AOD Assigned Axle of Responsibility

Sidewinder's Commitment to Fleet Completes Six-Year Department Task

Before 1950, with a handful of men, Dr. William B. McLean began working on SIDEWINDER behind Michelson Lab. Some of these men who worked designing the missile were L. M. Biberman, S. R. Crockett, Jack Braitman, Donald Duckworth, R. S. Estey, William Gey, L. W. Nichols, and R. R. Whitney. Woodrow Mecham and John Murray assisted on the early machine work.

The team spirit of the men who worked with Dr. McLean to solidify his first concept of SIDEWINDER remains in the growing squad of civilian and military personnel that now works to perfect the SIDEWINDER missile system. Let it be said that the growth of SIDEWINDER has been so rapid that it would be impossible to give a complete picture in one short article of the contributions afforded by the various departments, divisions and branches that now compose the Naval Ordnance Test Station, China Lake.

The first SIDEWINDER missiles were hand constructed by the Aviation Ordnance Department and the Engineering Department when these two departments were in their early years of existence.

When Dr. McLean became Technical Director, he gave the responsibility for technical direction of the system's development to Dr. N. E. Ward, Head of AOD. Within AOD, Dr. H. A. Wilcox created Division 2 to prosecute the SIDEWINDER program, and from this point Division 2 has been directly responsible for the SIDEWINDER program.

While Division 2 began early development of the guidance and control unit, the aerodynamic design for the missile, and specifications and design of launcher and aircraft equipment, the Engineering Department assisted in testing the structural components and provided continual research and development information on the environmental suitability of the quickly-developing missile system.

Division 2 also originated and maintained specifications and drawings describing the missile. The early testing of the missile also included actual firings. The Experimental Officer and the Naval Air Facility furnished the logistic aircraft necessary for the support, development and testing of the SIDEWINDER. Urgently needed parts and materials were flown to NOTS for the continuation of the testing program, but with SIDEWINDER'S highly effective "strike" capacity, one of NAF's biggest jobs has been to maintain the drones used for targets because of SIDEWINDER'S "strike" capacity.

Producing equipment to find out SIDEWINDER's capabilities and record this data has been no small chore. From among the divisions in AOD came the necessity for Rod McClung to produce the telemetering equipment and special instrumentation used for flight tests, as well as John Gregory's and Carl Freeman's radar electronic equipment, auxiliary aircraft equipment used to predict the missile range, and instrumentation and test facilities for special tests. Also, in these times of the missile system growth, AOD processed the telemetering records for evaluation.

Along with the missile's growth came the expansion of the SIDEWINDER program, the shifting of the early pioneers to different positions, the need for new personnel, and the expansion of the organization.

Having established the feasibility of the system, many more groups and organizations both on Station and off helped to put the SIDEWINDER missile system where it is today.

Dr. W. B. LaBerge became Head of AOD's Missile Division, having been in the earlier progress of the missile. Dr. LaBerge, along with his Associate Head, Dr. W. F. Cartwright, are now directly responsible for the SIDEWINDER program and are supported by these branches:

Aerodynamics Branch (L. T. Jagiello, Head, with M. Kamimoto and others) furnished complete aerodynamic design for the missile, as well as specifications and design of launcher and aircraft equipment.

Equipment Branch (J. H. Madden, Head) carried out the reliability program on the missile, produced test, assembly and auxiliary missile and aircraft equipment, and assisted in shipboard installations.

Research Branch (L. N. Nichols, Head) in a joint effort with **G and C Branch** (E. G. Swann, Head), furnished the basic research material on the missile guidance.

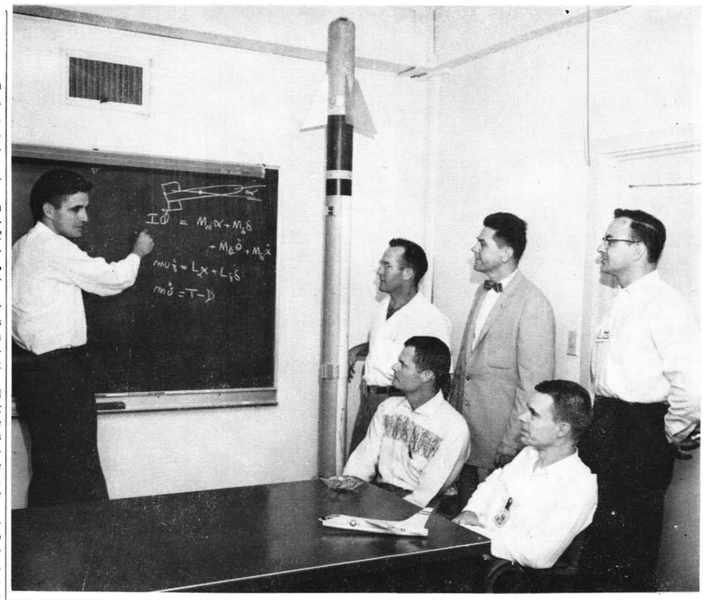
Missile Branch (C. P. Smith, Head) carried out the development and modification of the guidance and control unit in order to bring it to its present service capability, and directed the research flight test program.

Simulation Branch (Dr. P. T. McCormick, Head) provided detailed simulation of the performance of the missile and its components.

Weapon Coordination Branch (Cdr. W. H. Cone, USN, Head) is responsible for the overall coordination of the division's efforts.

Dr. Wilcox, moving from Division 2, AOD, to head the Rocket Development Department, has designed many of the components of SIDEWINDER. The Rocket Development Department also developed the rocket motor and warhead for the missile, providing production drawings and specifications for each.

The Propellants and Explosives Department picked up the ball from here, doing further research on the SIDEWINDER propulsion system, and extending the development of the materials that provide the "go-power" and the "blow-power" for SIDEWINDER guidance system. Beyond this, the department proceeded to develop equipment which made possible the processing and mass-production of the SIDEWINDER charge. As an aid to these efforts, the personnel of the Engineering Department in their well-equipped shops produced pieces of research and development hardware needed on urgent time schedules, and also provided initial pilot production runs on many of the parts used in the rocket propulsion system.



MISSILEMEN AT WORK — Engineers in Aviation Ordnance Department who figure prominently in the development of SIDEWINDER review technical data. Pictured standing (l. to r.) are: Dr. W. B. LaBerge, Head, Missile Development Division; E. G. Swann, Head, Guidance and Control Branch; L. T. Jagiello, Head, Aero Mechanics Branch; and P. T. McCormick, Head, Simulation Section. Seated at table (l. to r.) are: L. W. Nichols, Head, Research Branch; and J. H. Madden, Head, Equipment Branch.

SIDEWINDER began to have off-Station importance when the Naval Ordnance Laboratory at White Oak, Maryland and later at Corona, California, provided the technical direction of private contractors manufacturing the fuzing system.

The SIDEWINDER program continued to expand. The guidance system was manufactured by Philco Corporation under the technical direction of Missiles Development Division in AOD. Stringent test requirements continued to be thrown upon SIDEWINDER by Missiles Development Division, Test Department, Guided Missile Unit 61, and the U.S. Marine Corps Development Group.

Early in the research and development phase of the program, GMU-61 reported to this Station to participate in the missile flight-test program. The pilots of this unit have flown all the missile-firing tests leading to the completion of the operational missile development and an evaluation of the auxiliary missile equipment. Along with AOD and R. A. Blaise of Test Department, GMU-61 undertook the Bureau of Ordnance evaluation of the missile. Included in these tests were those generated by the U. S. Marine Corps Development Group assigned to the Station. Composed of Marine technicians, this group assisted the Missile Development Division with the assembly, loading, and testing of the research and development missiles.

The Development Group has conducted tests peculiar to shore-based installations by accumulating information and experience also valuable to the fleet units. Since the missile itself is readily adapted to Marine Corps use, the majority of the Marine Group's efforts have been directed toward test equipment, ground handling equipment, and storage facilities. These tests have considerably aided the Engineering Department in designing the packaging for each of the missile's components.

Along with these tests, the Research Department has assisted in aerodynamic wind-tunnel testing and flight instrumentation, and they have also given particular assistance in the simulation of the missile system, the operation of computing machines, and the analytical treatment of component operation. Although the simulation of missile performance is still handled within the Missile Development Division, in the early stages of the program simulation of test data could be handled by the group directly connected with the creation of SIDEWINDER, but with its rapid growth, the Research Department, like the many departments on the Station, joined in the development of the SIDEWINDER program.

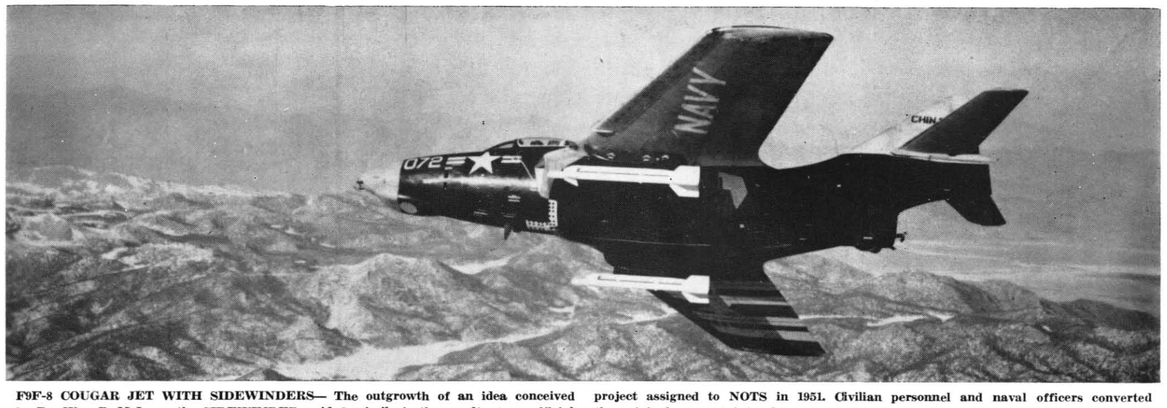
Since the SIDEWINDER program was not limited to the development of a missile alone, but rather with the development of a complete weapon system, the problem of coordinating all aspects of the program was of giant size. This function was originally assumed by LCdr. T. J. Christman, now assigned to BuOrd. He was succeeded by Cdr. M. O. Slater and later by Cdr. John Daniel.

During the most critical days of the program when the missile was being introduced into the fleet, Cdr. Wade Cone provided the necessary direction to meet deadlines that were defined in some quarters as "impossible". It must be acknowledged that these deadlines would have been impossible without the tremendous support of the NOTS Supply Department and the Naval Purchasing Office in Los Angeles.

With the investment of so many departments and people with one program, AOD could not handle the constant exchange of information. The Technical Information Department gave considerable aid by providing reports, brochures, technical lectures, patent information, and documentary films.

So a missile comes to light; from the time of conception, through the short days and long nights of unsung work of first a few ,then more and more people, until finally it becomes another weapon in the nation's arsenal, and its story can be told.

The story? Here it is. SIDEWINDER, a product of the Naval Ordnance Test Station, China Lake.



F9F-8 COUGAR JET WITH SIDEWINDERS— The outgrowth of an idea conceived by Dr. Wm. B. McLean, the SIDEWINDER guided missile is the result of an official project assigned to NOTS in 1951. Civilian personnel and naval officers converted the original concept into the weapon that it is today.

ROCKETEER

Vol. XII, 42 U.S. Naval Ordnance Test Station, China Lake, Calif. October 19, 1956

To The Sea -- 'A SIDEWINDER'

Deadly Desert Rattler In Form of Guided Missile

The Department of the Navy announced this week that the Navy's new air-to-air guided missile, SIDEWINDER, is now operational and is on board fleet units at sea. This missile is named after the fast striking, deadly, desert rattlesnake—the sidewinder. The SIDEWINDER missile was conceived here at NOTS and is now in production by the Philco Corporation of Philadelphia, Pennsylvania.

The highly successful working relationship between a Government agency possessing combat experienced research and development personnel, and a large private industrial concern possessing high level production and engineering personnel, which led to the fleet operational SIDEWINDER, is almost unique in today's missile business. The requirement for SIDEWINDER as assigned to the Naval Ordnance Test Station in 1950 and the original concept of SIDEWINDER was evolved by Dr. Wm. B. McLean, now Technical Director of NOTS and the Station's civilian scientists and engineers working with naval officers familiar with fleet requirements, converted the original concept of SIDEWINDER into the weapon that it is today.

SIDEWINDER provides the fleet with a rugged, inexpensive weapon capable of operating against high performance type aircraft. Extensive testing and evaluation has demonstrated that SIDEWINDER is reliable and can destroy enemy fighters or bombers from sea level to altitudes over 50,000 feet. The Navy explained that the SIDEWINDER is basically a defensive weapon and would be used to augment the protection of our men and ships at sea from attacks by enemy aircraft; thereby enhancing the position of our fleet in maintaining the freedom of the sea, for all nations. SIDEWINDER will also be employed in the air defense of the continental U. S., it was explained.

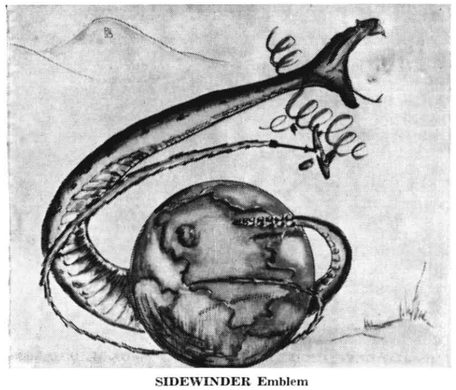
The Navy stated that two Navy squadrons possessing SIDEWINDER capability have already been deployed with the fleet. Tacron 46 has deployed aboard the USS Randolph with the 6th fleet in the Mediterranean area and Fitron 211 has deployed aboard the USS Bon Homme Richard with the 7th fleet in the Western Pacific.

Captain F. L. Ashworth, station commander, explains that the SIDEWINDER represents a new approach to weapons systems for defense against supersonic aircraft. This new missile has very few moving parts and no more electronic components than an ordinary radio and the simplicity of SIDEWINDER makes it possible for men of our Navy to handle and assemble this missile without undergoing any specialized technical training. Navy and Marine pilots will require little or no special flight training to effectively use SIDEWINDER against enemy aircraft in the defense of our fleets at sea.

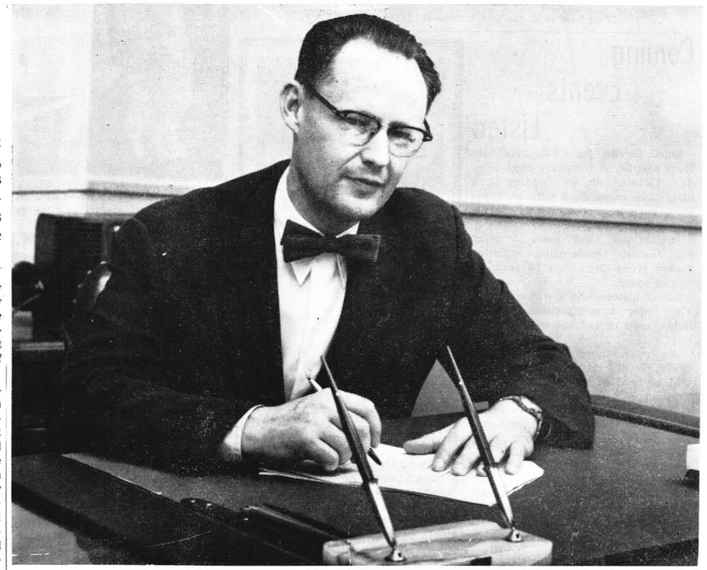
Other industrial concerns connected with the SIDEWINDER program are the Avion Division of the American Car and Foundry Industries at Paramus, New Jersey who produced experimental missiles used in the research and development program and the General Electric Company of Utica, New York who has recently been awarded a production contract. The Eastman Kodak Company of Rochester, New York and the Bulova Research and Development Laboratories of Woodside, New York are also involved in the SIDEWINDER missile program.

California contractors who provided the Naval Ordnance Test Station with important services during the development of SIDEWINDER are the following: Century Engineers, Inc., Burbank, Calif.; West Coast Electronics, Beverly Hills, Calif.; Bermite Powder Company, Saugus, Calif.; Hunter-Douglas, Riverside, Calif.; Santa Barbara Research Center, Goleta, Calif.; John H. Ransom Laboratories, Los Angeles, Calif.; Hoffman Laboratories, Inc., Los Angeles 7, Calif.; Associated Missile Products, Pomona, Calif.; Aerovox Corporation, Monrovia, Calif.; Horning-Cooper, Monrovia, Calif.; McCormick-Selph Associates, Palo Alto, Calif.; Litton Industries, Beverly Hills, Calif.; Rheem Manufacturing Co., Downey, Calif.; Trend Engineering & Publications, Inc., Los Angeles, Calif.; U. S. Flare Corporation & Assoc., Pacoima, Calif.

The following government agencies also contributed important services: Bureau of Standards, Corona, Calif.; Naval Ordnance Plant, Indianapolis, Indiana; Wright Air Development Center, Dayton, Ohio; Naval Ordnance Laboratory, White Oaks, Maryland; Holloman Air Force Base, New Mexico; Naval Air Missile Test Center, Pt. Mugu, Calif.; Edwards Air Force Base, Calif.; and Naval Powder Factory, Indian Head, Maryland.



SIDEWINDER Emblem



DR. WM. B. McLEAN—Technical Director of the Naval Ordnance Test Station, Dr. McLean conceived the Navy's latest guided missile, SIDEWINDER. He stressed simplicity and ease of manufacture.

From Gadgeteering, A Guided Missile Weapon With Complex Functions but Simple in Design

The conception of the SIDEWINDER guided missile is essentially the story of Dr. William B. McLean, Technical Director of the U. S. Naval Ordnance Test Station.

SIDEWINDER stemmed from the same interests that led high school student Bill McLean to build electric motors, design and construct his own photographic equipment, construct himself a canoe out of bows of touring car tops, and in other ways to spend his youthful hours tinkering with electrical and mechanical gadgets.

This gadgeteering, a lifetime hobby, covers the complete range from household knickknacks to complete weapon systems, the one common denominator being that Dr. McLean's most absorbing interest is in designing for simplicity no matter what the object or its purpose. This overwhelming urge to design for simplicity, Dr. McLean believes, resulted from the tight purse strings he had to tug against in his youth. If he wanted a photo enlarger or a new electrical gadget he had to design and build it himself. And since economy was the big factor, he had to design for economy in the cost of parts—economy in effort—and economy in respect to the tools he would need. It is little wonder then that when he became the main force in the development of SIDEWINDER that he continually stressed design simplicity and ease of manufacture.

The step up from designing and building boyhood objects of amusement to developing solutions to involved problems of defense was a natural one; however, it was to take years of study to develop this capability. From the early 1936's to 1939, William McLean attended the California Institute of Technology where he received a BS degree (1935), MS (1937) and PhD (1939) in physics. While taking his graduate studies he served as a part-time instructor in physics, worked in the photo lab, and built a ½-million-volt Van de Graff generator.

From 1939 to 1941 he carried out research work in nuclear physics at the University of Iowa. During this time he also spent many hours constructing equipment in the machine shop. He left the university in 1941 to go to the National Bureau of Standards in Washington, D. C., where he worked until 1945 on ordnance research and development projects.

While working for the Bureau of Standards the ideas began to evolve that were to lead to the SIDEWINDER development. In 1943 he was asked to provide consultant services on the gyro-control system for the BAT missile and as a result of this contact he had one problem etched in his mind—how to avoid the complications that seemed to be inherent in putting "brains" in a missile? He felt there must be ways to simplify the design of missiles and began collecting ideas on how this might be done. He had this problem in mind when he came to NOTS in 1945 as the head of a Branch which developed fire-control systems to improve the accuracy of air-to-air rocket firings.

Dr. McLean's experiences in fire-control work made it more and more obvious to him that the most effective solution to the problem of knocking down enemy invaders would be in putting the detection and computing equipment in the missile instead of in the airplane.

Shortly before the Korean conflict started, Dr. McLean established a plan which he felt would lead to the development of a simple and reliable system for guiding a conventional rocket to an invading aircraft. To establish the feasibility of the system, a small project was started with a very low level of effort, much of the work being done after regular working hours on a no-pay basis.

After the original feasibility studies it appeared that the missile could be built for about the same price as rockets with proximity fuzes. In 1951, the Research and Development Board approved the establishment of the SIDEWINDER guided-missile project.

Since 1951 when SIDEWINDER was established as a project, the work on this missile has been a team effort of the Station—each Department and organization contributing in some form to the development. Dr. McLean stresses that SIDEWINDER is a Station development and one in which each Station employee should accept credit.

How does a contriver of gadgets and designer of weapons react to the administrative duties of the top civilian job on the Station? According to Dr. McLean, there is less difference than one might suspect since he still is thinking about the same kind of things, and still is planning new projects. The big difference is that he now has help from more people and can see more projects progress from the idea stage to fleet weapons. As for actual laboratory work, he now satisfies his gadgeteering interests through his hobby of designing and building items such as a recently completed face mask and a floating take-up reel for skin diving. Hobbies such as this can be very important in providing outlets which complement the demands of a job.

Since SIDEWINDER represents the first air-to-air guided missile to be carried all the way from the idea stage to operational usefulness by a government laboratory, it is pertinent to examine the philosophy of SIDEWINDER'S originator in respect to the work and capabilities of this Station.

To Dr. McLean, design and development work can best be carried out where you can also test your item and re-orient your design according to test results. For this reason he feels that NOTS has a specific appeal to people who like to design things and see them work. This is what brought him to NOTS and what made it possible for him to bring about the SIDEWINDER project; likewise, he feels, it is the factor which is now attracting the young engineers and scientists who will provide the answers to weapon needs of the future.

ROCKETEER

Published every Friday at the
UNITED STATES NAVAL ORDNANCE TEST STATION
CAPTAIN F. L. ASHWORTH, UNITED STATES NAVY
Commander

The Rocketeer, an authorized Navy publication is printed weekly by Hubbard Printing, Ridgecrest, Calif., with appropriated funds and in compliance with NAVEXOS P-35, Rev. November, 1945. The Rocketeer receives Armed Forces Press Service material which may not be reprinted without AFPS permission. All photographs are official U. S. Navy photos, unless otherwise specified. Deadlines: News stories, Tuesday, 4:30 p.m.; photographs, Tuesday, 11:30 a.m.

F. ED. LANEY, Editor — BUDD GOTT, Assistant Editor

Phillys Wair, Editorial Clerk; Peg Gregory, Annex Correspondent (Foothill, phone Ext. 35); Art by Illustration Group, Technical Information Department. Photography by Rocketeer Photo Staff—T. E. Long PH2; Ken Antholt, PH2. Photographers for the Pasadena columns are—Shav Monsen, A. E. Block, and Jeanne Smith.

Office Building 35, Top Deck — Telephone 71354, 72082, 71655

Coming Events Listed

Dust Devils, Inc. will celebrate their second anniversary next Sunday, October 21, by sponsoring a drag race meet at 2 p.m. at Inyokern Airport, according to Bernie Partridge, president.

Invitations have been sent to the fastest accelerating machine racers from California to compete in the event.

Local automobile dealers will also enter a competition of 1957 model cars of various makes.

*

An open meeting of Women's Guild, NOTS Community Church, will be held at the Station Chapel, October 24 at 8 p.m. A general invitation is extended to residents to attend the meeting which will feature Miss Elsie M. Farris, Long Beach civic leader, attorney and missions booster.

*

A monthly meeting of the Art Study Group of AAUW will be held in the Community Center on October 24 at 8 p.m. Non-representational art will be discussed by Bruce Haig, guest speaker for the program.

*

NOTS Overseas Club will sponsor a showing of colored slides taken in Europe last spring. The showing is next Monday evening, October 22 in the Community Center at 7:45. The presentation will be narrated by John Fitzgerald.

*

Burroughs High School marching band will be seen on TV, Channel 4 at 2 p.m. tomorrow when they perform in half-time ceremonies during th USC-Washington U. football game at the L. A. coliseum. The event will take place in honor of the 13th annual high school band day.

*

Color television will be featured at the next meeting of the Institute of Radio Engineers to be held in Richmond School auditorium on October 30 at 7:30 p.m. A 21-inch home color television set will be used for the demonstration by Charles Nichols Jr. of Hoffman Television Laboratories. The public is invited.

*

A meeting of the Hebrew Temple congregation was held October 8 for election of officers for the coming year. Rabbi Irving Ganz of Bakersfield attended the meeting. His next visit is scheduled for Monday, November 12.

New officers elected were: Dr. Max Dubin, president; Dr. Eli Besser, vice president; Dr. Perry Stone, treasurer; Betty Stone, recording secretary; and Charlotte Braitman, corresponding secretary.

*

Blue Cross identification cards for members of NOTS Group Health Insurance Plan are available at the Housing Office, Room 13. Cards should be called for between 7:30 a.m. and 4:30 p.m. Policies for this plan are expected in November.

*

Jerome Hines, basso with the Metropolitan Opera, will be featured on the "Voice of Firestone" hour Monday evening, October 22 at 8:30 on channel 7. Hines is scheduled to appear at NOTS November 15 during the civic concert series.

*

Telephone extensions starting with 74, 75, 76 and 77 in the housing area will be temporarily out of order next Monday morning, October 22 from 4:30 to 7:30. Installation of new line equipmeent by the Power Distribution Branch of Public Works Department will be the reason for the temporary break in service.

Lt. (jg) J. C. Maize

Sidewinder, Maize Closely Associated

Probably the most widely-known person among those associated with SIDEWINDER is Lt. (jg) J. C. Maize, whose duties are only hinted at by his title of Assistant Project Coordinator of the Missile Development Division. Associated with SIDEWINDER throughout his three years in the Navy, John's reputation might be quoted to read, "The versatile red-head who tightens 'loose ends.'" However, these "loose ends" extend from briefing company representatives and visiting military personnel on the details of SIDEWINDER, to rescuing kittens stranded in an airconditioning unit. And the people suffering from "loose ends" hate to hear John speak of having only 22 days before entering civilian life and an engineering position with C. F. Braun & Co. in Los Angeles.

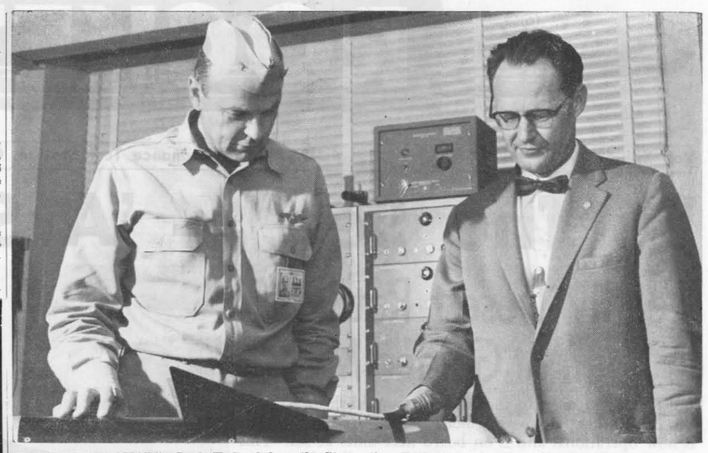
John is a graduate of California State Polytechnic College, and his wife, Phyllis, is a registered nurse. They have a 2-year old daughter, Elizabeth.

Cdr. J. I. Hardy

Experimental Officer Is Fleet Representative

Cdr. J. I. Hardy directs the efforts of NOTS Experimental Officers to provide close liaison with the Fleet to see that station weapon designers know the present and future Fleet requirements. Only by this close association with the Fleet could a missile like SIDEWINDER be an operational weapon in such a short time.

Besides these duties, Cdr. Hardy directs the procurement of drone aircraft for the test program. With SIDEWINDER's "striking" power, an adequate drone supply breathes life into SIDEWINDER's tough test program.



STATION OFFICIALS—Capt. F. L. Ashworth, Station Commander (left) and Dr. Wm. B. McLean, Station Technical Director view the finished product SIDEWINDER, designed and developed at NOTS.

SHOWBOAT

Starting Times: 6 and 8 p.m. daily
Kiddies' Matinee (Special Movies)
1 p.m. Saturday

TODAY — OCT. 19

"BACK FROM ETERNITY" (97 Min.)
Robert Ryan, Anita Ekberg
Millions are waiting for her first big picture—the action, romance, melodrama of nine people who crash landed in Amazon jungle—and the five who came back!
SHORT: "Hickman's Football Review" (9 Min.)

SAT. — OCT. 20

"TEN TALL MEN" (98 Min.)
Burt Lancaster, Gilbert Roland
No synopsis available.
SHORTS: "Destination Magoo" (7 Min.)
"Cafe Society" (10 Min.)

MATINEE
"TARZAN'S HIDDEN JUNGLE" (73 Min.)
Gordon Scott
SHORTS: "Home Made Home" (7 Min.)
"Monster and the Ape" No. 3 (18 Min.)

SUN.-MON. — OCT. 21-22

"THE LAST WAGON" (109 Min.)
Richard Widmark, Felicia Farr
Under sentence to hand, our hero wages war against the Indians after a wagon train massacre. Here's an excellent cast of future young stars.
SHORT: "Phoneys Beware" (8 Min.)

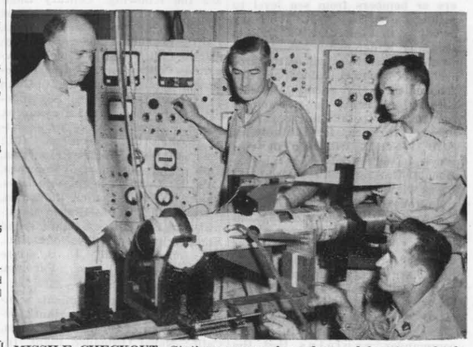
TUES.-WED. — OCT. 23-24

"FLYING LEATHERNECKS" (102 Min.)
John Wayne, Robert Ryan
A reissue.
SHORT: "Aqua Babes" (8 Min.)

THURS. — OCT. 25

"THE BRAVE ONE" (100 Min.)
Michael Ray, Joi Lansing
A straight forwara story about a little Mexican boy who idolizes a bull he has raised from birth to the day he fights in the bull ring.
SHORT: "Ice Climbers" (8 Min.)

SIDEWINDER PILOTS—Standing next to a typical installation of the missile on an F9F-8 Cougar (l. to r.) are: LCdr. G. A. Tierney, USN; Lt. (jg) T. S. Rogers Jr., USN; and Capt. T. E. Murphree, USMC.



MISSILE CHECKOUT—Station personnel conduct a laboratory checkout on SIDEWINDER. Pictured above (l. to r.) are: Bob Chatham, Philco engineer; Marvin Robertson, GFC, USN; Jim Thomas, GFC, USN; and Stanley Lis, M/Sgt., USMC.

'SIDEWINDER' Is Rattler Namesake

The choice of the name SIDEWINDER for the Navy's newest air-to-air missile is personified for NOTS scientists, physicists and engineers in the deadly striking power of the weapon and is characteristic of the desert rattlesnake.

The Sidewinder is a small rattlesnake (Crotulas cerastes). It gains its name because of its peculiar method of travel. Instead of a snakelike serpentine motion, sidewinders throw themselves from side to side. Coming toward you they look as if they were going away. They make a trail on the sand of parallel cross bars, while other rattlers leave a serpentine trail.

The Sidewinder is sandy in color, about two feet in length, and about as large around as a man's thumb.

Job Opportunities

Fiscal Accounting Clerk, GS-4, Commissary Store. Phone 72218.

MISSILE DEVELOPMENT DIVISION HEAD—Dr. W. B. LaBerge of Aviation Ordnance Department is prominently identified with the SIDEWINDER program. He has worked with the project since its inception.

Nation's Papers Tell of 'SIDEWINDER'

Sidewinder Overall Station Project

When Dr. William B. McLean first thought of such a missile as SIDEWINDER, probably little did he realize the force that "thought" would exert. Within the Station, the individual person realizes how that "thought" influenced him, but how about the Station as a whole? SIDEWINDER has called upon every department that composes NOTS. Here's what the departments did.

Missile Development Division in Charge; All Station Departments Aid Program

SIDEWINDER CONFERENCE — Station officials confer on the Navy's latest guided missile. Pictured standing (l. to r.) are: Dr. W. F. Cartwright, Associate Head of Missile Development Division, AOD; Dr. H. A. Wilcox, Head, Rocket Development Department; and Cdr. W. H. Cone, Head, Coordination Branch, AOD. Shown in foreground is Dr. W. B. LaBerge, Head, Missile Development Division, AOD.

Rocket Development Dept.

The design and development of several of the major components of the SIDEWINDER missile was carried out by the Rocket Development Department. These components included the rocket motor, the warheads, an auxiliary power supply and several flares for test purposes. The rocket motor used to propel the missile was originally developed for an air to ground weapon. This motor was adapted to the SIDEWINDER mainly by adding large wings and suitable launcher fittings.

Easily over a million dollars in funds and several years of time was saved by this use of an existing development. The work on this motor was directed originally by Jim McDonald, Jim Wilson, and Hugh Woodier, then by Gil Fountain and Bill Jandl. Under the guidance of Jim McDonald, Gil also designed the warhead specially for this missile. A number of new features were included in this design to achieve increased lethality without increasing cost or size.

To test the performance of a missile, engineers must be able to follow its flight with cameras and they must be able to determine where it hits. To facilitate these operations flash signals, tracking flares and exercise warheads were developed by members of pyrotechnic group. Most of the work on the flare development was directed by the late Dick Blanche. This has since been carried on by Thom Hahn. The complex exercise head that makes white or red signals which are visible for several miles was developed under the direction of Rod Weldon.

Engineering Dept.

The Engineering Department has enjoyed the part it has played in the development of SIDEWINDER. The deadlines, the crises, the worries are all but forgotten in sharing with pride the satisfaction of seeing SIDEWINDER released as an operational weapon.

The Department has worked with and contributed to almost every part that goes into the SIDEWINDER system. The Shop has produced parts so small that their handling is a problem, with tolerances that have taxed the ingenuity of the inspectors; and it has produced parts of such size and type they were defined only by the instructions "fill it up with lead."

The Standards Lab measured, in the early development days, the electrical characteristics of SIDEWINDER models. Recently the fledgling electronic model shop of the Engineering Department was hit with an order which, in size at least, literally was larger than the space assigned to the Shop. Parts had been made from sketches on the backs of envelopes to formal drawings.

It was no small job for the contractors, development groups, and others to get this data package together which allows SIDEWINDER to be released for mass production and service use. Weekly from this Station many pounds of mail go out to various industrial and military centers to keep information on SIDEWINDER current.

Parts of SIDEWINDER are currently being made in mass production by techniques which were not known a few years ago. It has been part of the production engineering effort of the Department to encourage advances in manufacturing methods and to introduce them into the SIDEWINDER system to both reduce its cost and increase its reliability.

SIDEWINDER has been tested above 50,000 feet at extreme temperatures; it has been transported on railroads, on trucks, on ships; it has been dropped from cargo nets—all without leaving Michelson Laboratory. Much of this has been done with the environmental testing facilities surrounding the all-weather chamber. One can suspect that these trips simulated within Michelson Lab are somewhat more severe than will be anticipated outside the fence, and SIDEWINDER has passed them all. This simulated handling has been done both in and out of service packaging. The service packaging, incidently, has been designed, developed, and evaluated as independent items within the Engineering Department.

Rubber is used on SIDEWINDER and so are many metals. To most of us rubber is rubber, and steel is steel; but to the materials engineers there are innumerable variations of each, and it was their job to specify the specific variation which would best satisfy the requirements. When plastic potting compounds turned to soup instead of a mass not too hard or not too soft, the materials engineers were called upon to solve a process problem.

The transition from development to production of new products offers many problems. The new plants, new machinery, and new people brought into the SIDEWINDER production program have introduced many but not altogether unexpected problems. This transition is of particular interest to the Engineering Department and is a phase, in steps from design to fleet use, in which it specializes.

Many terms have been applied to various stages of the transition, such as pilot production, evaluation proof production, experimental production; but regardless of the name, the Engineering Department assists commercial manufacturers in delivering, at the lowest possible cost, on time, the item that meets the specifications and drawings which represent the item developed and released for production. This is done through assistance and advice in manufacturing techniques and quality control.

The Department is looking forward to participating even more fully in the SIDEWINDER programs of the future.

Test Dept.

Test Department first entered the SIDEWINDER program in early 1951, when it was requested to help in the design of the seeker system. By July the SIDEWINDER project was far enough along that the Test Department Project Engineering Office was put in charge of the first SIDEWINDER firings at the 6-deg ramp to test the dummy airframe for stability and drag, and to obtain trajectory and ballistic data. A typical weapon-development pattern of design, test, and modify emerged.

The foremost NOTS ranges were used for this: K-2 for a long series of tests of warhead lethality and fuze function, Projectile Range for firings from a special ramp at targets to further assess fuze function, and B-4 for developmental firings of the fuze and other components, and to test reliability and operability of the complete missile.

Later the SNORT track was used for supersonic sled firings of dummy missiles to determine launching characteristics to enable development of a launcher, and to find if SIDEWINDER was reliable at supersonic launching speeds. Use of the B-4 and SNORT tracks to conduct these firings saved the taxpayer a considerable sum, as it was thus possible to recover the missile intact at the end of the run and use it over and over again. These tests showed up the reliability of such factors as soldered joints, electronic tubes, missile power supply, and even the telemetering equipment used to gain much of this data.

By September 1952 development and test had resulted in a SIDEWINDER missile ready for air firings. First firings were made with dummy rounds, and called for the expansion of the Project Engineering Office to cover the coordination of Aviation Ordnance Department missile personnel with Test Department range and instrumentation and Naval Air Facility flying and maintenance people. Air firings at this time were primarily to determine launching characteristics and ballistic data.

By September 3, 1952, development had reached the point where the first complete round with guidance could be fired. The first firings were unsuccessful. Test followed test, to determine the cause of failure. At last the bugs were eliminated, and on September 11, 1953, SIDEWINDER sent an F6F drone down in flames over the G ranges.

As air firings became more frequent, Test Department became more involved in the process of obtaining drones and modifying them for SIDEWINDER target use. Maintenance of range equipment and coordination of the range personnel became a bigger problem. Teamwork necessarily had to be developed to a high degree of efficiency. Development of SIDEWINDER proceeded on a crash basis. Parts for all the equipment needed were often second hand, having been cumshawed from sympathetic allies in all areas on NOTS. Baling wire and chewing gum were often the order of the day. Constant modification of SIDEWINDER continued as a result of both ground and air testing. It was fired at NOTS against many drones at both high altitudes and low altitudes to check performance factors.

By August 1955, SIDEWINDER was considered ready for evaluation for fleet use. Test Department Evaluation Committee was given the task of evaluating the Philco-produced SIDEWINDER to determine if Philco could produce and if it could be used in the fleet. By January 1956, tests carried out under this assignment determined that it was reliable enough to be released for suitability evaluation by Fleet Operational Development Force.

Propellants & Explosives Dept.

The Propellants and Explosives Department has developed the materials that provide the "go-power" and the "blow-power" for SIDEWINDER. Beyond this, the department has designed and developed the equipment that makes it possible to process and mass-produce the SIDEWINDER charge.

Fortunately, foresight on the part of the Propellants and Explosives Department scientists resulted in a suitabe propellant being available when SIDEWINDER was designed. The department has personnel continually developing new propellants, many of which are awaiting new rocket and missile designs. Thus, a propellant that exactly suited the needs of SIDEWINDER was available. Once the size and configuration of the propellant charge was decided upon, the Propellants and Explosives Department had the job of designing equipment and tools that would efficiently produce such a charge.

There were many problems in designing production and process equipment, among which was evaluation to determine how much a given charge could vary and still perform satisfactorily.

Propellants and Explosives Department also entered into the SIDEWINDER program in other ways. Surveillance studies and investigations into the storage life of the SIDEWINDER motor finally showed that the propellant would perform satisfactorily in sub-zero arctic weather or in the torrid, humid, equatorial regions.

Procedures for loading the SIDEWINDER warhead with explosive and methods of testing the warhead were aso developed in the Propellants and Explosives Department. For these procedures, as well as for production methods, equipment, and inspection, the Propellants and Explosives Department has prepared specifications that have become the final Bureau of Ordnance word on such matters.

All of the more or less scattered contributions to SIDEWINDER had to be integrated into a fine piece of precision machinery, and the Propellants and Explosives Department met the demands, along with other departments, to provide the Navy with a weapon of superior qualities.

Guided Missile Unit 61

Early in the research and development phase of the SIDEWINDER program, Guided Missile Unit 61 reported to this Station to participate in the missile flight test program. The pilots of this unit, presently directed by LCdr. G. A. Tierney, have flown many missile firing tests leading to the completion of the operational missile development.

Enlisted personnel in GMU-61 were responsible for the preflight phase of the missile test program and in accomplishing this task have reviewed the assembly techniques of the missile, and assisted in the development of the missile test equipment.

Marine Development Group

Getting requirements peculiar to the Marine Corps into the SIDEWINDER missile and its related equipment is the job of the detachment to the SIDEWINDER program. In addition to the Marine Corps requirements, this group has been very active in assisting the Missile Development Division with the assembly, loading, and testing of the research and development missiles.

The Group conducted tests peculiar to shore-based installations while the Navy has been concentrating on ship-based installations, and have accumulated a wealth of information and experience that has been valuable to the Naval Ordnance Test Station and Fleet Units as well as the Marine Corps.

The group of Marine technicians is headed by Capt. T. E. Murphree, USMC, recently nominated "Man of the Year" by the Chamber of Commerce. Included in the group are M/Sgts Wieczerzak, Lis, Albright, and Jolly; T/Sgt Cannon; and S/Sgts Whitwam and Moscoe. One of the first Marines to participate in the SIDEWINDER program is now a civilian in the project, F. H. Medlong.

Since the missile itself is readily adapted to Marine Corps use, the majority of effort as regards Marine Corps requirements has been directed toward test equipment, ground handling equipment and

(Continued on Page 4)

America's Defense Program Bolstered By Development of 'SIDEWINDER'

(Continued from Page 3)

storage facilities for Marine Corps field use.

Marine personnel from operating squadrons are being trained in the SIDEWINDER handling, assembly, and check-out procedures by the Marine SIDEWINDER Detachment. Briefing of various Marine Corps Commands have been conducted by Capt. Murphree who has not only been active in the research and development phases of the program, but has also flown many of the flight tests of the missile.

Naval Air Facility

The Naval Air Facility has materially contributed to the "SIDEWINDER" program in numerous ways since its initial start in 1949. The Naval Air Facility has furnished and maintained the jet aircraft used in testing the "SIDEWINDERS" and firing the missile in air to air and air to ground tests.

The Naval Air Facility has furnished the logistic aircraft necessary for the support, development and testing of the SIDEWINDER. Urgently needed parts and materials were flown in to NOTS for the continuation of the missile program. The SIDEWINDER missiles, racks and miscellaneous components were flown to different parts of the United States for firing demonstrations and testing.

The Naval Air Facility has, since May 1954, furnished, supported and maintained a very large drone aircraft unit to be used for target purposes in testing the effectiveness and capabilities of the SIDEWINDER in air to air firings. Being a highly effective and efficient missile, its "strike" is deadly and the drone support was a tremendous effort.

At the Naval Air Facility's desert "carrier deck" aircraft equipped with sidewinder missiles, racks and components were tested extensively during severe catapult and arresting gear operations to prepare it for effective Fleet use. The aircraft and missile components were subjected to maximum stresses and strains to assure its readiness for fleet use.

While the pilots attached to Guided Missile Unit 61 did the majority of the flying of SIDEWINDER jet aircraft during its development, they were often aided and assisted by project test pilots attached to the Naval Air Facility, namely—Cdr G. H. Mahler, III, Cdr. W. A. Jernigan Jr., and LCdr. A. F. Tozer.

Handling, loading, launcher checks and other ordnance functions provided many new ordnance problems which required immediate solutions. These solutions were often solved with the assistance of the Naval Air Facility Ordnance Department.

The entire Naval Air Facility organization has conscientiously endeavored to assist in any way possible the development and perfection of this highly effective weapon for the naval service.

Research Dept.

Many contributions were made by the Research Department in the successful development of SIDEWINDER.

Studies in the field of chemistry led to significant advances in the early stages and later development of this weapon. New components for the rocket motor and warhead; procedures for analyzing these components; design and fabrication of glass components; compatibility studies of components—these are some of the problems attacked by the chemists of the Research Department. In all phases of development work, the Chemistry Division gave valuable advice.

In a study of the properties of matter, the Physics Division has investigated the basic physical properties of various target detectors. The fruits of this study have been applied to many of the problems encountered by the development groups in their use of these devices. The results of this cooperative effort have been a speedier and more comprehensive solution of problems.

Computational techniques, both analog and digital, have played an important role in the development of SIDEWINDER. In November 1951 analog computation was started for the analysis of components for this weapon. The building of a mathematical model of the whole system was started, component by component. After the model was established as valid, extensive computations to optimize each component were made. When the actual firing of the missile was started the data was reduced, in part, on digital computers and was compared with the analog solutions. In each phase of research, development, and evaluation of SIDEWINDER, the Mathematics Division—its mathematicians and statisticians, as well as the use of computers—has done much to aid in the completion of SIDEWINDER.

Technical Information Dept.

SIDEWINDER was not developed in an informational vacuum. Rather, from the time of the original conception of the missile to the time of its introduction to the fleet, there has been a constant exchange of information—reports, brochures, technical lectures, patent information, and documentary films—all of which have helped to make the weapon a practical reality.

Much of this vital work in the information field was performed by the Technical Information Department (TID) and, prior to July 1954, the organizations which later went into TID.

To see just how TID has contributed to this important Station project, consider for a moment the role of the Publishing Division of TID. Editors of this Division have applied their editorial skills to the editing of a large number of technical reports which covered the research and development work on the missile. These same editors also wrote articles on the SIDEWINDER which have either appeared in journals, such as **Navy Electronics,** or are slated for early publication.

In addition to the technical reports and articles, the Division has prepared a Pilots' Handbook on SIDEWINDER which brought a special word of thanks from the Chief of Naval Operations. Illustrators of this Division have prepared illustrations on the program that have been used in reports, brochures, documentary films, and Station presentations. Members of the Division's Printing and Reproduction Branch have turned innumerable manuscripts into printed reports.

Just as the SIDEWINDER work of NOTS will not stop with introduction to the fleet, neither will the work on publishing of reports stop at present, for example, a SIDEWINDER brochure is being prepared for the briefing of both technical and non-technical personnel on the workings of the missile.

Printed reports are of no value unless they are made available to those who need the information. The Distribution staff of TID has seen to it that the SIDEWINDER reports, like all other formal reports of NOTS, have gone out to the men and women who need the information.

The Library Division of TID has also played an important part in getting the right facts to the right man. When a development engineer goes to the Library for a report on the development of, say, Component "A" of SIDEWINDER, he will get the report, a prompt result of the systematic procedures put into effect by the combined Library staff. And, of course, in a development of the scope of SIDEWINDER, NOTS scientists and engineers must draw ideas and data from the informational resources of the nation through printed reports. The Library foresees such needs and obtains all the reports it can on the type of work done at NOTS. When the reports are not on hand when requested, the Library makes arrangements for them.

The Patent Division is another organization in TID that made an important contribution to the SIDEWINDER program. Through the Patent Division, numerous patents have been filed on significant parts of the missile to assure patent protection on the development. This action cuts to a minimum the danger of the government having to pay royalties for similar mechanisms developed elsewhere.

An important part of any major development, especially in the early stages, is in getting project support. To do this it is vital that persons in responsible positions be informed of the potentialities of the development. A major means of doing this is with lectures and other presentations. The Presentations Division of TID, through the Technical Programs Coordinator, has arranged for a countless number of presentations that have covered the SIDEWINDER program. Documentary Film Branch has produced documentary films on SIDEWINDER that have been important tools of communication to both technical groups and servicemen who will use SIDEWINDER.

Development Branch in recent months has worked closely with SIDEWINDER development personnel and Station management in preparing information and photographs for release to the public on SIDEWINDER so that the importance of this weapon will be recognized, and so that the true potentialities of this Station in the weapon research and development field can become more generally known.

Command Administration Dept.

One of the major support roles for SIDEWINDER has been rendered by the Command Administration Department through its Security and Safety Divisions. Making the SIDEWINDER operational has, of necessity, required many safeguards by security.

The Security Division, under the direction of Commander E. V. P. Horne, has given invaluable assistance. Information, directives and notices concerning SIDEWINDER were restrictively controlled but did not retard development of the missile. Safety is always important and detailed attention by the Safety Division resulted in an effective work program for project SIDEWINDER

TEAMWORK—Division heads of three technical departments at NOTS corroborate on SIDEWINDER project. Pictured (l. to r.) are: F. L. Carlisle, Engineering Dept.; R. A. Blaise, Test Dept.; and D. D. Ordahl, Rocket Development Dept.

Supply Dept.

The Supply Department provides complete logistic support to the SIDEWINDER program. The contract and production specialists of the Procurement Branch, Pasadena, have negotiated scores of contracts for the technical parts, equipment and materials which have gone into the production and testing of SIDEWINDER. Some contracts are with firms as distant as New Jersey.

Close deadline dates must be established and adhered to in order to meet test schedules. This means frequent conferences of Supply Department personnel with contractors, SIDEWINDER technicians and engineers and Navy personnel. It also means constant liaison and advance planning to meet many frustrating problems and to maintain schedules. In addition to contract negotiation there are thousands of fast moving purchase orders of lesser magnitude for exacting SIDEWINDER material and parts, also under short leadtime delivery deadlines involving constant follow-up to insure that they are met.

One of the most difficult phases program encountered by the Supply Department is the shipping of firing and test equipment developed at NOTS to distant ports such as Yorktown, Philadelphia, Seattle for installation on the Navy's biggest carriers. They have put into the ports under orders specifically for the installations which means that the equipment must be there on exact schedule to meet them. Premium air transportation is mandatory in most cases though occasionally a shipment can make it by railway express.

Experimental Officer

The Experimental Officer and his assistants have been a part of the SIDEWINDER program since its inception. Early in the program, pilot officers on the staff of the Experimental Officer were called upon to estabish a set of guide lines for operational requirements with modern aircraft within which the missile would be expected to perform. Throughout the development program, a close liaison has been maintained to ascertain that these requirments would be met. The result has been a simple, rugged, easily maintained weapon, which can be handled by fleet personnel and flown from fleet aircraft with a minimum of special equipment and training.

Assistance was also forthcoming from this office in the procurement of Navy operational and drone aircraft for the test program and to conduct the aircraft/missile airborne compatibility demonstrations prior to operational tests of the entire system. The Assistant Experimental Officer responsible for procurement, received a high degree of cooperation from the Air Force Development Field Representative, also arranged for Navy pilots to be checked out in Air Force planes.

The Marine Corps Liaison Officer, another member of the Staff, participated by outlining Marine Corps requirements peculiar to field handling. This included redesign of test equipment to portable size, and development of handling gear for transport of the missile in combat areas. He also arranged for instruction of Marine Units by the Marine Group attached to the SIDEWINDER project.

The Field Service Unit has worked closely with the SIDEWINDER Group to aid in solving problems encountered in initial fleet use of SIDEWINDER, and in presenting indoctrination and shipboard units handling the missile. Information gathered in the field by the unit has been transmitted to appropriate SIDEWINDER groups for action as required. The unit also participated in trial operations aboard ships being equipped to handle the missile, and observed the Operational Development Force Evaluation program. The unit cooperated with Naval Ordnance Laboratory, Corona, in the development of a surveillance program in the fleet for the purpose of obtaining usage data.

By coordinating and directing the functions outlined above, the Experimental Officer has been able to provide an important contribution to early fleet introduction of SIDEWINDER.

Personnel Dept.

Although not directly connected with the development of SIDEWINDER, the Personnel Department did not set on the sidelines in this endeavor. The station-wide aspects of the program require services from all sections of the Personnel Department.

The jobs of performing the personnel staff functions to the line organizations in a project as great as SIDEWINDER was a major undertaking. The recruitment, employment, and training of technical personnel necessary for the jobs was the principal assignment. We believe that the personnel of this department can feel justly proud for having participated in such a project.

Public Works Dept.

The scientific concept cannot be taken as a final technical development until it is actually a "piece of hardware". In order to proceed with experiments, tests, and production of such a missile, it is necessary to have a great many facilities designed and constructed, or many of the existing facilities altered, to fit the conditions. In this way, the Public Works Department handled several major contracts for the construction of buildings and extended the facilities associated with the test ranges and laboratory.

Each test of the SIDEWINDER required Public Works' support in a form of hidden services: things such as transportation, target preparation, missile recovery, and construction of special camera pads, all associated with the special project, had to be accomplished in time to coordinate with the schedule.

Dept. of Community Affairs

Probably the most obscure and unnoticed among the contributions to the SIDEWINDER effort is that of the Department of Community Affairs. This is not to say their contribution was unimportant. The Community Manager is responsible for providing adequate living conditions for the people who develop ordnance weapons for the Navy, no small item in the preparation and final acceptance of SIDEWINDER.

FIELD TEST EQUIPMENT—Military personnel work on a Field Test set which is used in testing the guidance and control section of the SIDEWINDER missile. Pictured (l. to r.) are: Chester Cannon, T/Sgt., USMC; Michael Wieczerzak, M/Sgt., USMC; Joseph Pillittere, GFAN, USN; and Thomas Moscoe, S/Sgt., USMC.