and ceramics. Accordingly, the Laboratory has a crystal cutting shop, equipped with diamond saws designed for all type cuts, which turns out cut crystals at the rate of several thousand each year.

Ceramics have been used so widely, in recent years, as elements in sonar transducers that they are expected to replace synthetic crystals.



Pressure tank

Le Brusc has kept pace with the art by developing a facility for testing the physical properties of ceramics, especially the variations of these properties resulting from temperature and pressure. The testing equipment consists of an anechoic tank for measuring transducer response at temperatures ranging from 0° to 30°C, and a pressure tank with pressures up to 1400 psi; both tanks are equipped with adequate instrumentation.

Engineers dealing in underwater acoustics are required to make absolute measurements, and acoustic pressure measurements are by far the most important. Acoustic pressure is much more difficult to measure, for instance, than a length, a weight, or even an electrical value, but the absolute data are fundamental to the evaluation of the merits of a sonar or the noise made by a ship. Acoustic pressure measurements are made with the help of standard hydrophones. Le Brusc Laboratory manufactures its own hydrophones and has all the facilities to calibrate them by reciprocity methods. These calibrated standard hydrophones can be used for every kind of measurement; noise level, transducer sensitivity, and source level are but a few.

Since the accuracy of these measurements depends chiefly upon the acoustic field in which they are made, it is essential that there be no reflecting surface in the vicinity of the element to be measured, i.e., the working conditions must be those of a free-field. For this purpose, the Laboratory has at its disposal two measuring barges, one moored in Le Brusc harbor and the other in Lake Castillon.

One of these barges is moored in the harbor of Le Brusc over a pit 100 feet* long, 50 feet wide, and 20 feet deep which was dredged some 220 yards offshore. The bottom of the pit is covered with seaweed which provides good absorption characteristics. The barge, previously a harbor coal lighter, has been largely rebuilt and is now fitted with two test wells of 10 x 7 feet and 5 x 7 feet. The type of measurements conducted aboard are: (1) secondary calibrations with the use of standard transducers (the barge can handle transducers weighing up to 1-1/2 tons), (2) recordings of directivity patterns, and (3) studies and tests of sonar domes. The measurements made from this barge are subject to certain limitations set by the harbor water depth of 15 feet, which allows measurements above 5 kc only.

The desirability of working in frequencies below 5 kc indicated the need for an acoustic range suitable for low frequencies. After much searching for a location which met all the requirements, a site was chosen at Lake Castillon, about 87 miles from Toulon. Lake Castillon is about 6 miles long and from 3/8 to 1-1/4 miles in width with water depth varying from 160 to 260 feet. The lake provides favorable measuring conditions; for instance it is usually so calm the ambient noise noise level corresponds to sea state zero.

The Castillon barge, which is nothing more than a house erected on a platform supported by steel coffers, is moored over the deepest part

*Dimensions are not exact; they have been converted from the metric system and rounded-off.

of the lake. Its test well and associated facilities is capable of handling transducers weighing up to 8 tons. Measurements as low as 1.5 kc can be obtained under acceptable free-field conditions.

Although calibration barges of the type described permit accurate measurements, anechoic tanks are more convenient for routine work such as checking transducers or testing small-size hydrophones. As was stated earlier, Le Brusc has two such tanks. They are lined with a sound-absorbing material consisting of different-sized wedges of a cork-rubber mixture, giving them a reflection factor of less than 10 db for frequencies between 10 and 30 kc. The smaller (10-foot) tank is used chiefly for hydrophone calibration by filtered noise techniques. The large (15-foot) tank is used for sonar transducer calibration and for directivity pattern recording by use of the pulse technique.

SONAR SYSTEMS

The Laboratory's activities include both the design of sonar equipment and research in the field of signal processing. At one time the Laboratory was engaged in the design of complete sonar sets, but now, because of the increased complexity of this equipment, the Sonar Branch has turned to theoretical research to improve signal processing and the design of electronic sets as necessary to put these theories into operation. This branch also writes specifications for new sonar sets and evaluates prototypes developed by contractors.

Calibration barge on Lake Castillon

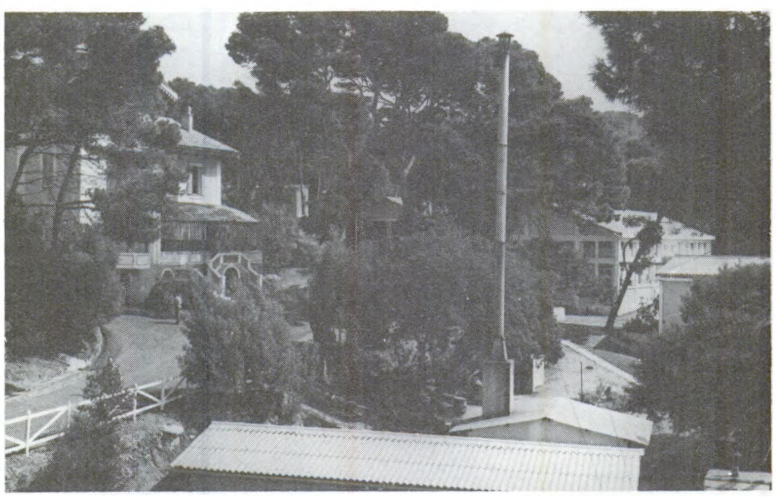
NOISE MEASUREMENTS

At Le Brusc, the field of noise measurement is considered in two phases: radiated-noise and self-noise. The method used to measure radiated noises is selected to fit the need. Most of the measurements are made on an acoustic range over bottom-mounted hydrophones; however, to suit specific needs, the hydrophones are sometimes suspended over the side of the barge. The acoustic range at Le Brusc permits ranging of the largest vessels at full speed. The hydrophones are set at different frequency bands to facilitate covering the complete spectrum of infrasonics, sonics, and ultrasonics.

Ship-noise measurements, because they require considerable instrumentation which must be calibrated before and after each series of measurements, are made aboard ship by specialized teams. A working period of two or three days is required to make a complete self-noise analysis of an escort vessel. In order to point out noise sources and to evaluate improvements obtained after each dry-docking, the Laboratory engineers maintain close liaison with their colleagues in the Navy Dockyards.

Sideline activities at Le Brusc have resulted in significant accomplishments, such as the development of "noise-makers" for evaluating the passive sonar sets which were used in designing and manufacturing the acoustical equipment of the French Navy Bathyscaphe FNRS 3 and in the construction of ship noise simulators for measuring the recognition differential of active and passive sonar systems.

Le Brusc Laboratory, now in its sixteenth year, has acquired vast experience in the various areas of research which have been conducted there over the years. Although appreciable results have been obtained in many areas, there remains a need for further improvement in facilities and constant adaptation to meet the changing demands of antisubmarine warfare.



The informal setting of the Le Brusc Laboratory

A Study of Frostbite Treatment *

William J. Mills, Jr., M.D.

If our armed forces expect to continue activities in frigid zones it is vitally necessary that all ranks and ratings–especially all medical personnel–acquire a sound working knowledge of the prevention and treatment of the various types of cold-weather injuries. Fortunately, the Bureau of Medicine and Surgery and the Office of Naval Research have sponsored continuing research on these problems, both in laboratories and in the actual environments of extremely bitter cold in the polar and sub-polar areas. A great deal has been learned, but there still remains an urgent need for new knowledge if man is to be given the best possible opportunity of survival in these extremely dangerous regions of the world.

Frostbite may be defined as the cooling of body tissue to the point of ice-crystal formation. There are numerous classifications as regards severity, durations of exposure, type of cold (wet or dry), rapidity of freezing, and other factors. A variety of signs are usually listed to determine the "degree" of frostbite and therefore to guide treatment. Although some differences in management will exist between the more trivial and the serious cases, it is apparent that, as in burns, even the experienced clinician will have great difficulty in accurately classifying the severity of injury early and that a more simple classification as to "superficial" or "deep" would probably be more suitable.

The interest of three Alaskan physicians* was aroused in this problem early in 1955 by a group of patients who had sustained clinical frostbite and all of whom had, as a result, one or both of the lower extremities amputated at levels varying up to the low thigh. Frostbite has been treated by such highly variable methods as packing the part in ice, primary application of pressure dressings, sympathetic block, insulation of the affected part at room temperature, and the application of local heat in many forms, including the use of diathermy. These programs have frequently included debridement, amputation, or both. It was realized that some variation in treatment is to be expected among a group of physicians and that individual cases may demand some adjustment of methods. Nevertheless, they felt that the wide latitude of treatment permitted between packing the part in ice or immersing it in a warm bath, or between considered watchful neglect or early amputation above the site of demarcation, could profitably be narrowed. So they were stimulated to try to find some treatment that would minimize or eliminate the severe losses commonly associated with frostbite.

The mechanism of injury in frostbite, although still not clearly understood, apparently depends on at least three distinct processes. The

*Adapted from an article by William J. Mills, Jr., M.D., Robert Whaley, M.D., and Winthrop Fish, M.D., Anchorage, Alaska. The article originally appeared in Alaska Medicine (March 1960, December 1960, and June 1961 issue) and was reprinted in Navy Medical News Letter (Vol. 38, Nos. 9, 10, 11, and 12, 1961). The studies were supported in part by a contract between the Office of Naval Research and Dr. Mills.

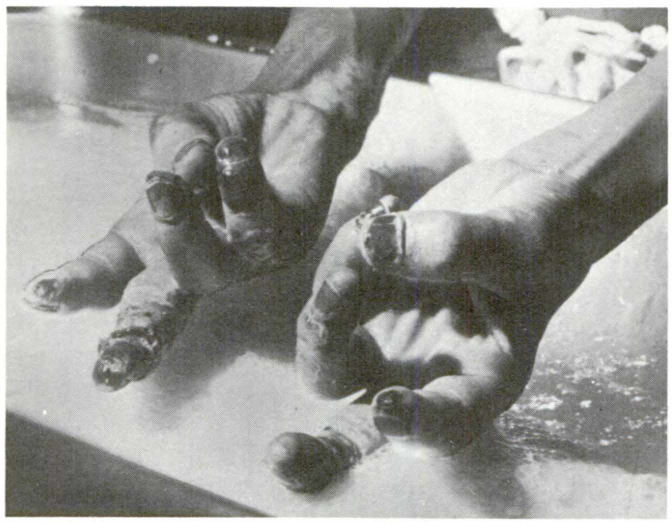
first and most obvious is the actual disruption of cellular and tissue structure due to ice-crystal formation. Associated with the ice-crystal formation is some type of direct cold injury to protoplasm, which is probably due, in part at least, to extensive dehydration. The third type of tissue injury is that resulting from impaired circulation.

METHOD OF TREATMENT

Fifty-one cases of frostbite were studied for a period of five years. Of these, 41 were treated directly by the senior investigator (WM) as either the attending or consulting physician. The remaining cases were drawn from the files of the Alaska Native Service Hospital and Providence Hospital, Anchorage. The majority of these cases not directly treated were studied by at least one of the investigators as an interested observer. Only three of the total series were not seen by any of the doctors. Hospital records for all patients were carefully perused and any pertinent information abstracted. When possible, the patients themselves were interviewed at length concerning the cause and character of their exposure and the resulting symptoms. All data which were considered of any possible value in the epidemiologic or clinical study were compiled.

Statistically, the patients were mostly between 15 and 45 years of age, and were almost equally divided between Caucasians and natives—Aleuts, Eskimos, and Indians. The causes of exposure were preponderantly the result of mishaps, such as vehicle accidents or breakdowns, runaway dog teams, or falling through the ice while crossing rivers and lakes. The natives were less apt to suffer frostbite because of loss of mittens or gloves, but otherwise they were just as prone to carelessness, and consequent injury, as the whites. A large number of the patients suffered exposure as a result of intoxication. Several of the natives were exposed because they were rendered helpless or unconscious by attack. Three of the latter were women, who reported flight after the assault in sub-zero weather without adequate clothing. Among all of the patients, the feet were involved more than any other site, with the hands next. In some individuals, all four extremities were affected.

When a patient was first seen by the investigators, the initial treatment consisted of rapid restitution of body temperature by a warm total bath (not always possible) and the feeding of warm liquids. Parts still frozen or cold were then brought to body temperature by immersion in a water bath of 110° to 118°F, preferably in a whirlpool. This was followed by very careful cleansing of the affected part, by scrubbing it thoroughly but gently with a germicidal solution (pHisoHex®) benign to the tissue. Scrupulous care was taken to avoid trauma to the tissues and puncture of any blebs. After the involved part had been made as nearly aseptic as possible, it was placed at rest on a sterile sheet and covered with a cradle over which a second sterile sheet was arranged to prevent contamination and unnecessary contact. No dressings of any kind were used except small pledgets of sterile cotton inserted between fingers or toes to avoid maceration.



Upper: Blebs formed on deeply frostbitten fingers, three days after rapid rewarming. Lower: Same hand being exercised in whirlpool bath.

Debriding action of whirlpool bath. Note dead skin peeling away.

Cause of Frostbite Injury by Race

Cause of Exposure	Caucasian	Native	Total
Insidious	1	3	4
Involuntary (accidental)	18	14	32
Aircraft accident	3	2	
Land vehicle breakdown	3	0	
Hunting or trapping	5	4	
Injury at work	1	0	
Assault	2	2	
Runaway dog team	0	3	
Fell through ice in river	0	3	
Other	4	0	
Alcoholic stupor	8	7	15
With assault		3	
Total	27	24	51

Whenever possible, physiotherapy with whirlpool bath was begun immediately, usually combined with ultrasonics. The baths were given for twenty minutes once or twice daily for one or two weeks under as nearly sterile conditions as could be achieved. Active motion of the affected part was encouraged from the beginning, but passive manipulation was delayed until the acute stage had subsided and danger of infection had diminished. Antibiotics were utilized in the same amounts and for the same rationale as for open fractures. In general, the method was directed toward the restoration of normal circulation, prevention of infection and ascending gangrenous change, and preservation and early rehabilitation of muscle and joint function.

For most of the subjects the investigators had very little control of early treatment, which had varied widely, depending upon where and by whom they were first seen. This included whirlpool and physical therapy in some cases, occlusive dressings in others. A few patients were treated with anticoagulants, vasodilators, or sympathetic block, but these were too few in number to warrant statistical consideration.

VARIATION OF RESULT BY METHOD OF TREATMENT

Thawing Methods

The data seem clearly to indicate that thawing with dry heat at high temperatures is hazardous because of the danger of raising tissue temperatures above the limit of viability, especially tissues previously traumatized by excessive cold. Aside from this, superficial injuries can be thawed by almost any method with apparently reasonably good results. At least no great difference in results was demonstrated in this small series, other than a definite earlier return to normal sensation and appearance in the extremities rapidly rewarmed in a water bath.

For deep injuries, best results were obtained with a warm water bath.* The temperature of the water, actually, is quite critical: it should be from 110° to 115°F. Temperatures less than 110 seem to be unsatisfactory, and when the water gets to 120 it begins to be scalding. Experience indicates that rewarming in a 110° to 115° whirlpool bath from 20 to 40 minutes will quickly restore nearly normal coloring to the frozen member. These temperatures applied only to the initial rewarming. For the follow-up therapy–daily or twice daily whirlpool baths–the water was kept at 98° to 100°.

This method is more painful in its initial stage, resulting in an increased content of blood in the part, with distension of the blood vessels, and larger blebs. The pedal pulses often are "pounding," after warming, and the blebs usually extend outward along the fingers or toes, clear to the tips. Because of the extreme reaction, particularly the edema and bleb formation, this is not a "trail therapy."

Although the results from "gradual thawing" or thawing at room temperature apparently do not differ statistically from other methods in cases of superficial injury, there is obvious clinical evidence that this method yields poor results, often associated with considerable tissue loss, in the "deep injury" cases.

The treatment of deep frostbite by ice, ice-water, or snow plainly results in greater tissue loss, and the method appears to have little theoretical or experimental basis to recommend it. More than likely this traditional method arose from the lessened pain and discomfort during thawing, particularly in superficial injury, and the obviously disastrous results obtained by applying external dry heat. It was probably this effect of excessive dry heat that accounted for the severe gangrenous results reported by Larrey during Napoleon's retreat from Moscow, a report so often quoted in the cold injury literature that rewarming at temperatures greater than body temperature was for many years rejected and only recently received encouragement.

Physiotherapy

Physiotherapy serves at least two purposes. First, it allows the patient to participate in the therapy. Travel to the therapy area, at least once a day, may well be a considerable morale boost, particularly for bedridden patients or those hospitalized for 30-150 days. Also, patient

*A recent letter from the author stated "...We have had almost as many frostbite patients this year (1961) as in the five years (1955-1960) covered by the described investigation. Over 50 percent were rewarmed rapidly. In none of these will there by any loss greater than a portion of a digit, and in the greatest majority no anatomical loss at all."

Appearance of feet after thawing by ice-and-snow method. One set of toes had to be amputated.

is able to measure his progress by gradual increase in range of motion of the digits and the return of more normal sensation. Second, the use of Hexachlorophene(R) detergent in the whirlpool removes surface bacteria, hastens normal physiological debridement, and permits a stimulating massage of tissues. Also, the offensive odor so often troublesome to patients is considerably lessened. Too, whirlpool possibly increases local circulation, and, in this study, it appeared to cause rapid diminution of edema.

Serial whirlpool readily relieves pain, and patients tend to exercise the extremities while in whirlpool more than while lying in bed. Hand exercises, especially after the blebs have dried and sterile fluffs are utilized for pressure exercises (squeezing), are made easier and are more likely to be performed regularly during and after whirlpool therapy.

Ultrasound was found to be both help and hindrance. Some patients with superficial injury reported "improved" sensation and ease of interphalangeal joint motion. In several, in which the cold injury was assumed to be nearly symmetrical in both extremities but with only one receiving ultrasound, there appeared a measurable change. Increased interphalangeal joint motion and increased sensory return were marked. There was observed visual evidence of an apparent increase in vascularity of fingers and toes, particularly noted immediately after the use of ultrasound. With deep injury there is cause to believe, from sensations reported (boring pain or dull ache) and from appearance (hastened necrosis in some), that the use of ultrasound is harmful.

In some cases, particularly those thawed by ice and snow and a few slowly warmed at room temperature, dry gangrenous tissues soon became wet after ultrasound, and liquefaction of the distal tissues was hastened. In further control groups, of approximate equal injury to each extremity, ultrasound has demonstrated its ability to cause resolution of blebs on one extremity many days ahead of those on the opposite untreated extremity. At the third or fourth week, however, no difference was generally exhibited between the extremities.

Debridement

In most cases, normal debridement is adequatley and physiologically performed by the whirlpool. The bath's gentle motion removes eschar–scab-like dead tissue–only when it is physiologically prepared to separate.

From this study it is apparent that mechanical debridement is the most harmful of all therapies for cold injury, because incision of swollen and friable tissue permits ready access for bacteria, usually already present on the skin. Further, debridement or amputation in the early stages (first to third week) will penetrate the edematous tissues, which then retract, exposing more bone and joint surface with further tissue loss.

Infection

Superficial infection was present in most of the cases treated; patients had pockets of pus in the eschar. The superficial infection appeared held in abeyance by whirlpool, but it increased in many cases after debridement and without whirlpool. It is presumed that the effectiveness of Hexachlorophene(R) in the bath was that of a germicidal agent. At any rate, infection was more prevalent in those cases treated with closed dressings or not receiving whirlpool bath or daily lavage. Under the conditions described by these investigators, constant whirlpool followed by dry "open" method of dressing is the best way to prevent the rapid growth of bacteria.

For the first four years of the study the patients were placed routinely on broad-spectrum antibiotics. In the last year antibiotics were utilized only after definite indication and following culture and sensitivity studies. Use of antibiotics was not essential for most patients utilizing whirlpool bath but was required more frequently in patients treated otherwise.

AMPUTATION

The early appearance of the deep-frozen extremity, once blebs have dried, is often that of black mummification extending even above the digits and involving all of the extremity's surface. The over-all appearance is often misleading, and premature amputation must be avoided. Amputation or debridement at this period (6-21 days) may reveal viable deep structures that would have permitted growth of new tissue under the eschar. The eschar, after new tissue has grown, will often loosen and shed, permitting exposure of healing tissues below. If amputation must be performed at the digital level, most satisfactory results appear to be at the end of the 60- to 90-day period. It was observed in this study, that the digits will separate spontaneously, requiring only revision later.

If, because of ascending infection, amputation must be performed at a higher level, it is absolutely essential to perform a strict guillotine procedure. After edema has subsided and an adequate granular bed developed, revision of the stump can follow. It is interesting to note that only one patient had to be amputated following rapid rewarming as described, and that resulted in loss only of a large toe.

ASSOCIATED INJURY

Management of the accident victim may become a problem in therapy, since frostbite often is secondary to dislocation or fracture or crush injury of the extremity. These cases present combined technical difficulties other than the method of rewarming and frostbite care and, as a group, are desiring of more study. The approach here is similar to that of an open fracture, where consideration is given first to preservation of life and limb, then function, and, last of all, cosmetic result. Despite the glibness of this approach the problem is not that simple. Much clinical investigation is required to further the treatment of fracture dislocation or soft tissue injury of the extremity with associated cold injury.

Of particular interest are the patients who become irrational or confused on the trail after freezing injury and the bed patient who, after five or six days, demonstrates a severe emotional reaction, even developing hallucinations. Few of these patients required psychiatric care of any prolonged nature, but they did require understanding, tolerance of their mood, patience, and constant visitation and encouragement.

CONCLUSIONS

It is apparent from this study that the elimination of freezing injury is improbable, but a decrease in incidence is possible with proper prophylaxis. General knowledge of proper clothing, especially hand and foot gear, and the care and use of such gear in freezing temperatures, is essential. Basic information regarding the mechanism of heat production and loss resulting from the effect of activity, fatigue, sweating, shivering, wind exposure, and wet clothing should be made available to winter travelers in the Alaskan area.

Methods of care in the event of unavoidable trauma should be taught those whose occupation or avocation permits exposure in the Arctic or sub-Arctic. For neither here nor elsewhere has a solution been found which will nullify the effects of neglect, carelessness, alcoholic intoxication, accident, or assault that were the contributing causes of injury in this series.

Research Notes

Army Makes Big Splash with New Anchor

Army Engineers have combined solid rocket fuel and a revolutionary design to develop an explosive-driven anchor–one of the few basic changes in anchor design in many years. This special purpose anchor, developed by the U. S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va., does not eliminate the need for the conventional anchor carried by ships. Rather, it is part of a system designed to provide secure mooring in offshore open-sea areas from which oil tankers can discharge oil through undersea pipelines.

The mooring system consists of a platform-type buoy, fitted with a pipeline in its base, and the anchor. The buoy is towed into position and the anchor is released by remote control. The solid rocket fuel detonates when the anchor contacts the floor and drives the anchor into the ocean floor; latest tests show a 34-foot penetration into a hard bottom.

Tankers simply moor themselves to the buoy, attach their pipelines, and start pumping oil. If it becomes necessary to abandon the site in a hurry, the buoy may be cut loose and the anchor left in the ocean floor. Because of its relatively low cost, it is considered expendable.

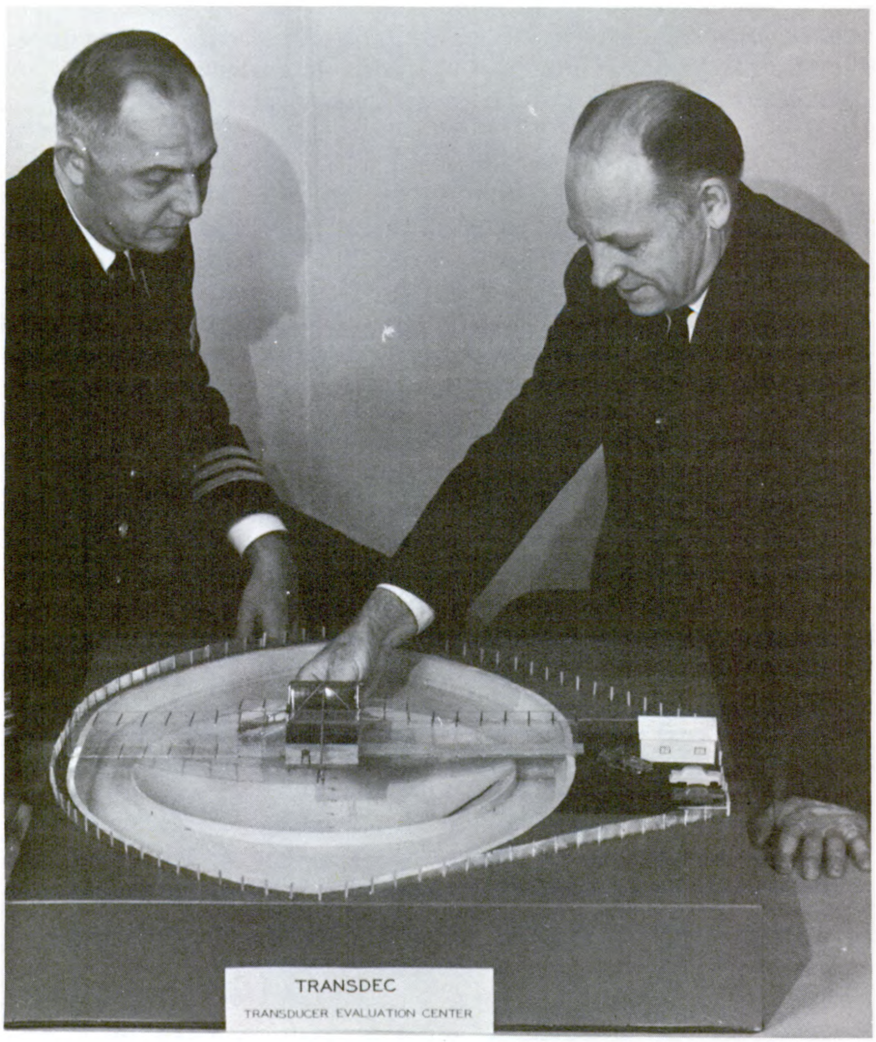
The Army Engineers, cooperating with the Navy and private industry, tested experimental mooring anchors weighing 225 pounds with a minimum holding power of 50,000 pounds, on sand, silt, coral, and rock bottoms. Results of these tests are expected to lead to the development of similar explosive-driven anchors weighing approximately 1500 pounds with a holding power of 300,000 pounds, which would do the job of the conventional-type anchor of equal holding power, but weighing 42,000 pounds.

The contract development program was under the direction of the Advance Systems Development Division of the Pneumo Dynamics Corporation, El Segundo, California.

NEL to Build New Sonar Transducer Test and Evaluation Center

Construction of a huge new Sonar Transducer Test and Evaluation Center (TRANSDEC) at the U. S. Navy Electronics Laboratory, Point Loma, San Diego, California, is expected to begin as soon as contractual arrangements are settled. This center will replace the NEL Sweetwater Lake Sound Calibration Station which was rendered permanently unsuitable for further tests when the water level was lowered to the extent that adequate and valid calibrations of new transducers could no longer be obtained.

TRANSDEC will feature an anechoic tank 300 feet long and 200 feet wide with a maximum depth of 38 feet. This tank, to be constructed of concrete, will be the largest of its kind, and possibly the only one of its kind in existence. The basis for the design is an ellipsoid of revolution with a central bowl 160 feet in diameter. The design locates the test transducer at one focus of the ellipsoid, which causes all reflected sound to be projected into an absorbing zone outside the bowl. The pool's echo-free sound field will be contoured to a sector of a canted ellipse. The slope of the pool's surface was designed to direct all sound from outside the pool's boundaries in such a manner as to provide a sound field almost completely free from interference. The pool will be provided with a sound trap 10 feet deep with the bottom covered with a 4-foot layer of absorbent mud. Multiple reflections will reduce the sound intensity to negligible levels. The calibration building will be suspended from a truss across the pool to prevent structure-generated noises from entering the water and influencing measurements.



CDR A. C. Carson, USN, program officer at NEL, and Charles E. Green, designer of the tank, discuss a model of TRANSDEC

Transducer design and evaluation, because of advances in sonar and acoustics equipment, have become critical factors in the application of electronics to antisubmarine warfare and oceanographic systems. The complexity of designing and evaluating transducers is such that they must be developed well in advance of the systems in which they are to be used. TRANSDEC will perform research, development, and test functions directed primarily toward the improvement of weapons systems for antisubmarine warfare, mine hunting, and ASW/mine countermeasures.

Point Light Source Projection Technique

A unique nonprogrammed projection technique has been developed for use with flight trainers and other military vehicle simulators, making it possible to simulate the visual environment outside the trainer's cabin. A pilot in a simulated helicopter, for instance, is able to see the terrain, trees, buildings, and other obstructions as he maneuvers over the simulated ground. In the past, most flight simulators were designed only for instrument flight. The development of the nonprogrammed projection technique is a major step forward in the technology of simulation.

The prototype projector involves four primary components: (1) a brilliant point light source; (2) a 6 x 6-foot transparency depicting the desired conditions; (3) a basic motion device to change the position of the transparency; and (4) a 20-foot diameter, 250-degree contoured screen. When the projector is operated, light from the point light source

Point light source projection wide angle scenic display radiates in all directions and a section of these rays passes through the transparency and is projected onto the screen.

When the terrain transparency is moved horizontally below the point light source, the illusion of movement over terrain is created on the screen. When the transparency is moved vertically down from the point light source, an illusion of increased altitude is projected on the screen. Thus by controlling the movement of the terrain transparency, an observer can appear to have all six degrees of movement: up, down, turn, roll, pitch, and yaw.

When development has been completed, it will be possible to simulate views from moving aircraft, helicopters, ships, or other type vehicles; in all cases the operator of the simulated vehicle will be able to maneuver the vehicle with complete freedom within the area projected on the screen.

The development, application, and study of this projection technique was undertaken by the deFlorez Co., Inc., Englewood Cliffs, N. J., under the direction of the U. S. Naval Training Device center, Port Washington, N. Y. The prototype is installed at NTDC and is undergoing further tests.

– Geo. Puller, NTDC

Hydroskimmer Research Craft Planned

The Bureau of Ships has contracted for a 22-ton hydroskimmer research craft. Sometimes called a ground effects machine or hovercraft, it will be a part of the Navy's program to develop ocean-going vehicles of this type. It will be used to develop an understanding of rough-weather control problems and design criteria for future vehicles. The craft will also permit exploration of this concept for possible military vehicles.

Expected to be ready for testing by mid-1963, the amphibious vehicle will skim on a cushion of air over smooth water and flat land surfaces at speeds in excess of 70 knots. Test runs will be made on Lake Erie and the Niagara River.

The aluminum-hulled hydroskimmer will be 62 feet long, 27 feet wide, and have an overall height of 21 feet. An open cargo deck at the aft end of the hydroskimmer will provide for approximately five tons of payload.

Four air cushion fans, mounted horizontally in the hull, will provide the lift needed to rise from the surface. It will hover at a height of a little more than two feet. Two propellers, mounted in ducts in the after deck, will supply thrust. Aerodynamic rudders, located in the slip stream of the propellers, will provide yaw (turning) control. Four 1080-horsepower gas turbine engines, mounted in the hull, will power the four air cushion fans and drive the two forward thrust propellers.

Secretary Wakelin presents Naval Reserve Research General Excellence Award to CAPT Wadsworth as RADM Towner, left, looks on.

On the Naval Research Reserve

National General Excellence Award Presented to NRRC 13-6

Friday evening, 9 February 1962, was a memorable day for Naval Reserve Research Company 13-6, Idaho Falls, Idaho. On this date the HON James H. Wakelin, Jr., Assistant Secretary of the Navy (Research and Development), presented the first Naval Reserve Research General Excellence Award, a national award established by the Chief of Naval Research. The award was accepted for the company by CAPT Thomas J. Wadsworth, USNR, Commanding Officer of NRRC 13-6. The Idaho Falls Company was selected winner of the award among the 114 Research Reserve companies (Nav. Res. Rev., Jan. 1962).

The Company was also the recipient of another award that evening. RADM George C. Towner, USN, Commandant, THIRTEENTH Naval District, presented the First Place permanent plaque to NRRC 13-6 in recognition of its designation as the outstanding company of the thirty-nine specialist companies in the THIRTEENTH Naval District.

The awards were presented at a typical NRRC 13-6 drill meeting which had been preceded by a dinner for all hands. After the presentation of the awards the program consisted of talks by two members of the Company: LCDR W. S. Manning, USNR, led a discussion on leadership and LCDR J. E. Van Hoomissen, USNR, carried out an instruction period on the SL-1 reactor disassembly.

The ceremony was attended by many friends and dignitaries, among whom were: CAPT J. W. Jockusch, Jr., USNR, of Washington, D. C., representing the Chief of Naval Research; LCDR W. F. Cooper, USNR, and LT R. G. Gantt, USN, both of the ONR Branch Office, San Francisco, California; representatives from the THIRTEENTH Naval District including CDR K. P. Huff, USNR, (Executive Assistant, Naval Reserve and Training), LCDR J. L. Morton, USN, (Naval Reserve Recruiting), LT F. D. Snyder, USN, (Public Information Officer), and Mr. Kenneth Easter, Seattle, Washington, National Navy League Director, and other members of the Navy League from the three states of Washington, Idaho and Montana. There were many ladies present, including Mrs. Wakelin, wife of the secretary. In all, over 160 persons from Idaho and surrounding states attended this presentation of the first annual Naval Reserve Research General Excellence Award.

Selections for Captain, USNR

One hundred and sixty-six Naval Reserve line officers have been selected for promotion to Captain by the FY 1962 Reserve Selection Board, which was approved on 6 February 1962. Of this number 5 are Research Reservists. Congratulations are extended to:

	NRRC
J. R. Boline, Jr.	9-6
G. J. Haltiner	12-8
W. D. McClurkin (Commanding Officer)	6-18
H. V. Nutt	5-11
T. E. Oberbeck	12-8

Statistics based on the records of the Research Reservists selected for promotion are as follows:

Date of Rank	Designator	Year of Birth
7-1-54	1105 - 2	Earliest 1909
	1355 - 2	Latest 1918
	1405 - 1	Median 1914

It is to the advantage of the officers selected to qualify for promotion within one year from the date on which the President approved the report of the selection board (6 February 1963). By qualifying within this year these officers will be entitled to pay and allowances of the new grade for that year. However, if more than a year is taken to qualify, the entitlement for pay and allowances of the new grade date from appointment in that grade.

Another change this year–the physical examination for promotion may now be taken as soon as the official letter of notification of selection has been received even though the officer may not have completed the professional requirements at that time.

Two FY 1962 Research Reserve Seminars Scheduled for June

Two Research Reserve Seminars will be conducted in June 1962 to complete the seminar program for this fiscal year. It has been necessary to postpone indefinitely three of the Research Reserve Seminars due to the unavailability of funds. However, it is planned to hold the following two seminars regardless of the funding situation: ONR Seminar at Washington, D. C., convening 4 June and the Training Device Seminar at Port Washington, New York, convening 11 June.

ONR SEMINAR

The ONR Research Reserve Seminar for FY 1962 will meet in Washington, D. C., for two weeks beginning 3 June 1962. About 100 officers are expected to attend the meeting, which is open to all services. The ONR Seminar is under the general direction of CAPT J. W. Jockusch, Jr., USNR, Special Assistant to the Chief of Naval Research (Research Reserve). Technical direction will be supervised by the Research Director, Dr. S. Silverman.

This year the conferees will meet as a complete group for all sessions of the seminar. This is a change in the general plan of presentation since small group study has been employed for the past five years. In addition to an overview of current naval research and development, the following specific scientific areas will be presented:

- Search of the Oceans (Dr. A. E. Maxwell)
- Navy and the Space Age (CAPT R. J. Trauger, USN, and Dr. R. Roberts)
- Potentials of Life Sciences (CAPT J. P. Pollard, MC, USN)
- Geophysical Relations to Nuclear Detection (Mr. J. W. Winchester)

NOTE: There is a change for the worse in the availability of quarters for this year's seminar. The BOQ at the Naval Receiving Station, which was formerly used by officers attending the ONR Seminar, was disestablished on 15 December 1961. Local BOQs of other services (South Post of Fort Myer and Bolling Air Force Base) are extremely limited in space and are unable to reserve accommodations for officers attending this seminar. However, a list of available hotels and motels with information on rates will be forwarded to the attendees.

TRAINING DEVICE SEMINAR

The Training Device Seminar will be held at the U.S. Naval Training Device Center, Port Washington, New York, for the period of 10 - 23 June 1962. This seminar covers current developments of training devices, training aids, human engineering, and related fields of scientific research and development. Priority is given to the members of the Research Reserve Program but other qualified reservists may attend on a space-available basis. Also, quotas have been given to other services for participation of selected officers. No BOQ's are available but suitable commercial accommodations may be obtained at reasonable rates. Comments from officers who have attended past seminars at the Training Device Center indicate an enthusiastic approval of the content and presentation of the seminar program.

Comment on the Research Reserve Award Program

In the Annual Report of the Naval Reserve Program, the Commander Naval Reserve Training Command took note of the establishment of national competition among Research Reserve companies and commented favorably on the Research Reserve specialist program. Following is an excerpt from the Report:

"FY 1961 saw the institution of competition on a national basis in one Specialist program. Upon recommendation of the Chief of Naval Research, and with the concurrence of Commander, Naval Reserve Training Command, the Secretary of the Navy approved a national competition for Naval Reserve Research companies. [The two awards, General Excellence (described in this issue) and the A. Hoyt Taylor (Nav. Res. Rev., Jan. 1962) were singled out.]

"This is the largest of the Specialist programs with over 2000 officers in 113 companies. Due to the breadth and scope of the professional and scientific disciplines represented in their membership, and the unexcelled control, leadership and guidance which ONR exercises through its Branch Offices, the training, lectures, seminars and projects they conduct are highly effective."

Seminars Planned for Fiscal Year 1963

Eleven Research Reserve seminars are planned by the Office of Naval Research for fiscal year 1963. Final approval on these seminars must be given by the Bureau of Naval Personnel. Further information will then be promulgated officially in BUPERS Instruction 1571.4 series. This Instruction is expected to be available in May 1962. The titles, places, and dates of the seminars presently planned are as follows:

Nuclear Sciences, Idaho Falls, Idaho	23 July 1962
Naval Research Laboratory, Washington, D. C.	20 August 1962
Biological Defense, Fort Detrick, Frederick Maryland	1 October 1962
Electronic Computers, Newburgh, New York	15 October 1962
West Coast, Pasadena, California	22 October 1962
Nuclear Sciences, Oak Ridge, Tennessee	26 November 1962
Submarine and Diving Medicine, New London, Connecticut	18 March 1963
Life Sciences, Bethesda, Maryland	13 May 1963
Research Reserve Seminar, ONR, Washington, D. C.	10 June 1963
Research Methods, Columbus, Ohio	17 June 1963
Training Device Center, Port Washington, New York	17 June 1963

Field Trips by Research Reserve Companies

Two Research Reserve Companies conducted interesting weekend tours to nearby facilities. By means of group training orders, officers of these companies enjoyed informative trips to local air commands.

OAK RIDGE COMPANY VISTS AFB

Seventeen members of NRRC 6-3, Oak Ridge, Tennessee, participated in a tour of Sewart Air Force Base, Smyrna, Tennessee, on 27 January 1962. This base, under the Tactical Air Command, has the mission of supporting world-wide operations of the C-130 aircraft.

The tour started with Base Operations, covering the flight plan room, weather observation and forecasting, and the control tower. A C-130 was inspected on the flight line as well as the flight simulator used to train pilots new to the C-130. The Aerial Port Squadron demonstrated the mission and operating methods of a combat control team in air drops of men and material and in operation of a temporary air strip. Briefing was given on the maintenance of these craft. The fire department provided a demonstration of procedures for fighting fires both on the base and in an air crash. The well-planned and executed tour gave an excellent picture of the position and mission of the C-130 in the defense of the United States.

DENVER COMPANY TOURS NORAD HEADQUARTERS

On 21 December 1961 nine members of NRRC 9-21, Denver, Colorado, traveled to NORAD Headquarters, Colorado Springs, for a tour of the central control facilities for Continental Air Defense.

NRRC 9-21, activated 1 February 1961, is made up almost entirely of junior officers. Among its 15 members there are no captains or commanders, and there are several officers whose entry into active service was so recent that they do not rate campaign ribbons. Yet these officers show a high capability in their specific fields of interest.

In Memoriam

It is with deep regret the Research Reserve has learned of the death of CAPT Ray H. Parker, USNR, a member of Naval Reserve Research Company 12-1, San Francisco, California, in November 1961. CAPT Parker joined the Naval Reserve in 1927 and held active duty assignments in the field of communications. CAPT Parker was an enthusiastic supporter of the Navy and the Naval Reserve and made notable contributions through his service as Commanding Officer of NRRC 12-1, as a member of both the Naval District and National Naval Reserve Policy Boards, as organizer of Research Reserve seminars, and as a member of a reserve selection board.

Hydroponic Gardens

Sailors in the Navy's Polaris Submarine Fleet are being fed fresh vegetables right from the garden. The garden is on board the submarine.

It is a known fact that submariners need fresh vegetables on long voyages to maintain their health, and someone has done something about keeping a supply of the green stuff always on hand. Scientists developed hydroponic gardening kits. The seeds are planted in the hydroponic kits and shipped to the submarines at their Holy Lock anchorage. The kits are flower-box type containers that are filled with a chemical growth base. Heat and light necessary for growth are supplied by intense fluorescent lamps.

How long does it take to get results? With love and tenderness, ruby lettuce can be grown in about three weeks, dwarf peas in four weeks, and carrots in about a month. Now the cooks will have to add new qualification to their rating—a green thumb.

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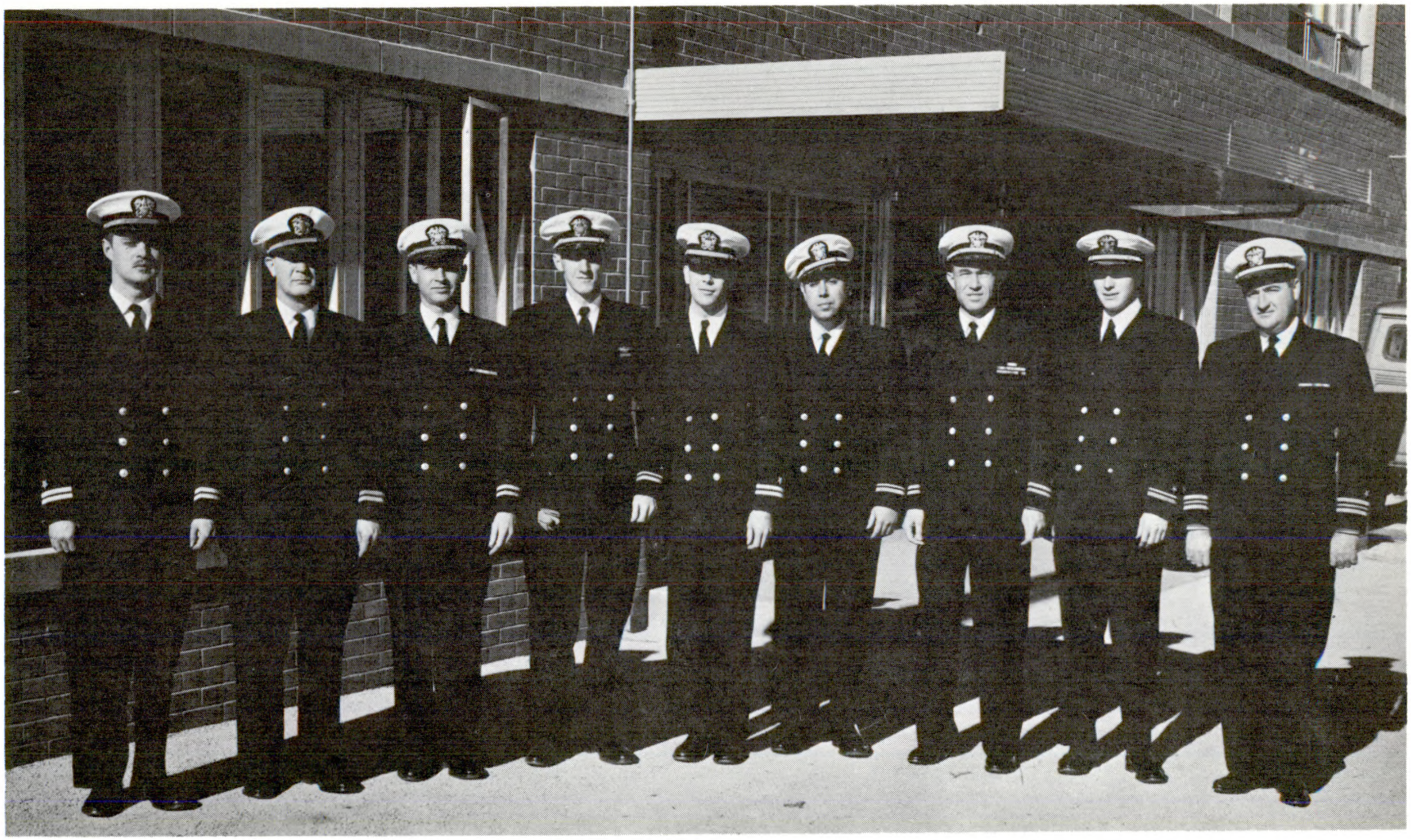

NRRC 9-21 at NORAD. The Commanding Officer, LCDR Gus Francis, USNR, is on the extreme right.

IN THIS ISSUE

A New Variable in Underwater Explosions .... E. A. Schuert 1

In Project HYDRA, carried out by NRDL in California waters, radioactive tracers are included in underwater explosion research.

The Naval Civil Engineering Laboratory 4

A young but capable establishment at Port Hueneme is the research and development laboratory for the Seabees and the CEC.

The French Navy's Underwater Sound Laboratory .... M. P. Foache 9

A small fishing port near Toulon is the site of France's modern ASW Laboratory.

A Study of Frostbite Treatment .... W. J. Mills, Jr., et al 15

Analysis of the various methods of treating frostbite, conducted with Alaskan whites and natives, indicates that rapid thawing in warm, agitated water is preferred.

Research Notes 23

On the Naval Research Reserve 27

NAVAL RESEARCH reports highlights of technical progress in research by Navy laboratories and contractors and the development of important naval research facilities. The magazine is listed for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. Subscription price: $1.50 per year in U. S. and Canada; $2.00 per year, foreign; $0.15 per individual copy. Changes of address should be sent to Code 740, Office of Naval Research, Washington, D. C. The issuance of this publication approved by the Secretary of the Navy on 1 March 1961.

Instrument raft for measuring effects of Project HYDRA explosions. (See Pages 1-3.)

NAVEXOS P-510